

**SPECIES IMPACT STATEMENT FOR THE
PROPOSED WOLLAR TO WELLINGTON 330KV
TRANSMISSION LINE**

Volume 2 - Species Impact Statement

For:

TRANSGRID

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Final Report

Cumberland Ecology

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The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology

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Date: 18 August, 2005

CERTIFICATION

This is to certify that this Species Impact Statement has been prepared in accordance with the requirements of Sections 109, 110 and 111 of the *Threatened Species Conservation Act 1995* particularly the requirements notified by the Director General of the NSW Department of Environment and Conservation, and with regard to the matters identified by Section 5A of the *Environmental Planning and Assessment Act 1979*.

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Executive Summary

PURPOSE

Cumberland Ecology Pty Ltd was commissioned by International Environmental Consultants to prepare a Species Impact Statement (SIS) to assess potential impacts upon threatened flora and fauna by TransGrid's proposed 330kV Transmission Line from Wollar to Wellington. The proposed transmission line route has been selected to minimise impacts upon native vegetation and a high proportion of it is located within cleared agricultural land (see Project Route Plans 1-42 in Volume 3 of the EIS). At some places along the proposed route, avoidance of native vegetation is not possible and the transmission line easement will pass through, and require clearing of, some eucalypt forest and woodland, including habitat for threatened flora and fauna.

The purpose of this SIS is to formally evaluate the impacts of the proposal upon threatened flora and fauna and to provide recommendations to mitigate and manage flora and fauna impacts arising from the construction and operation of the transmission line. Although the SIS has been prepared primarily to meet the requirements of the New South Wales *Threatened Species Conservation Act 1995* (TSC Act), it also assesses the impact to threatened flora and fauna listed by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Therefore, within this document threatened flora and fauna include populations, species and communities listed by the EPBC Act and/or the TSC Act. Threatened aquatic species listed by the New South Wales *Fisheries Management Act 1994* were also considered when preparing the initial assessment. However, the proposed route will not have significant impacts upon streams and so aquatic species have not been covered in the SIS.

BACKGROUND

TransGrid went through a Preferred Corridor selection process in 2003 which involved community consultation and environmental assessment of three viable corridors located in the Northern, Central and Southern parts of the area; with a variation on the Northern Corridor. Assessment of these corridor options included desktop studies, targeted fieldwork and community and stakeholder consultation. The Corridor Selection Report was placed on public exhibition for formal submissions and a preferred corridor chosen by TransGrid, with consideration to the report and submissions. After extensive community consultation and assessment of the relative impacts of each corridor the Northern Corridor incorporating the Wollar Variation was selected as the preferred corridor and this is the subject of this SIS. The "Northern Corridor - Wollar Variation option" was judged to have the least overall impact on people living within the locality and upon the surrounding environment. Volume 1 contains further details about the corridor selection process.

Preliminary flora and fauna investigations by Cumberland Ecology in 2004 identified a suite of threatened flora and fauna that could be potentially impacted by the project, including the endangered ecological community known as White Box – Yellow Box – Blakely's Red Gum Woodland and threatened bird species including Diamond Firetail, Speckled Warbler and Brown Treecreeper. Eight part test assessments were completed as required under Section 5A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and these concluded that the project had potential for a significant impact upon these threatened biota so Director General's Requirements were duly sought and received from the Department of Environment and Conservation (DEC) in February 2005. White Box – Yellow Box – Blakely's Red Gum Woodland overlaps with a vegetation community that has been listed by the EPBC, which is known as White Box Grassy Woodland. Consequently, an environmental assessment called a "referral" was also made to the Commonwealth Department of Environment and Heritage (DEH), recommending that the proposal be considered a "controlled action", (which, in the terms of the EPBC Act means a project with significant impacts) primarily because of its impacts to Grassy White Box Woodland. DEH confirmed that the project is a controlled action and will assess the project based upon information submitted within the EIS/SIS.

STUDY AREA

The study area covered by the SIS included areas to be directly impacted by clearing within the proposed 60 metre wide and 117 km long easement upon which the transmission line is to be constructed (the "subject site"). The study area also included adjacent areas that have potential to be affected indirectly by the proposed transmission line components including all areas to be built upon and any auxiliary infrastructure construction outside the easement such as access roads. For the purposes of this SIS, the vegetation communities that have been mapped and are shown in Figures 6a to 6o (in Volume 3 of the EIS) form the extension of the study area from the subject site.

The study area includes terrain that ranges from gently undulating valley floors through to steep rocky ridges. It also includes a mixture of native vegetation including Black Cypress Pine – Broad-leaved Ironbark Open Forest and eucalypt and callitris woodland. The plant communities occurring in the study area show varying degrees of modification and disturbance. Vegetation on fertile and lower lying areas of the study area has been modified by land clearance and pasture improvement. The original vegetation of such areas is most likely to have consisted of Temperate Eucalypt Woodland Complex communities. Clearing has occurred throughout the study area as evidenced by the young age of trees and disturbed structure of the woodlands, especially within the western portion of the proposed transmission line route. Despite this, remaining areas of native vegetation are notable for having high biodiversity and for supporting a variety of threatened and regionally significant flora and fauna.

SUBJECT FLORA AND FAUNA

Within the SIS, “subject” flora and fauna include threatened species/populations/communities that occur or potentially could occur within the study area. “Affected” flora and fauna are a subset of subject flora and fauna that are considered likely to be impacted in some way by the proposal. The subject flora and fauna are listed below. Note that a wider range of flora and fauna was originally considered for inclusion as subject species but some were rejected for detailed consideration because of lack of habitat and/or because they are now extinct in NSW. The complete list of potential species is covered in Chapter 2 of the SIS.

Endangered Ecological Communities:

- Fuzzy Box Woodland on alluvial soils; and
- White Box – Yellow Box – Blakely’s Red Gum Woodland (also overlaps with the threatened EPBC-listed Grassy White Box Woodland and Yellow Box/Red Gum Grassy Woodland communities).

Flora Species: *Boronia ruppia*, *Bothriochloa biloba*, *Dichanthium setosum*, *Diuris tricolour*, *Eriostemon ericifolius*, *Eucalyptus cannonii*, *Goodenia macbarronii*, *Grevillea divaricata*, *Grevillea masonii*, *Homoranthus darwinoides*, *Indigofera efoliata*, *Philotheca ericifolia*, *Pilularia novae-hollandiae*, *Pomaderris queenslandica*, *Rulingia procumbens*, *Swainsona recta*, *Swainsona sericea*, *Zieria ingramii* and *Zieria obcordata*.

Fauna Species: Terrestrial/Semi-arboreal Mammals: Spotted-tailed Quoll, Brush-tailed Phascogale, Striped-faced Dunnart. Arboreal Mammals: Squirrel Glider and Koala. Microchiropteran Bats: Large-eared Pied Bat, Eastern False Pipistrelle, Eastern Bentwing-Bat, Little Bentwing-bat Eastern Freetail-bat, Greater Long-eared Bat and Yellow-bellied Sheath-tail Bat. Birds: Glossy Black-cockatoo, Brown Treecreeper (eastern subspecies), Painted Honeyeater, Swift Parrot, Square-tailed Kite, Hooded Robin (south-eastern form), Black-chinned Honeyeater (eastern subspecies), Turquoise Parrot, Barking Owl, Powerful Owl, Masked Owl, Grey-crowned Babbler (eastern subspecies), Speckled Warbler, Diamond Firetail and Regent Honeyeater.

FIELD SURVEY RESULTS

A range of native plant communities occur in the study area and these can be grouped into four broad categories based upon topography, species composition and other habitat conditions: Open Forest, Woodland, Grassland and Exotic Vegetation (see vegetation maps in Figures 6a to 6o in Volume 3 of the EIS).

The open forest group consists of Black Cypress Pine – Broad-leaved Ironbark Open Forest Community (Community 1) in the eastern portion of the route. This community was

limited to a sandstone ridgetop in the eastern end of the easement near to the north with Goulburn River National Park.

The woodland group consists of several types of woodland communities on a variety of hillside locations and soils. This includes four communities from the Black Cypress Pine League [Black Cypress Pine Woodland (Community 2), Black Cypress Pine – White Box Woodland (Community 3), Black Cypress Pine – Red Box Woodland (Community 4) and Black Cypress Pine – Tumble-down Red Gum Woodland (Community 5)] and six communities from the Yellow Box – White Box - Red Gum League [Yellow Box – Blakely's Red Gum Woodland (Community 6), Yellow Box – White Box Woodland (Community 7), White Box – Inland Grey Box Woodland (Community 8), White Box Woodland (Community 9), White Box – Red Stringybark Woodland (Community 10), Blakely's Red Gums (Community 11)], River Red Gum Riparian Forest (Community 12) along the creek lines and Fuzzy Box Woodland.

The Black Cypress Pine community complex tends to occur on poorer soils with the result that they are often in more natural condition than the Yellow Box-White Box-Red Gum League communities. They generally comprise a dense cover of *Callitris endlicheri* (Black Cypress Pine) with scattered eucalypts and a shrub stratum above a generally sparse ground cover.

The Yellow Box – White Box - Red Gum League serves as indicators of good pastoral and agricultural land as members of this league mostly occurs on fairly deep soil of moderate to high fertility (Forestry Commission of NSW 1989). Therefore undisturbed examples of this league are now extremely rare (Forestry Commission of NSW 1989). Owing to the relatively fertile soils on which these communities occur, most sites have been highly modified by clearing, with varying subsequent regeneration and weed invasion. Most comprise grassland with an open to scattered cover of trees. Some of the sites where this community remain are on poorer or stony soils that were less desirable for farming and therefore less cleared.

White Box – Yellow Box - Blakely's Red Gum Woodland Complex was detected in patches scattered intermittently along the whole proposed transmission line route.

The threatened plant species Narrow Goodenia (*Goodenia macbarronii*) was detected on the eastern portion of the proposed Transmission line route and therefore impacts on this threatened plant species from the proposed transmission line route were predicted.

Four threatened bird species (Speckled Warbler, Brown Treecreeper, Diamond Firetail and Glossy Black Cockatoo) and three threatened bat species (Large-eared Pied Bat, Eastern Bentwing Bat and Yellow-bellied Sheath-tail Bat) were detected during the fauna survey.

Another comprehensive survey was undertaken within the western part of the alignment of the transmission line as part of the EIS for the proposed Wilpinjong Coal Project (Resource Strategies 2005b). Threatened species either recorded as part of that study or referenced by that study as being known from previous studies were: Diamond Firetail, Speckled Warbler, Brown Treecreeper, Hooded Robin, Painted Honeyeater, Masked Owl,

Square-tailed Kite, Glossy Black-cockatoo, Turquoise Parrot, Black-chinned Honeyeater, Grey-crowned Babbler, Powerful Owl, Barking Owl, Red-tailed Black-cockatoo, Blue-billed Duck, Squirrel Glider, Large-eared Pied Bat, Eastern False Pipistrelle, Little Bentwing-bat, Eastern Bentwing-bat, Eastern Freetail-bat and Yellow-bellied Sheath-tail Bat. A number of these species, even if not recorded by the current Cumberland Ecology study, were considered to be probably affected by the current proposal based upon the Wilpinjong records.

Two migratory bird species (Rainbow Bee-eater and Dollarbird) were also recorded in the study area. Three declining woodland birds with potential to be listed as threatened species in the future were recorded in the study area as well (Jacky Winter, Restless Flycatcher and Southern Whiteface). Other threatened fauna species are expected to occur from time to time in the habitats of the study area and these are discussed further within the SIS.

The threatened species known to occur in the study area, are highly mobile, have broad home ranges and are unlikely to depend solely on the habitat within the subject site. There is also similar habitat conserved in surrounding national parks (such as Goulburn River National Park in the eastern portion of the study area) and these species are known to occur there.

The proposed transmission line route crosses two Local Government Areas: the Midwestern Regional Council and Wellington Council, both of which are listed in Schedule 1 of *State Environment Planning Policy No 44 Koala Habitat Protection* (SEPP 44). Two species of Koala feed trees listed in Schedule 2 of SEPP 44, *Eucalyptus punctata* (Grey Box) and *E. albens* (White Box) were detected on the subject site. However no Koalas, and no evidence of Koala activity, were recorded during the field survey.

IMPACTS

The construction and operation of the proposed 330kV Transmission Line from Wollar to Wellington will necessitate some clearing of native vegetation and other fauna habitats such as rocky outcrops that form habitat for threatened flora and fauna. The proposed 117 km transmission line has a 60 metre wide easement and totals 724 hectares (ha), of which 600 ha is cleared land and 115 ha retains some form of woodland. Of the woodland that occurs, approximately two thirds consists of dense woodland and one third consists of open woodland with wide spaces between the trees. Clearance of some areas of Yellow Box – Blakely's Red Gum Woodland (including EPBC Grassy White Box Woodland and EPBC Yellow Box/Red Gum Grassy Woodland) will occur, as indicated in the Table S.1 below. Although some areas are required to be cleared, overall it can be seen from the data in this table that the vast majority of occurrence of these EECs within the study area will not be cleared.

Table S.1 SUMMARY OF IMPACTS TO ENDANGERED ECOLOGICAL COMMUNITIES (EECS)

EPBC Act EEC	TSC Act EEC	Community Name	Mapped Vegetation in Study Area	Vegetation in Subject Site	No. of Towers Impacted	Area cleared (ha)
YRG	WYG	Yellow Box - Blakely's Red Gum (community 6)	463.8	20.6	12	15.4
YRG	WYG	Yellow Box - White Box (community 7)	178.6	10.9	9	8.2
YRG	WYG	Blakely's Red Gum (community 11)	24.7	2.8	1	2.1
GW	WYG	White Box - Inland Grey Box (community 8)	1037.3	17.6	6	13.2
GW	WYG	White Box (community 9)	689.7	23.4	8	17.5
GW	WYG	White Box - Red Stringybark (community 10)	14.3	0.5	2	0.4
	FB	Fuzzy Box Woodland (community 13)	11.7	0.5	2	0.3

Key: EPBC Act EECs: YRG = Yellow Box/Red Gum Grassy Woodland, GW = Grassy White Box Woodlands.

TSC Act EECs: WYG = White Box Yellow Box Blakely's Red Gum Woodland, FB = Fuzzy Box Woodland

The proposed transmission line route will also result in impacts to variety of threatened species and the key impacts are as follows:

- Protection of Narrow Goodenia (*Goodenia macbarronii*) in area of identified occurrence;
- Removal of open forest and woodland habitat that for a variety of threatened vertebrate fauna determined to be affected by this SIS including Squirrel Glider, Koala, Large-eared Pied Bat, Eastern False Pipistrelle, Eastern Bentwing-Bat, Little Bentwing-bat, Eastern Freetail-bat, Greater Long-eared Bat, Yellow-bellied Sheath-tail Bat, Glossy Black-cockatoo, Brown Treecreeper, Painted Honeyeater, Swift Parrot, Square-tailed Kite, Hooded Robin, Black-chinned Honeyeater, Turquoise Parrot, Barking Owl, Powerful Owl, Masked Owl, Grey-crowned Babbler, Speckled Warbler, Diamond Firetail and Regent Honeyeater.

As a result of the clearing other indirect impacts are possible and these have been assessed in the SIS / EIS. Such key potential impacts include:

- Fragmentation of larger patches of habitat into smaller patches of habitat;

- Edge effects;
- Weed invasion;
- Feral animal incursion (cats, foxes, rabbits, etc)
- Bush rock removal;
- Infection of native parrots by *Psittacine circoviral* disease;
- Infection of native plants by *Phytophthora cinnamomi*;
- Introduction of Fire ants;
- Erosion from and/or sedimentation into existing habitats;
- Alteration to the natural flow regimes of rivers, streams and floodplains;
- Removal of dead wood and dead trees;
- Competition from feral honeybees; and
- Alteration of the fire regime.

MITIGATION MEASURES

A range of mitigation measures has been developed to address the predicted impacts to native flora and fauna and to provide for no net loss of biodiversity as a result of the project. Firstly, the route has been chosen to avoid the majority of woodland in the study area. This has occurred via a detailed constraints analysis and community consultation process. Secondly, in many locations the position of a tower site has been chosen on environmental merit over visual and social merit. TransGrid determined that the actual area of clearing was 97.5ha as a result of fine tuning some tower locations. This compares to the initial impact area calculated by GIS analysis of 130.1ha. In summary, although it was assumed during the initial alignment option investigation that an area roughly equivalent to the 130.1ha figure would be impacted, this has been reduced by an estimated 25% (32.6ha) as a result of the TransGrid additional tower location impact investigation.

Other proposed mitigation measures that will be implemented along the easement include fauna rescue and pre-clearance surveys, erection of species-specific nest boxes, and reduction in the level of disturbance underneath the transmission line in areas where the threatened species *Goodenia macbarronii* and Stripe-faced Dunnart were recorded.

In addition to the mitigation measures proposed along the easement, TransGrid will provide compensatory habitat for the subject species determined to be affected by the proposal on a “like for like” basis via financial support for tree planting and rehabilitation schemes, particularly those that provide for White Box – Yellow Box – Blakely’s Red Gum

Woodland. This will benefit not only the subject species determined to be affected, but also a wide range of other common native species. This will result in an area of approximately 97.5 ha of native vegetation being regenerated in the locality. Such rehabilitation could extend upon existing patches, increasing patch sizes, and in some instances improve connectivity in the locality.

CONCLUSION

The proposed transmission line will clear approximately 97.5 hectares of woodland and related habitats within the proposed 60 metre wide Transmission Line easement and associated auxiliary infrastructure. In comparison, the combined area (including grassland) to be impacted by the proposed 330kV Transmission Line development is approximately 724 hectares.

The proposed transmission line will result in clearance of habitat of threatened fauna species and endangered ecological communities that are listed on both the NSW TSC Act and the Commonwealth EPBC Act. However, woodland habitat will remain extensive within the locality and the proposed mitigation measures have been formulated to provide for no net loss of such habitats from the locality in the long term.

Chapter 1

Introduction

1.1 Purpose

Cumberland Ecology (CE) has been contracted to prepare a Species Impact Statement (SIS) that is a component of the Environmental Impact Statement (EIS) for the preferred route alignment of a proposed 330kV transmission line. The transmission line is to be constructed between the towns of Wollar and Wellington on the central western slopes

The purpose of this SIS is to formally evaluate the impacts of the proposal upon threatened flora and fauna and to provide recommendations to mitigate and manage flora and fauna impacts arising from the construction and operation of the transmission line. Although the SIS has been prepared primarily to meet the requirements of the New South Wales *Threatened Species Conservation Act 1995* (TSC Act), it also assesses the impact to threatened flora and fauna listed by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Therefore, within this document threatened flora and fauna include populations, species and communities listed by the EPBC Act and/or the TSC Act. Threatened aquatic species listed by the New South Wales *Fisheries Management Act 1994* were also considered when preparing the initial assessment. However, the proposed route will not have significant impacts upon streams and so aquatic species have not been covered in the SIS.

The SIS has been prepared in accordance with Division 2 Part 6 of the TSC Act which includes the requirements of the Director General (DGRs) of the NSW Department of the Environment and Conservation (DEC), which are provided in Appendix A. It has also been prepared to assess threatened flora and fauna listed by the EPBC Act, irrespective of whether such entities are listed by the TSC Act.

Throughout the SIS at the start of each major section the relevant parts of the DGRs are reproduced in italics in order to demonstrate how each SIS section complies with statutory requirements.

1.1.1 Objectives

The main objectives of this SIS are to:

- Identify threatened species issues and provide appropriate amelioration strategies to minimise adverse impacts resulting from the proposal;
- Provide an appropriate level of background information and assessment to facilitate determinations and licensing processes;
- Assist consent or determining authorities in the assessment of the development application under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act);
- Assist the Director-General of DEC in deciding whether or not concurrence should be granted for the purposes of Part 5 of the EP&A Act;
- Assist the Director-General of the DEC or the Minister for the Environment when consulted for the purposes of Part 5 of the EP&A Act;
- Assist the Director-General of the DEC in the assessment of Section 91 Licence applications lodged under the TSC Act; and
- Assist DEH in deciding whether or not approval should be granted according to the legislative requirements of the EPBC Act.

1.2 Terminology

The following terms will be used in this SIS, in compliance with the Director General's Requirements (DGRs):

- Activity has the same meaning as in the Environmental Planning and Assessment Act 1979;
- Affected species/populations/communities refers to threatened flora and fauna that are considered likely to be affected by the proposal;
- Development has the same meaning as in the Environmental Planning and Assessment Act 1979;
- Locality means the area within a 50 km radius of the study area;
- Region means a biogeographically region that has been recognised and documented in the Interim Biogeographical Regions of Australia (Thackway and Cresswell 1995);
- Study area is the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. For the purposes of this SIS, the study area consists the subject site (the easement) plus all areas of mapped vegetation extending outside of the subject site area;

- Subject site means the area which is proposed for development/activity. This includes the transmission tower sites, easement and access roads and other auxiliary areas;
- Subject species/populations/communities means those threatened flora and fauna which may occur in the study area because suitable habitat is, recent records occur within the locality and/or the study area is within the known distribution of a species.

1.3 Background

DGR 1.1- A topographic map of the locality at the most detailed scale available should be provided. This map should detail the route of the transmission line, the locations of pylons, any access roads or ancillary structures, any locally significant areas for threatened species such as parks and reserves, and areas of high activity such as townships, regional centres and major roads.

The proposed transmission line route is situated predominantly in the NSW South western Slopes (NSS) bioregion, with the far eastern edges located on the boundaries of the Sydney Basin (SB) bioregion, and, to a lesser degree, the Brigalow Belt South (BBS) bioregion (NSW NPWS 2003a, Thackway and Cresswell 1995). The proposed 117 km corridor stretches from Wollar in the Midwestern Regional Council Local Government Area (LGA) to Wellington in Wellington Council LGA, as shown in Figure 1.1. Figure 1.2 shows the broad scale topography and significant areas for threatened species. A more detailed map of these features is provided in Figures 6a to 6o and aerial photographs within Project Route Plans 1-42 in Volume 3.

The proposed transmission line and easement which is the subject of this SIS was selected through a formal Corridor selection process (ERM 2003). For a detailed explanation, please refer to Volume 1 of the EIS. The Preferred Corridor selection process involved community consultation and environmental assessment of five viable corridors located in the Northern, Central and Southern parts of the area. Assessment of these corridor options included desktop studies, targeted fieldwork and community and stakeholder consultation.

The Corridor Selection Report was placed on public exhibition for formal submissions and a preferred corridor chosen by TransGrid, with consideration to the Corridor Selection Report and formal submissions. After extensive community consultation and assessment of the relative impacts of each corridor the Northern Corridor incorporating the Wollar Variation was selected as the preferred corridor. The Northern Corridor Wollar Variation option was considered to have least overall impact on the community and the surrounding environment. The Northern Corridor Wollar Variation was developed into the current proposed transmission line with a 60m wide easement and is referred to as the proposed transmission line throughout the remainder of this SIS.

Preliminary flora and fauna investigations by Cumberland Ecology in 2004 identified a suite of threatened flora and fauna that could be potentially impacted by the project, including the endangered ecological community known as White Box – Yellow Box – Blakely's Red Gum Woodland and threatened bird species including Diamond Firetail, Speckled Warbler and Brown Treecreeper. Eight part test assessments were completed as required under Section 5A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and these concluded that the project had potential for a significant impact upon these threatened biota so Director General's Requirements were duly sought and received from the Department of Environment and Conservation (DEC) in February 2005. White Box – Yellow Box – Blakely's Red Gum Woodland overlaps with a vegetation community that has been listed by the EPBC, which is known as White Box Grassy Woodland. Consequently, an environmental assessment called a "referral" was also made to the Commonwealth Department of Environment and Heritage (DEH), recommending that the proposal be considered a "controlled action", (which, in the terms of the EPBC Act means a project with significant impacts) primarily because of its impacts to Grassy White Box Woodland. DEH confirmed that the project is a controlled action and will assess the project based upon information submitted within the EIS/SIS.

The proposed transmission line is located in an area of the NSS Bioregion that comprises foothills on the inland slopes of the Great Dividing Range. This area has had a long history of use for farming and is the most extensively cleared bioregion in New South Wales with only 16% of the original native vegetation remaining (NSW NPWS 2003a). However, within the locality surrounding the proposed easement, approximately 25% of the landscape retains native woodland vegetation.

The proposed 117 km transmission line has a 60 metre wide easement and totals 724 hectares (ha), of which 600 ha is cleared land and 115 ha retains some form of woodland. Of the woodland that occurs, approximately two thirds consists of dense woodland and one third consists of open woodland with wide spaces between the trees.

The geology of this area, and consequently the soils and vegetation, are varied. In the east within the portion of the study area that is in the SB bioregion, there occurs a complex of Permian shales, Narrabeen sandstones, conglomerates, volcanics and coal measures (NSW NPWS 2003a). However, for the majority of the proposed transmission line route Ordovician to Devonian folded and faulted sedimentary sequences occur, with smaller patches of volcanic rocks and areas of intrusive granites (NSW NPWS 2003a). See Volume 1 Chapter 5 for further descriptions of the geology and soils.

The transmission line and associated easement traverses a variety of distinct soil landscapes and 15 vegetation communities have been identified within the study area. The plant communities are described in further in Chapters 2 and 4.

This report identifies the native flora species and vegetation communities on the proposed transmission line and the potential or known fauna species residing on or using the subject site as part of their foraging range. Specific assessment of the subject site has been undertaken to identify habitat of threatened species, populations and ecological communities listed in the schedules of the TSC Act and EPBC Act.

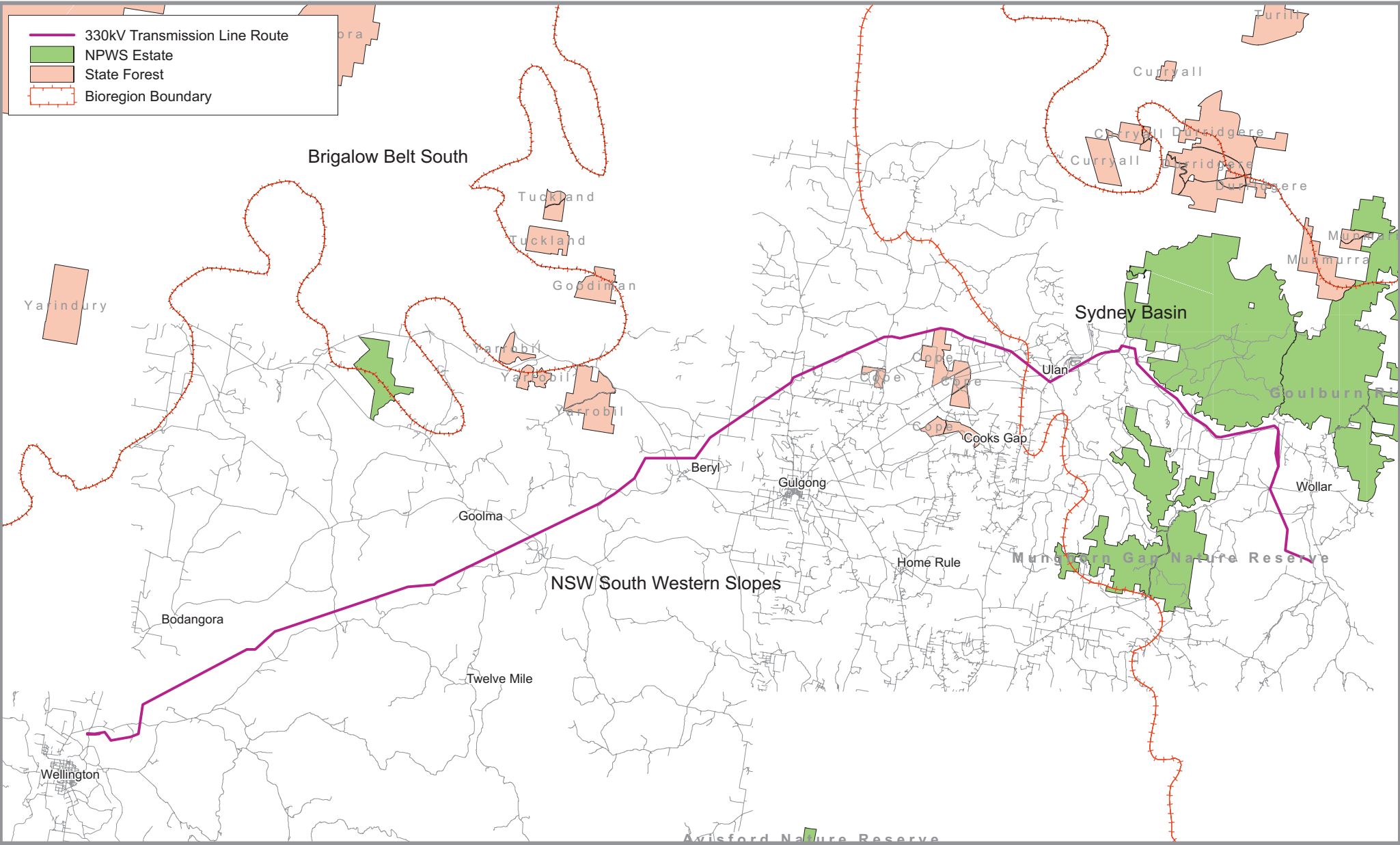


Figure 1.1 Bioregions within the Study Area

1.3.1 The Proposed Transmission Line

TSC Act (Section 110 (1)) - A species impact statement must include a full description of the action proposed, including its nature, extent, location, timing and layout and, to the fullest extent reasonably practicable, the information referred to in this section.

DGR 1.2 - The type of action proposed shall be detailed, including the timetable for the carrying out of the proposed clearing and the number of hectares affected. This shall include details of the location of any auxiliary infrastructure such as water storage areas, roads and stockpiles.

i. Nature and Extent of Proposed transmission line

TransGrid Pty Ltd is proposing to build a high power (330 kV) transmission line from a new switching station in Wollar to the existing switching station located at Wellington. The proposal is for the construction of two-hundred-and-seventy-six (276) 22 to 36m high steel lattice towers along a 117 km route, including a 60 m wide easement, from Wollar in the Midwestern Regional Council LGA to Wellington in Wellington Council LGA. This proposed transmission line is the proposed action under the TSC Act for which this SIS has been prepared and is the proposed activity under Part 5 of the EPA Act for which the EIS is prepared.

Following the identification of the Northern Corridor as the preferred transmission corridor, a proposed route has been developed based on technical considerations, consultation with property owners and other key stakeholders, and the results of preliminary environmental studies (ERM 2003). The proposed route is a 60m wide easement located within the preferred northern corridor with a preferred alignment. Wherever possible, the preferred alignment has been located to utilise existing easements, tracks and infrastructure to limit the degree of environmental impact.

ii. Location of Proposed Transmission Line

A detailed description of the location of the transmission line is provided in Volume 1 Chapter 4.2.

iii. Layout and Construction of Proposed Transmission Line

A transmission line comprises supporting structures between which are strung the conductor cables that transmit the electricity. The single circuit transmission line to be constructed will carry twin conductors of approximately 28mm in diameter, spaced 380 mm apart and two overhead ground wires, one being an optical fibre ground wire. These will be supported by square-based, steel lattice towers throughout, with typical tower heights ranging from 22 to 36 metres and tower spacing typically 400 metres according to terrain. Longer and shorter spans will be used according to terrain conditions and constraints. The location of towers is shown in Volume 3 – Project Route Plans 1 - 42.

Supporting structures are required at regular intervals along the line to ensure that adequate and safe clearance is maintained. The location of each structure is shown in Volume 3 – Project Route Plans 1 - 42.

A detailed description of the layout, activities necessary for the construction and maintenance of the transmission line and associated auxiliary infrastructure is provided in Volume 1 Chapter 4.

Construction and auxiliary construction activities include:

- Centreline survey;
- Access track construction;
- Vegetation clearance;
- Structure foundations;
- Structure erection;
- Conductor and earthwire erection;
- Erosion and sediment control;
- Vegetation management;
- Stream and drainage line crossings;
- Works within 40m of prescribed streams; and
- Rehabilitation program.
- Concrete Batching Plants
- Stockpiles
- Rehabilitation

Operation and maintenance activities will be conducted for the transmission line and easement. A detailed description of these activities is provided in Volume 1 Chapter 4.

iv. Timing

The overall timing for the transmission line is outlined below.

- August 2005 EIS and SIS go on public exhibition.

- November 2005 Submissions to the EIS and SIS are compiled and a Representations Report is lodged with the Department of Infrastructure, Planning & Natural Resources (DIPNR).
- November 2005 SIS issues to be forwarded to DEC.
- January 2006 DEC makes recommendations to Minister of Environment.
- February 2006 Minister for Environment makes determination on SIS.
- February 2006 DIPNR makes a recommendation to the Minister for Planning.
- March 2006 Ministerial approval of the transmission line.
- Mid 2006 Construction of transmission line and switching station begins.
- Late 2007 The Wollar to Wellington transmission line and Wollar switching station are commissioned.

The clearance of the vegetation is planned to start in mid 2006 and continue in a staggered operation until late 2007.

1.3.2 Transmission Line Environmental Assessment and Approval Process

The demand for electricity in the central western areas of NSW has been increasing steadily for many years due to population and industry demands. It is necessary to reinforce the electricity network in the region to keep pace with such demands.

In 2003 TransGrid undertook an options study to identify the best long-term solution to this issue. In conjunction with Country Energy it was determined that the best option was to construct a new 330kV switching station in the Wollar area and connect the switching station to the existing substation in Wellington with a single circuit transmission line.

In October 2003 a Corridor Selection Report was prepared by Environmental Resources Management Australia (ERM 2003) to summarise the environmental, social and engineering aspects of viable corridor options.

In December 2003 a preferred corridor was selected, following extensive community consultation and assessment of the relative impacts of each option.

In December 2004 Cumberland Ecology prepared a brief letter report providing assessment of threatened flora and fauna under Section 5A of the *Environmental Planning and Assessment Act 1979* (EPA Act), recommending that a SIS was necessary for the proposed transmission line.

In January 2005, DEC Director-General's Requirements (DGRs) for an SIS were sought for the proposed transmission line. The DGRs are addressed herein as part of the approval process for the proposed transmission line.

This SIS, as part of the EIS, details the anticipated impacts on flora and fauna from the construction and operation of the transmission line within the Northern Corridor Wollar Variation with regard to the relevant legislation (See Section 1.4) and the Director-General of DEC requirements.

The overall EIS process is necessary to gain approval for the proposed transmission line.

A Referral has already been completed and sent to DEH for assessment. The Referral states that the proposal will be a controlled action. DEH has agreed and Preliminary Documentation will be required to be supplied to DEH as part of the assessment process under the EPBC Act.

1.3.3 The Need for a Species Impact Statement

A brief eight part test letter report was prepared in December 2004 by Cumberland Ecology (Cumberland Ecology 2004) to provide impact assessments as required under section 5A of the *Environmental Planning and Assessment Act 1979* (EPA Act). This assessment – the so-called eight part test - considered threatened flora and fauna that have been observed within areas of the Wollar to Wellington Proposed Transmission Line development.

The proposed route will cross a range of habitat types that vary from cleared croplands to relatively undisturbed open forest and woodland communities. Among the latter habitats are patches of woodland that fit the description of an endangered ecological community that is listed by the TSC Act and the EPBC Act: White Box Yellow Box Blakely's Red Gum Woodland. These patches, considered in the assessment, partly comprise the type of woodland to be cleared for construction of the transmission line. Furthermore, owing to the configuration of these patches and the array of other constraints that have influenced the determination of the preferred alignment within the proposed route, it is not possible to avoid such clearance, although it is possible to reduce the total extent of clearance. For this reason, an eight part test has duly been prepared to assess the likely extent of clearing upon this plant community and to determine the need for a SIS.

i. White Box Yellow Box Blakely's Red Gum Woodland

The preferred route alignment intercepts about 13.2 km of vegetation in length with affinities for White Box – Yellow Box – Blakely's Red Gum (WBYBBRG) Woodland which is listed as a threatened ecological community under the *Threatened Species Conservation Act 1995* (TSC Act).

This woodland type has previously been subject to extensive clearing and modification throughout its range. There are small occurrences of White Box- Yellow Box- Blakely's Red Gum Woodland in the Border Ranges National Park, Goobang National Park, Goulburn River National Park, Manobalai Nature Reserve, Mt Kaputar National Park, Oxley Wild Rivers National Park, Queanbeyan Nature Reserve, Towari National Park,

Warrumbungle National Park, Wingen Maid Nature Reserve and Wollemi National Park (NSW Scientific Committee 2004c1, DEH 2005a).

The community also occurs in the following State Conservation Areas; Copeton State Conservation Area, Lake Glenbawn State Conservation Area and Lake Keepit State Conservation Area (NSW Scientific Committee 2004c1, DEH 2005a). Within the locality of the preferred route, which occurs in the Central Western Slopes, a high proportion of this vegetation has been cleared or modified.

In NSW 400 hectares of relatively intact WBYBRG woodland remains (NSW Scientific Committee 2004c1). (DEH 2005a) Within the locality of the proposed transmission line a high proportion of this community has been cleared or modified. Some of the WBYBRG woodland to be cleared does provide habitat linkages between areas of woodland, both reserved and unreserved. Within this context the clearing of large areas of remnant WBYBRG woodland is likely to be significant.

The eight part test concluded large areas of vegetation that are broadly comparable to the endangered ecological community White Box - Yellow Box - Blakely's Red Gum Woodland will be affected. Within the context of the National distribution of this community, and particularly within the context of the Central Western Slopes, these areas are significant as they have known habitat. This community has potential to be significantly impacted.

The preferred route is likely to require clearing of patches of woodland in a way that could effectively bisect some of these woodland patches. While this is unlikely to completely isolate the resultant patches, it could isolate the patches of a significant portion of the plant species that form habitat for threatened woodland fauna.

One threatened plant species that is listed on the EPBC Act, *Goodenia macbarronii*, has been detected adjacent to one tower location. However, the tower has been slightly moved to avoid impacts to the species. As such no significant impacts are predicted for this species of herbaceous plant.

ii. *Threatened Woodland Birds*

In addition to the endangered ecological community, a suite of threatened species could occur along the preferred route of the transmission line, including several threatened woodland birds. Three such species – Brown Treecreeper, Diamond Firetail and Speckled Warbler - were detected in woodland along the preferred route during the site inspection and are expected to be resident species within such woodland patches (NSW Scientific Committee 2004e, Swift Parrot Recovery Team 2000, NSW Scientific Committee 2004x, NSW Scientific Committee 2004g, Garnett and Crowley 2000).

The White Box Yellow Box Blakely's Red Gum Woodland community is of particular relevance to threatened woodland species such as the Brown Treecreeper, Speckled Warbler and Diamond Firetail. Within the eight part test by Cumberland Ecology (Cumberland Ecology 2004) the predicted scale of impacts and the potential consequences of impacts were most pronounced for:

- Brown Treecreeper (*Climacteris picumnus*);
- Speckled Warbler (*Chthonicola sagittata*); and
- Diamond Firetail (*Stagonopleura guttata*).

Actual and potential habitat of the Regent Honeyeater and the Swift Parrot will also be affected by the clearing of 97.5 hectares of all woodland. Habitat linkages will be further fragmented, particularly in the eastern portion of the development area. The likely impact of clearing may be significant on a local scale.

Other threatened species of flora and fauna could also potentially occur in habitats along the preferred route alignment.

1.4 Legislative requirements

1.4.1 SIS Compliance with Statutory Requirements

This SIS has been prepared in accordance with Sections 109 and 110 of the TSC Act, which describe the form and content of a SIS, with the exception of those matters limited or modified in the Director General of the Department of Conservation and Environment (DEC) requirements (DGRs) as listed below. The requirements of the Director General of the DEC were sought pursuant to Section 111 of the TSC Act.

i. DGR - Matters which have been limited or modified

The following Section 110 matters need not be addressed by this SIS.

- All reference to endangered populations. The TSC Act does not currently list any endangered populations in the area likely to be affected by the application;
- Reference to recovery plans in Section 110(2)(c). No recovery plans relevant to the subject area have been approved in accordance with the TSC Act. However, the *Zieria obcordata* Draft Recovery Plan, Barking Owl Draft Recovery Plan and Koala Draft Recovery Plan are relevant to the subject area. Consideration should be given to the content of these Plans in the preparation of the SIS.
- Section 110(2)(e). This section is a replication of 110(2)(a);
- All reference to critical habitat. There is currently no declared critical habitat in the area likely to be affected by the application; and
- Section 110(2)(g). The matters raised in this section of the act have been clarified by the requirements.

According to the DGRs the SIS must meet all matters specified in Sections 109 and 110 of the TSC Act with the exception of those matters limited above.

A full copy of the Director General's requirements is reproduced within Table A.1 of Appendix A. A summary of compliance details is also provided at the beginning of each chapter of the SIS. Within this document, the term "DGR" refers to a particular section or part of the Director General's requirements.

Considerations have also been made to the requirements of the EPBC Act. Under the environmental assessment provisions of the EPBC Act, actions that are likely to have a significant impact on a matter of National Environmental Significance (NES) are subject to a rigorous assessment and approval process. An action includes a project, development, undertaking, activity, or series of activities.

The Act identifies seven matters of NES:

- World Heritage properties;
- National heritage places;
- Wetlands of international importance (Ramsar wetlands);
- Threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas; and
- Nuclear actions (including uranium mining).

All of these matters of NES have been considered as part of the environmental assessment process for the proposal. The assessment information provided in this SIS is primarily focused on the presence (or potential presence) of nationally listed threatened species, ecological communities and migratory species. Where relevant, this SIS makes reference to each NES's EPBC Act status and provides an assessment of the likely impacts upon such matters.

1.4.2 Environmental Planning Instruments

Planning instruments issues relevant to the proposed transmission line are considered in detail in Volume 1 Chapter 2.

Of particular relevance to Volume 2 is State Environmental Planning Policy 44 (SEPP 44) Koala Habitat Protection. The proposed transmission line route crosses two LGAs; the Midwestern Regional Council and Wellington Council. The Midwestern Regional Council is an amalgamation of Rylstone (70%), Merriwa (10%) and Mudgee Councils (100%), all of which are listed in Schedule 1 SEPP 44 (Department of Planning 1995). Furthermore, two species of Koala feed trees, *Eucalyptus punctata* (Grey Gum) and *E. albens* (White box), listed in Schedule 2 of SEPP 44 occur on the subject site and within the study area.

For these reasons the subject site provides potential Koala habitat and must be assessed in accordance with SEPP 44 guidelines.

Reference has also been made to other more recent information, including the Draft Recovery Plan for the Koala (NSW NPWS 2003c) and other information from the DEC (NSW NPWS 1999e) and NSW Scientific Committee (NSW Scientific Committee 2004r).

1.4.3 Provisions of applicable legislation

This report also considered the consequences of the proposed activity on native vegetation clearing under the NSW *Native Vegetation Conservation Act 1997 and 2003* (NVC Act), in relation to cumulative loss and fragmentation of fauna habitat locally and in terms of connectivity and conductivity with special reference to wildlife corridors. Further legislation and planning policies are considered in Volume 1 Chapter 2.

1.4.4 Approvals and licences

All work was carried out on New South Wales Department of Environment and Conservation Scientific Licence number 11164 and New South Wales Department of Primary Industries Agriculture Animal Research Authority (Trim File No. 04/935).

1.5 Report Structure

The EIS is in a number of volumes and this SIS forms Volume 2 of the EIS. This SIS also refers to maps and figures of the proposed route and tower locations in Volume 3.

This SIS is structured as following:

- Chapter 2 summarises the initial site assessment with determination of subject species and description of the study area;
- Chapter 3 details the methodology used in the flora and fauna surveys;
- Chapter 4 describes the flora and fauna survey results;
- Chapter 5 discusses the economic and social impacts the proposed transmission line will have upon individuals or groups within the region;
- Chapter 6 describes ecological sustainable development principals and considers these principals in a regional context;
- Chapter 7 discusses the impacts the proposed transmission line will have upon threatened flora and fauna species;
- Chapter 8 discusses the impacts the proposed transmission line will have upon endangered ecological communities;

- Chapter 9 describes the mitigation measures, long-term management strategies and on-going monitoring programs;
- Chapter 10 provides a list of additional approvals; and
- Chapter 11 summarises the findings of this report.

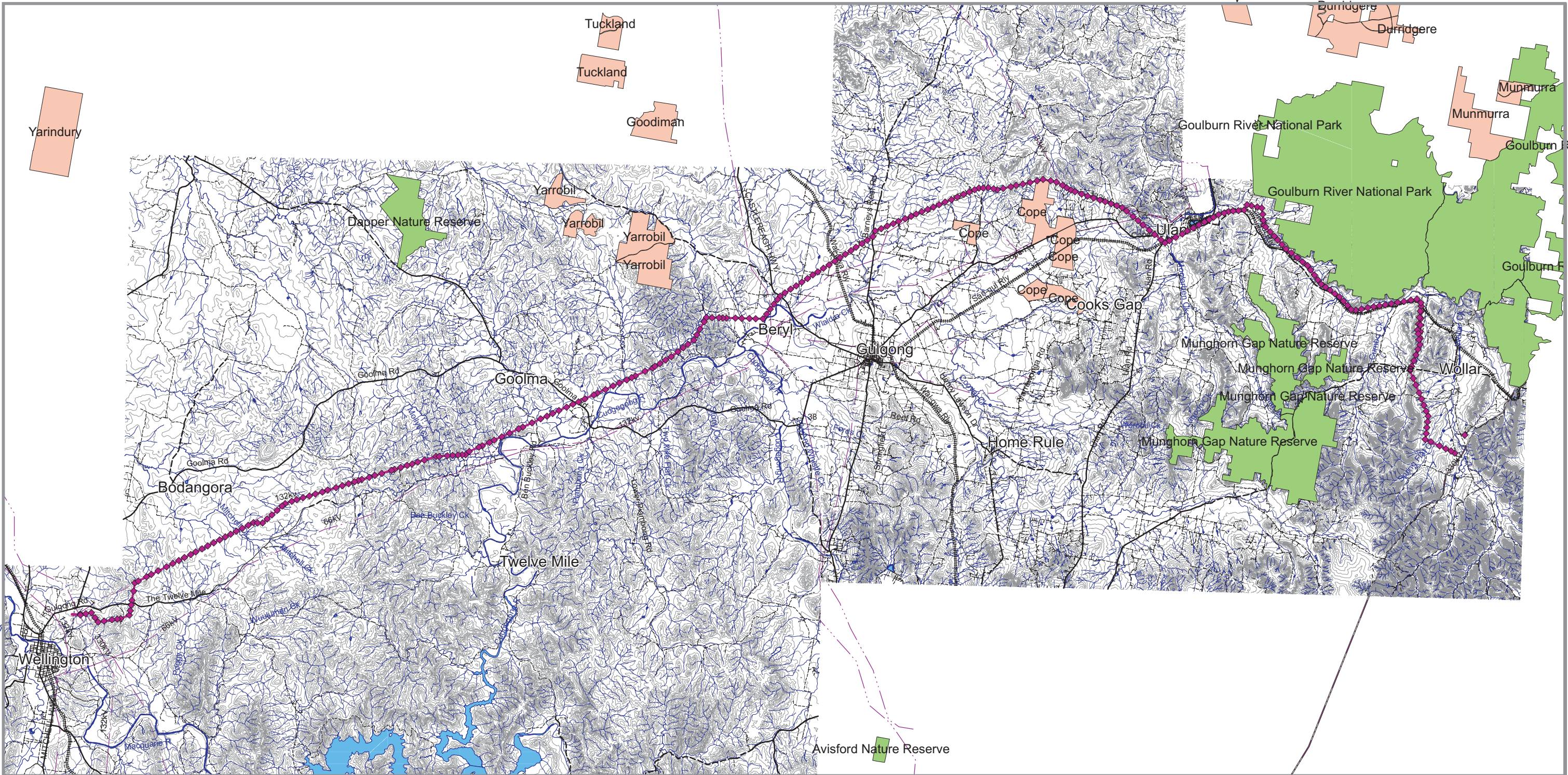
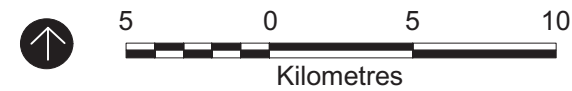


Figure 1.2 Topographic map of the locality showing the proposed development, areas of significance for threatened species and high human activity

Wollar to Wellington Proposed 330kV Transmission Line Species Impact Statement

- ◆ Proposed Tower Location
- 330kV Transmission Line Route
- NPWS Estate
- State Forest
- Rail
- Contours



Chapter 2

Initial Site Assessment

This Chapter provides an initial site assessment, giving:

- a detailed definition and description of the study area;
- an analysis of the Key Threatening Processes (KTAs) that do or could operate within the study area to impact threatened flora and fauna; and
- a refined list of subject species for more detailed assessment within subsequent chapters of the SIS.

2.1 Study Area

2.1.1 Study Area Definition

DGR 1.6 - In defining the study area consideration shall be given to possible indirect effects of the action on the area surrounding the subject site, for example, altered hydrological regimes or increased predation pressure due to improved access or conditions for feral predators, such as foxes.

The subject site includes the transmission tower sites, easement, access road sites and other auxiliary areas. The subject site is located in selected vegetated patches along the proposed 330kV Transmission line route from Wollar to Wellington. The route traverses Midwestern Regional Council and Wellington Council Local Government Areas. The subject site is located mainly in private lands and crown reserves.

The study area includes the whole 60 m easement area along the Wollar to Wellington corridor and any additional areas which are likely to be affected by the proposal, either directly or indirectly. For the purposes of this SIS, these other areas considered likely to be affected by the proposal consist of the areas of mapped native woodlands/forests. The location, size and dimensions are indicated in a number of maps. These maps include:

- Figure 1.1, depicting topography, tower locations, conservation areas and areas of high human activities;
- Figures 6a to 6o in Volume 3, depicting vegetation communities and woodland habitat; and

- Project Route Plans 1 to 42 in Volume 3, aerial photograph depicting tower locations and auxiliary infrastructure.

The study area includes mainly private lands and crown reserves. This definition of study area has been adopted so as to include a wide area around the transmission line. This is to enable inclusion of all flora and fauna that could directly or indirectly be impacted by different components of the transmission line when considering the potential for:

- habitat fragmentation;
- vegetation corridors;
- altered hydrology regimes;
- soil erosion, pollution;
- noise disturbance; and
- Increased human presence.

It includes areas that could be used for local wildlife dispersal and some areas that are located in the valleys directly below the tower sites.

Minor creeks, streams and drainage lines occur in the study area and at some points along the proposed transmission line. However, the transmission line route is largely across dry land areas. Where it crosses creeks, towers will be located away from creek bank areas and the transmission line will straddle the creek lines with minimal need for clearance of riparian vegetation. No significant impacts are therefore predicted for rivers and streams. For further details about relevant mitigation measures that will protect rivers and streams see the mitigation measures described in Preliminary Project Environmental Management Plan and summarised in within Volume 1, Table 8.1 of the EIS.

2.1.2 Study Area Description

***DGR 1.7** - In describing the study area, consideration shall be given to the previous land uses and the effect of such land uses on the study area. Relevant historical events may include fire history, cropping and other agricultural activities.*

The transmission line traverses a range of landscapes, vegetation types and habitats. The majority of the area is grazed grassland (approximately 600 ha), much of which is degraded. Approximately 130.1 hectares is timbered. The transmission line skirts the edges of Goulburn River National Park at its north eastern end. Near Ulan it skirts the edge of Munghorn Gap Nature Reserve. At Cope it skirts Cope State Forest. Near Beryl it crosses a nature conservation area. In the western area to Wellington the proposed transmission line crosses grazed grassland.

As shown in Figure 1.1, the study area is located within two Bioregions (Thackway and Cresswell 1995). The majority of the study area is located in the NSW South Western Slopes Bioregion, while the eastern end is located within the Sydney Basin Bioregion.

i. Soils and geology

The geology of this area, and consequently the soils and vegetation, are varied. In the east there occurs a complex of Permian shales, Narrabeen sandstones, conglomerates, volcanics and coal measures. However, for the majority of the proposed transmission line route Ordovician to Devonian folded and faulted sedimentary sequences occur, with smaller patches of volcanic rocks and areas of intrusive granites. Further information on the geology and topography can be found in Volume 1, Chapter 5.2.

In the NSW South Western Slopes Bioregion soils are generally shallow and stony on the tops of ridges and hills. Moving down slope, soils with contrasting texture generally occur, with subsoils derived from the underlying weathered rock and the topsoils, a homogenised surface mantle of coarser material derived from all parts of the slope. Subsoils on the valley slopes generally have poor drainage and can accumulate soluble salts. Dryland salinity is widespread. Alluvial sands and loams are more common than clays in most parts of the landscape (NSW NPWS 2003a).

Soils within that part of the study area within the Sydney Basin bioregion are generally shallow with a stony texture and contrasting profiles, usually with gritty well drained A horizons, over tough yellow or grey poorly drained clays (NSW NPWS 2003a). Refer to Volume 3 Figure 5 for an illustration of the soil landscapes within the study area. Further information on soils can be found in Volume 1, Chapter 5.3.

Information on the hydrology and water quality is provided in Volume 1, Chapter 5.6.

ii. Land use

Currently the subject site is mostly privately tenured agriculture land (freehold), with some mining lease and crown land. The route was selected to be as environmentally sensitive to crown land that occurs on or near the proposed transmission line by avoiding or skirting the edges of crown land that is conserved in Goulburn River NP, Munghorn Gap NR and Cope SF, as well as a conservation area near Beryl. Excluding these conservation areas the extent of crown within the proposed transmission line is not significant (ERM 2003).

The majority of the proposed route covers privately owned agricultural land. The route does intersect the Ulan Mine located within the eastern portion. It also transverses very minimal crown land, particularly the southern edge of Goulburn NP, the far northern extremities of Munghorn Gap NP, Cope SF and a community conservation area near Beryl.

iii. *Fire History*

Wild fires in the study area generally occur between September and December, although the fire season can extend until May (Resource Strategies 2005a). Goulburn River NP & Munghorn Gap NR Fire Management Plan has been prepared by the National Parks division of DEC. This management plan documents the fire history and addresses management issues in the vegetation communities of these large conservation areas in the study area. Although long-term spatial fire history is not available for this area, anecdotal evidence suggests a fire regime of one major fire approximately every 40 years. In the 17 years of recorded fire history, wildfires have occurred during 5 fire seasons. During the fire season of 1997/1998, 23,990 hectares of these reserves were burnt, in what was the most extensive fire event recorded to date. Prescribed burns were carried out in 1993-94, 1995-96 and recently in 2001 (NSW NPWS 2004b).

iv. *Vegetation*

The native vegetation communities in the study area can be divided into two broad groups of woodland, including the Yellow Box – White Box – Red Gum League and the Black Cypress Pine League. The former of these two groups is equivalent to the TSC listed White Box Yellow Box Blakely's Red Gum Woodland EEC, and the EPBC-listed White Box Grassy Woodland and Yellow Box Red Gum Woodland EEC's.

There were also small patches of Fuzzy Box (*Eucalyptus conica*) that are representative the TSC-listed EEC entitled: Fuzzy Box Woodland on alluvial soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions. This EEC is referred to as Fuzzy Box Woodland for the purposes of this SIS.

2.2 Key Threatening Processes

The arrays of formally listed Key Threatening Processes (KTP) that have been determined by the NSW Scientific Committee were considered when completing the impact assessments for this SIS for the subject species and communities within this report. Amongst the KTAs considered are:

- Psittacine circoviral disease in threatened parrots;
- Phytophthora cinnamomi infection;
- Introduction of Fire ants;
- Competition with feral bees;
- Feral Cat predation;
- Red Fox predation;
- European Rabbit grazing and competition;

- Change in fire frequencies;
- Bushrock removal; and
- Clearing of native vegetation.

2.3 Determination of Subject Species

DGR 1.5 - A list of subject species shall be provided. In determining these species, consideration shall be given to the habitat types present within study area, recent records of threatened species in the locality and the known distribution of threatened species. Databases such as the NPWS Atlas of NSW Wildlife and information from the Royal Botanic Gardens and Australian Museum may be used to assist in compiling the list.

In order to determine a list of subject species that should be assessed within this SIS a database search and literature review was conducted to consider records of threatened species within what is referred to as the “locality”, defined here as land within a 50 km radius of the transmission line easement. Threatened species, populations and ecological community records from within the locality were obtained from databases, including the Wildlife Atlas of NSW and local biodiversity reports for the area. Previous surveys of the locality (Resource Strategies 2005b) were also consulted to provide records of threatened species, populations and ecological communities within the study area.

The following sources were used to compile a list of subject species occurring or potentially occurring in the study area:

- Lists of flora and fauna in the DGRs;
- Lists of flora and fauna derived from the EPBC database search;
- Lists of flora and fauna derived from the DEC Wildlife Atlas 50km database search; or
- Flora and fauna recently detected within the Wilpinjong Coal Project Area (that included the eastern end of the transmission line study area.

That initial assessment therefore provided a list of “potential subject species, populations and communities”. The potential subject species included all of those species listed in the DGRs, plus some additional species found during the field surveys along the easement. The potential subject flora and fauna records were then evaluated for currency and relevance to the known habitats that occurred along the transmission line easement.

A final list of subject species was then determined based upon the analysis of potential flora and fauna species, populations and communities. The analysis of potential and actual subject flora and fauna is provided within Table 2.1. A full list of flora and fauna species (threatened, protected and introduced), and their occurrences obtained from these databases and other surveys is found in Appendices C and D.

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
Endangered Ecological Communities					
Fuzzy Box Woodland on alluvial soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions		E	Occurs on alluvial soils, dominated by Fuzzy Box; community includes large variety of species. Moderately dense ground cover comprising native forbs.(NSW National Parks and Wildlife Service)	Occurs on the subject site in a small localised area.	Yes
White Box Yellow Box Blakely's Red Gum Woodland (consistent with both Yellow Box/Red Gum Grassy Woodland and Grassy White Box Woodland as listed under EPBC Act)		E	Occurs on moderate to highly fertile soils on tablelands and western slopes of NSW. Occurs at altitude of 170m-1200m on northern tablelands. Herbaceous species form ground layer. (NSW National Parks and Wildlife Service). This state listed community is equivalent to the EPBC listed Grassy White Box Woodlands and Yellow Box / Red Gum	Occurs on the subject site extensively as six variations of plant communities.	Yes

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
Flora			Grassy Woodland.		
	<i>Boronia ruppia</i>	E1	Dry sclerophyll forest on sandstone or serpentine, commonly located in the Sydney region from Barraba to Berrima (Harden 1991).	One record of this species from near Ulan in 1992 (wildlife atlas). No other records for this species in locality or study area. Despite detailed surveys within the tower areas during its flowering season, not recorded on the subject site. Marginal disturbed and grazed habitat, although not considered likely to be affected by the proposal.	No
	Lobed Blue-grass	<i>Bothriochloa biloba</i>	V	Occurs in a variety of grassland and woodland associations; preference to heavier textured soils; common to areas	No records for this species in locality or study area. Despite detailed surveys within the tower

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Common Name	Scientific Name	Status		Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC			
				that are conservatively grazed, eg on roadsides and travelling stock routes (NSW Scientific Committee 2004c).	areas during its flowering season, not recorded on the subject site. Marginal disturbed and grazed habitat, although not considered likely to be affected by the proposal.	
Bluegrass	<i>Dichanthium setosum</i>	V	V	Grows in woodland and grassland; northern tablelands, north western slopes, central western slopes, north western plains (Harden 1993).	No records for this species in locality or study area, although a subject species in DGRs. Despite detailed surveys within tower areas during its flowering season, not recorded on the subject site. Marginal disturbed and grazed habitat, although not considered likely to be affected by the proposal.	Possible
Tricolour Donkey Orchid	<i>Diuris tricolor</i>		V	Sclerophyll forest among grass, often with <i>Callitris</i> ; northern tablelands, central tablelands, north western slopes, central	No records for this species in locality or study area, although a subject species in the DGRs.	No

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
			western slopes (Harden 1993).	Despite detailed surveys within tower areas (outside of Spring flowering season), not recorded on the subject site. Highly disturbed and grazed habitat present along the subject site considered unlikely to support this species.	
Capertee Stringybark	<i>Eucalyptus cannonii</i>	V	V	Occurs on a variety of geological types and soil substrates including metasediments and coarse conglomerates; wide altitudinal range. Present at various topographic locations such as foot-slopes (NSW NPWS 2000). Sclerophyll woodland on shallow soil rises (Harden 1991).	Recorded in the locality (Resource Strategies 2005b) approximately 2km south of the proposal. No other records for this species in locality or study area, although a subject species in the DGRs. Despite detailed surveys within tower areas, not recorded on the subject site. Could potentially occur in the subject site between tower areas.
					Possible

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status		Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC			
Narrow Goodenia	<i>Goodenia macbarronii</i>	V	V	Damp sandy soils, south from Guyra and Inverell districts (Harden 1992).	Recorded in the locality approximately 10 km to north of the subject site (north of Ulan) (wildlife atlas). No other records for this species in locality or study area, although a subject species in the DGRs. Recorded on the subject site in the dry creek bed at Tower site 91.	Yes
	<i>Grevillea divaricata</i>		E	Woodland on tablelands near streams and on moist slopes; mallee and shrubland on the plains; slopes on sandy soils (Harden 1991).	No records for this species in locality or study area. Only known from the type collection made north of Bathurst and was last collected in 1823. Despite detailed surveys within tower areas, not recorded on the subject site. Marginal disturbed and grazed habitat, although not considered likely to be affected by	No

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
	<i>Homoranthus darwinioides</i>	V	Dry sclerophyll forest or woodland; sandstone outcrops or ridges; rare, from Putty to Dubbo district (Harden 1991).	the proposal. No records for this species in locality or study area. Despite detailed surveys within tower areas, not recorded on the subject site. Marginal disturbed and grazed habitat, although not considered likely to be affected by the proposal.	No
Leafless Indigo	<i>Indigofera efoliata</i>	E	E1 Recorded from stony ground; very rare - collections only from the Dubbo area (Harden 1991).	No records for this species in locality or study area, although a subject species in DGRs. Despite detailed surveys within tower areas, not recorded on the subject site. Marginal disturbed and grazed habitat, although not considered likely to be affected by the proposal.	No

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status		Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC			
	<i>Philothea ericifolia</i>	V	V	Drainage areas in dry sclerophyll open forest; woodland on sandstone; in heath on damp sandy flats and gullies; coarse gravel alluvial deposits in dry creek beds. This species inhabits the north-western slopes and central western slopes of NSW, from the upper Hunter Valley, to Pilliga and to the Peak Hill district (DEH 2004a).	No records for this species in locality or study area, although a subject species in DGRs. Despite detailed surveys within tower areas, not recorded on the subject site. Marginal disturbed and grazed habitat, although not considered likely to be affected by the proposal.	No
Austral Pillwort	<i>Pilularia novae-hollandiae</i>		E1	Widespread, though uncommon in seasonally dry depressions and margins of marshes; possibly grows submerged; central coast, southern tablelands, south western slopes (Harden 1990).	No records for this species in locality or study area. No suitable habitat is available for this species.	No
Scant Pomaderris	<i>Pomaderris queenslandica</i>		E1	Rare in NSW, specimens collected from Mt Danger and Gloucester district; more widespread in Qld; north coast, central	No records for this species in locality or study area, although a subject species in DGRs. This	No

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
			western slopes (Harden 1990).	species has not been collected since 1904 in NSW (Harden 1990). Despite detailed surveys within tower areas, not recorded on the subject site. Marginal disturbed and grazed habitat, although not considered likely to be affected by the proposal.	
	<i>Rulingia procumbens</i>	V	V	Grows in sandy sites, confirmed mainly to Dubbo, Mendooran, and Gilgandra region. Also in Pilliga and Nymagee areas (Harden 1990)	Recorded on the database map sheet (wildlife atlas). No other records for this species in locality or study area. Despite detailed surveys within tower areas, not recorded on the subject site. Marginal disturbed and grazed habitat, although not considered likely to be affected by the proposal.

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status		Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC			
Small Purple-pea	<i>Swainsona recta</i>	E	E1	Grassland and open woodland; on stony hillsides; southern tablelands, central western slopes, south western slopes, north western plains (Harden 1991).	No records for this species in locality or study area, although a subject species in the DGRs. Despite detailed surveys within tower areas (outside of Spring flowering season), not recorded on the subject site. Highly disturbed and grazed habitat considered unlikely to support this species.	No
Silky Swainson-pea	<i>Swainsona sericea</i>		V	Grassland and eucalypt woodland, sometimes with <i>Callitris</i> species. Distributed from the northern tablelands to southern tablelands and Monaro region and further inland to the slopes and plains (NSW Scientific Committee 2004a1)	No records for this species in locality or study area, although a subject species in the DGRs. Despite detailed surveys within tower areas (outside of Spring flowering season), not recorded on the subject site. Highly disturbed and grazed habitat considered unlikely to support this species.	No

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM "POTENTIAL" SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status		Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC			
Ingram's Zieria	<i>Zieria ingramii</i>	E	E1	Gentle rocky slopes; crests of low rises in rolling terrain; red-brown, yellow-brown light sandy loams in association with outcropping sedimentary rock (DEH 2004b)	Recorded on the database map sheet (wildlife atlas). No other records for this species in locality or study area. Despite detailed surveys within tower areas, not recorded on the subject site. Marginal disturbed and grazed habitat, although not considered likely to be affected by the proposal.	No
	<i>Zieria obcordata</i>	E	E1	Gentle to moderately steep, west to north facing slopes of low hills or ridges, undulating terrain of low hills. Occurs around the base, in crevices or nearby granite boulders. Sandy or gravelly loam soils. Eucalypt woodlands with open, low shrub understoreys; shrublands	Suitable habitat in the study area. Recorded to the north east of Wellington (wildlife atlas) and a subject species in the DGRs. A Draft Recovery Plan has been prepared by the DEC for the population. No other records for this	Yes

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
			dominated by <i>Acacia</i> species (DEC (NSW) 2005b).	species in locality or study area. Despite detailed surveys within tower areas, not recorded on the subject site. Low probability of occurring at Wellington end of proposal.	
Fauna					
Terrestrial Mammals					
Rufous Bettong	<i>Aepyprymnus rufescens</i>	V	Grassy eucalypt forest and woodland (NSW Scientific Committee 2004w).	No records for this species in locality or study area. Not recorded on the subject site.	No
Brush-tailed Bettong	<i>Bettongia penicillata penicillata</i>	Extinct	E4 Woodlands, open gum tree forests, woody scrub areas.	Extinct in NSW (NSW Scientific Committee 2004f).	No
Spotted-tailed Quoll (SE mainland population)	<i>Dasyurus maculatus maculatus</i>	E	V Sclerophyll forest floors and coastal woodlands (Dickman and Read 1992) Nests in rock caves and hollow logs or	No records for this species in locality or study area. Not recorded on the subject site. Subject species	No

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status		Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC			
				trees, basking sites usually found nearby.	in DGRs.	
Eastern Quoll	<i>Dasyurus viverrinus</i>		E1	Hollow logs and rock piles in which to den; dry sclerophyll forest, shrub, heathland, agricultural land (Strahan 1995, NSW NPWS 1999c).	No records for this species in locality or study area. Not recorded on the subject site.	No
Greater Bilby	<i>Macrotis lagotis</i>	V	E4	Woodland, open scrub, shrubland, low shrubland, gibber desert, tussock grassland. ((Hyett and Shaw 1980),	Extinct in NSW (NSW Scientific Committee 2004a).	No
Bridled Nail-tailed Wallaby	<i>Onychogalea frenata</i>	Extinct		Woodland, open scrub (Hyett and Shaw 1980).	Extinct (NSW Scientific Committee 2004d).	No
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>		V	Dry sclerophyll open forest, sparse ground cover of herbs, grasses and scleromorphic shrubs or leaf litter; heathland, swamps, rainforest, wet sclerophyll forest. Primarily occurs	No records for this species in locality or study area. Not recorded on the subject site.	No

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status		Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC			
				where average rainfall exceeds 500mm [(Soderquist 1995) (Dickman and McKechnie 1985); (Traill and Coates 1993); (NSW NPWS 1999b) NSS bioregion has up to 1200mm rainfall in eastern side (NSW NPWS 2003a).		
Brush-tailed Rock-wallaby	<i>Petrogale penicillata</i>	V	E1	Loose piles of large boulders containing subterranean holes and passageways; cliffs (generally over 15m high); mid-level ledges, some with caves and/or ledges covered by overhangs; isolated rock stacks, sheer sided and often covered with fallen boulders (NSW NPWS 2002a)	One record for this species in locality (wildlife atlas). Not recorded on the subject site.	No
Arboreal Mammals						
Eastern Pygmy-possum	<i>Cercartetus nanus</i>		V	Closed forests, open forests, heaths at elevations between 300m to 1000m	One record for this species in locality (wildlife atlas). Not recorded	No

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
			above sea level. They feed on pollen and nectar from Banksias, eucalypts, and understorey plants as well as insects, seeds and fruits (NSW NPWS 2004a).	on the subject site. Subject species in DGRs.	
Squirrel Glider	<i>Petaurus norfolcensis</i>	V	Eucalypt forests and woodlands; tree hollows and reliable winter flowering trees in coastal zones; Coastal Banksia and Spotted Gum; to a lesser extent Grey Ironbark and Smooth-barked Apple (Menkhorst et al. 1988).	Subject species in DGRs. Recorded in locality (Resource Strategies 2005b). Suitable habitat in the study area. Could potentially occur on the subject site and study area.	Yes
Koala	<i>Phascolarctos cinereus</i>	V	Koalas feed on foliage from genera Eucalyptus, Corymbia and Angophora. They appear to have a preference for feeding in <i>Eucalyptus punctata</i> (Grey Gum) however other species such as <i>E. haemastoma</i> (Scribbly Gum), <i>E. robusta</i> (Swamp Mahogany) and non endemic	Food trees available. Subject species in DGRs.	Yes

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status		Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC			
				species such as <i>E. nicholii</i> (Narrow-leaved Black Peppermint) are also commonly utilised (Smith and Smith 2000).		
Stripe-faced Dunnart	<i>Sminthopsis macroura</i>		V	Occurs in low shrublands of saltbush and bluebush, in tussock grasslands on clay, sandy or stony soils, in spinifex grasslands on sandy soils, among sparse <i>Acacia</i> shrublands and on low, shrubby, rocky ridges (Strahan reference).	Recorded on the subject site via hair sample analysis.	Yes
Megachiropteran Bats						
Grey-headed Flying Fox	<i>Pteropus poliocephalus</i>	V	V	Subtropical and temperate rainforests; tall sclerophyll forests and woodlands; heaths and swamps (Eby 1995)	Not recorded in study area. Suitable habitat not available.	No
Microchiropteran Bats						
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V	V	Dry forests and woodlands.	Suitable habitat in the study area.	Yes

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
			Occasionally edge of rainforests and moist eucalypt forest (Hoye & Dwyer, 1995).Roost in mine tunnels (Hyett and Shaw 1980),	Could potentially occur on the subject site and study area. Subject species in DGRs. Recorded in locality (Resource Strategies 2005b).	
Little Pied Bat	<i>Chalinolobus picatus</i>	V	Dry open forest, open woodland and shrubland. Roost in trees, caves and abandoned mines and houses (Churchill 1998).	Subject species in DGR's. Suitable foraging habitat only. Not recorded in study area.	No
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	V	Loose piles of large boulders containing subterranean holes and passageways; cliffs (generally over 15m high) including mid-level ledges some with caves and/or ledges covered by overhangs; isolated rock stacks, usually sheer sided and often encompassed (Hyett and Shaw 1980)	Suitable habitat in the subject site and study area. Recorded in locality (Resource Strategies 2005b).	Yes

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
Eastern Bentwing-Bat	<i>Miniopterus schreibersii oceanensis</i>	V	Prefers forested valleys but also found in rainforests, wet/dry sclerophyll forests, monsoon forests, open woodlands, paperbark forests & open grasslands. Roosts in caves, stormwater pipes. This species feeds on insects, mostly moths (Hyett and Shaw 1980).	Suitable habitat in the study area. Could potentially occur on the subject site and study area. Subject species in DGR's. Recorded in locality (Resource Strategies 2005b).	Yes
Little Bentwing-bat	<i>Miniopterus australis</i>	V	Prefer well timbered areas including rainforest, wet and dry sclerophyll forest, <i>Melaleuca</i> swamps and coastal forests. They roosting in caves and eat insects (Churchill 1998).	Recorded in locality (Resource Strategies 2005b). Suitable habitat occurs.	Yes
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	V	Little is known about this species but most records come from dry eucalypt forest and woodland. Mostly roost in tree hollows.	Recorded in locality (Resource Strategies 2005b). Suitable habitat occurs.	Yes
Greater Long-eared Bat	<i>Nyctophilus bifax</i>	V	They favour wetter habitats, ranging	Not recorded in study area. Some	No

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
(south-eastern form)			from rainforest and monsoon forest to riverine forests of paperbark. Although they do occur in open woodland, tall open forest and dry sclerophyll woodland. They roost in forest foliage and bark as well as hollows (Churchill 1998).	potential habitat occurs.	
Greater Long-eared Bat	<i>Nyctophilus timoriensis</i>	V	Tall eucalypt forests, open savanna and Blackbox woodland. They seem to prefer semi-arid area. Roost sites include tree hollows, fissures in branches and sheets of bark (Churchill 1998).	Likely habitat. Subject species in DGR's.	Yes
Yellow-bellied Sheath-tail Bat	<i>Saccolaimus flaviventris</i>	V	This species roosts in tree hollows in wet and dry sclerophyll forest, open woodland, Acacia shrubland, mallee, grasslands and desert (Churchill 1998).	Suitable habitat in the study area. Could potentially occur on the subject site and study area. Subject species in DGR's (Resource Strategies 2005b).	Yes

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
Eastern Cave Bat	<i>Vespadelus troughtoni</i>	V	Inhabit tropical mixed woodland and wet sclerophyll forest, and extend into the drier forest of the western slopes (Churchill 1998). Roosts in caves (NSW Scientific Committee 2004i)	Subject species in DGR's. Not recorded in study area. Unsuitable habitat.	No
Birds					
Blue-billed Duck		V	The species favours deep, permanent, well vegetated freshwater swamps, especially those with beds of Cumbungi Typha species (Marchant and Higgins 1990)	Recorded in locality (Resource Strategies 2005b). Suitable habitat does not occur.	No.
Southern Whiteface	<i>Aphelocephala leucopsis</i>	P	Dry, sparse open forest/woodland; inland scrubs eg. Mallee, mulga, cypress pine; saltbush, dead trees, stumps, black box/lignum flats (Pizzey and Knight 2003).	Not yet listed declining woodland species. Suitable habitat in the study area. Recorded on the subject site. Considered unwarranted for inclusion within this detailed SIS.	No

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
Glossy Black-cockatoo	<i>Calyptrorhynchus lathamii</i>	V	She-oaks (mostly <i>Allocasuarinas</i>) in forests, woodlands, timbered watercourses; hilly rocky ridge country; eucalypts, native cypress (<i>Callitris</i>), brigalow (<i>Acacia</i>) scrub (Pizzey and Knight 2003).	Suitable habitat in the study area. Could potentially occur on the subject site and study area. Subject species in DGR's. Recorded in locality (Resource Strategies 2005b).	Yes
Red-tailed Black-cockatoo	<i>Calyptrorhynchus banksii</i>	V	Eucalypt woodlands and along water courses. Nests in large hollows. (www.zoo.org.au).	Recorded in locality (Resource Strategies 2005b). Outside usual area of occurrence and considered unlikely to occur.	No
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus victorae</i>	V	Eucalypt woodlands, drier forests/scrubs and open woodland lacking dense understorey. Red river gums on watercourses; margins of denser wooded areas; around lake shores (Pizzey and Knight 2003).	Suitable habitat in the study area. Could potentially occur on the subject site and study area. Subject species in DGR's. Recorded in locality (Resource Strategies 2005b).	Yes
Dollarbird	<i>Eurystomus orientalis</i>	Migrat	P	Edges of rainforest, forest, woodland,	Suitable habitat in the study area. No, but

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status		Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC			
		ory		watercourses, wetlands; country, farmlands, treed outer suburbs (Pizzey and Knight 2003).	Recorded on the subject site. This species is a commonly occurring migratory species, and it is considered unlikely that the proposal will affect any local populations.	considered further in SIS
Painted Honeyeater	<i>Grantiella picta</i>		V	Mistletoes in eucalypt forests/woodlands; paperbarks, casuarinas; mulga, other acacias; farmland trees; gardens (Pizzey and Knight 2003).	Suitable habitat in the study area. Could potentially occur on the subject site and study area. Recorded in locality (Resource Strategies 2005b).	Yes
Swift Parrot	<i>Lathamus discolor</i>	E	E1	Flowering resources; habitats including box ironbark forests and woodlands, plantations, banksias, etc.; street trees, parks and gardens (Pizzey and Knight 2003, Swift Parrot Recovery Team 2000)	Suitable habitat in the study area. Could potentially occur on the subject site and study area. Subject species in DGR's.	Yes
Malleefowl	<i>Leipoa ocellata</i>	V	E1	Mallee, acacia, paperbark, she-oak,	Unlikely to occur in the subject site	No

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status		Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC			
Square-tailed Kite	<i>Lophocictinia isura</i>	Migratory	V	eucalypt woodland; coastal heath; commonly found on sandy or gravel soils (Pizzey and Knight 2003). Heathlands, woodlands, forests: tropical and subtropical rainforest, timbered water courses; hills and gorges. Ridge and gully forests dominated by Woollybutt Eucalyptus longifolia, Spotted Gum <i>E. maculata</i> or Peppermint Gum <i>E. elata</i> , <i>E. smithii</i> . The species has also been sighted in forests containing other eucalypts, <i>Angophora</i> spp and <i>Callitris</i> spp with a shrubby understorey and box-Ironbark woodland (Debus and Czechura 1989) .	and study area. Atlas of NSW Wildlife records in the locality. Suitable habitat in the study area. Could potentially occur on the subject site and study area. Recorded in locality (Resource Strategies 2005b).	Yes
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata cucullata</i>		V	Eucalypt woodlands, Acacia shrublands and open forests. Temperate woodlands	Suitable habitat in the study area. Could potentially occur on the	Yes

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
			in areas adjoining large woodland blocks, areas of dead timber/stumps or regrowth with sparse shrub cover; banksia-dominated coastal scrubs. In semi-arid western NSW the species favours open woodlands of Belah, Rosewood, Mulga and Cypress Pine (Pizzey and Knight 2003, Higgins and Peter 2002).	subject site and study area. Subject species in DGR's. Recorded in the locality (Resource Strategies 2005b).	
Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis gularis</i>	V	Feeds on arthropods, nectar and lerps from eucalypt foliage and bark (Blakers et al. 1984). Dry eucalypt woodland within an annual rainfall range of 400-700 mm; associations containing Box and Ironbark (NSW Scientific Committee 2004b).	Suitable habitat in the study area. Could potentially occur on the subject site and study area. Subject species in DGR's. Recorded in the locality (Resource Strategies 2005b).	Yes
Rainbow Bee-eater	<i>Merops ornatus</i>	Migrat	P	Open woodlands with sandy, loamy soil;	Suitable habitat in the study area. No, but

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
		ory	sandridges, sandpits, riverbanks, road cuttings, beaches, dunes, cliffs, mangroves, rainforest, woodlands, golf courses (Pizzey and Knight 2003).	Recorded on the subject site. This species is a commonly occurring migratory species, and it is considered unlikely that the proposal will affect any local populations.	considered further in SIS
Jacky Winter	<i>Microeca fascinans</i>	P	Open woodlands, scrublands; paddocks with live/dead trees; stumps, fences, timber on dams, watercourses, country roadsides, golf courses, orchards (Pizzey and Knight 2003).	Not yet listed declining woodland species. Suitable habitat in the study area. Recorded on the subject site. Considered unwarranted for inclusion within this detailed SIS.	No
Restless Flycatcher	<i>Myiagra inquieta</i>	P	Open forests/woodlands; river red gums near water; inland/coastal scrubs; golf courses, orchards, roadside timber, parks, gardens (Pizzey and Knight 2003).	Not yet listed declining woodland species. Suitable habitat in the study area. Recorded on the subject site. Considered unwarranted for inclusion within this detailed SIS.	No
Turquoise Parrot	<i>Neophema pulchella</i>	V	Steep rocky ridges and gullies, rolling	Suitable habitat in the study area.	Yes

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
			hills, valleys, river flats & plains of the Great Dividing Range; eucalyptus woodlands, open grassy woodland with dead trees, near permanent water and forested hills; forests/woodlands with assemblages of native pine Callitris and a variety of Eucalyptus species inc. White Box, Yellow Box, Blakely's Red Gum, Red Box, Red Stringybark, Bimble Box, Mulga Ironbark. (NSW NPWS 1999h)	Could potentially occur on the subject site and study area. Subject species in DGR's. Recorded in the locality (Resource Strategies 2005b).	
Barking Owl	<i>Ninox connivens</i>	V	Hollows in eucalypt woodland, open forest, swamp woodlands and timbered watercourses. Ideal habitat includes open country with a choice of large trees for roosting and nesting (NSW NPWS 2003b).	Suitable habitat in the study area. Could potentially occur on the subject site and study area. Subject species in DGR's. Recorded in locality (Resource Strategies 2005b).	Yes

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
Powerful Owl	<i>Ninox strenua</i>	V	Tall, damp eucalypt forests; also uses drier eucalypt forest and woodland [Debus, S. J. S. and Chafer, C. J. (1994) The Powerful Owl <i>Ninox strenua</i> in New South Wales Australian Birds 28:1-16]. Roost in trees or tall shrubs, generally with dense canopies such as Turpentine's, she-oaks, and rainforests. Favours roost trees in gullies rather than on ridges (Smith and Smith 2000). Nests in hollows of mature eucalypts usually in or near well timbered gullies (Debus and Chafer 1994).	Recorded in locality (Resource Strategies 2005b). Suitable habitat occurs.	Yes
Masked Owl	<i>Tyto novaehollandiae</i>	V	Forests, open woodlands, farmlands with large trees, timbered watercourses, paperbark woodlands, caves; nest in hollow eucalypts, bare sand or earth of caves (Pizzey and Knight 2003).	Recorded in locality (Resource Strategies 2005b). Suitable habitat occurs.	Yes

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
Gilbert's Whistler	<i>Pachycephala inornata</i>	V	Tall drier scrubs; woodland with dense understorey; mallee-spinifex, cypress pine, mulga, belar, buloke, coastal tea-tree; black box/lignum, broom honeymyrtle (Pizzey and Knight 2003).	Not recorded in the study area. Suitable habitat in the study area. Could potentially occur on the subject site and study area. Subject species in DGR's.	No
Superb Parrot	<i>Polytelis swainsonii</i>	V	Red river gums, black box, yellow box, river oak, mostly near rivers; mallee, stubbles, pastures, gardens (Pizzey and Knight 2003).	Not recorded in the study area. Suitable habitat in the study area. Could potentially occur on the subject site and study area	No
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis temporalis</i>	V	Open forest; woodland; Acacia shrubland and adjoining farmland; scrublands, outer suburbs (Pizzey and Knight 2003).	Suitable habitat in the study area. Could potentially occur on the subject site and study area. Subject species in DGR's. Recorded in locality (Resource Strategies 2005b).	Yes
Speckled Warbler	<i>Pyrrholaemus sagittatus</i>	V	Eucalypt and cypress woodlands on slopes west of the Great Dividing Range.	Suitable habitat in the study area. Could potentially occur on the	Yes

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
			Woodlands with grassy understorey often on ridges or gullies. Drier woodlands with tussocks, dense litter and fallen branches, rocks (Pizzey and Knight 2003, NSW Scientific Committee 2004x).	subject site and study area. Subject species in DGR's. Recorded in locality (Resource Strategies 2005b).	
Painted Snipe	<i>Rostratula benghalensis</i>	E1	Shallow freshwater wetlands, vegetated ephemeral and permanent lakes and swamps; inundated grasslands. Well vegetated shallows and margins of wetlands, dams, sewage ponds; wet pastures, marshy areas, irrigation systems, lignum, tea-tree scrub, open timber (Pizzey and Knight 2003).	Unlikely. No suitable habitat in the subject site and study area. Subject species in DGR's.	No
Diamond Firetail	<i>Stagonopleura guttata</i>	V	Eucalypt woodlands, forests and mallee; buloke, where there is a grassy understorey; red river gums; cypress	Suitable habitat in the study area. Could potentially occur on the subject site and study area. Subject	Yes

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
			pine, acacia scrubs; golf courses (Pizzev and Knight 2003).	species in DGR's. Recorded in locality (Resource Strategies 2005b).	
Regent Honeyeater	<i>Xanthomyza phrygia</i>	E	E1	Nectar sources include three Eucalypt sp; Red Ironbark, White Box and Yellow Box (Webster and Menkhorst 1992). Habitat commonly box-ironbark eucalypt associations, mainly wetter more fertile sites; riparian stands of Casuarina (Menkhorst et al. 1999)	Yes
Reptiles					
Pink-tailed Legless Lizard	<i>Aprasia parapulchella</i>	V	V	Native grasses, partially buried rocks; southern ranges around ACT and adjacent NSW. Shelters beneath rocks and in ant tunnels (Wilson and Swan 2003).	No
Pale-headed Snake	<i>Hoplocephalus</i>		V	Dry sclerophyll forests and woodlands,	No

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status	Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC		
	<i>bitorquatus</i>			usually on floodplains or near watercourses, mainly in dry areas west of coastal ranges. Shelters behind loose bark or in hollow trunks and limbs of standing timber (Wilson and Swan 2003).	subject site and study area.
Broad-headed Snake	<i>Hoplocephalus bungaroides</i>	V	E1	Triassic sandstone of Sydney basin. Exposed sandstone outcrops; woodland vegetation, open woodland and/or heath. Rock crevices and exfoliating sheets of weathered sandstone during cooler months, tree hollows during summer. Canopy tree species located in co-occurrence include <i>Corymbia eximia</i> , <i>C. gummifera</i> , <i>Eucalyptus sieberi</i> , <i>E. punctata</i> , <i>E. piperita</i> (NSW NPWS 1999a).	Not recorded in the study area. Suitable habitat in the study area. Could potentially occur on the subject site and study area, although not recorded.

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status		Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC			
Little Whip Snake	<i>Suta flagellum</i>		V	Associated with permanent flowing drainages, shallow rocky rainforest streams, and slow moving rivers in lowland open forest. Not restricted to particular vegetation forms, utilising rainforest, wet sclerophyll forest and cleared land, riparian areas where vegetation cover is present (NSW Scientific Committee 2004n).	Not recorded in the study area. Suitable habitat in the study area. Could potentially occur on the subject site and study area. Subject species in DGR's.	No
Western Blue-tongue	<i>Tiliqua occipitalis</i>		V	Dry to arid open sandy areas supporting shrublands, heaths and mallee woodlands with spinifex (Wilson and Swan 2003)	Unlikely. No suitable habitat in the subject site and study area. No recorded.	No
Grassland Earless Dragon	<i>Tympanocryptis lineata pinguicolla</i>	E	E1	Confined to scattered remnants of treeless native grassland on plains of NSW. Shelters in invertebrate holes and soil cracks (Wilson and Swan 2003).	Not recorded in the study area. Suitable habitat in the study area. Could potentially occur on the subject site and study area.	No

Table 2.1 DETERMINATION OF SUBJECT SPECIES (INCLUDING COMMUNITIES) REQUIRING FURTHER ASSESSMENT FROM “POTENTIAL” SUBJECT SPECIES LIST GENERATED FROM ALL LOCAL RECORDS

Common Name	Scientific Name	Status		Habitat	Likelihood of subject species occurring on study area and subject site	Subject species, population or community ?
		EPBC	TSC			
Frogs						
Giant Barred Frog	<i>Mixophyes iteratus</i>	E	E1	Shallow rocky streams in rainforest, wet sclerophyll forest and farmland from 100m to 1000m; deep slow moving streams with steep banks in the lowlands (NSW Scientific Committee 2004n).	Unlikely. No suitable habitat on the subject site. Recorded in locality (Resource Strategies 2005b).	No

Key: V = vulnerable, E = endangered, E1 = Listed as endangered on schedule 1 of TSC Act, E4 = Listed as extinct on schedule 4 of TSC Act, P = Protected, U = unprotected

Chapter 3

Flora and Fauna Survey Methods

3.1 Introduction

DGR 1.9 - A fauna and flora survey is to be conducted in the study area. Targeted surveys shall be conducted for all subject species where suitable habitat for these has been identified as occurring within the study area. Species of taxonomic uncertainty shall be confirmed by a recognised authority such as the Australian Museum for animals and the Royal Botanic Gardens for plants.

DGR 1.14 - The methodology of surveys is the responsibility of the consultant and as stated in 1.12 above must be fully documented in the SIS. Suggested methodologies for certain aspects of the field survey are:

- *the study area should be stratified to reflect natural variation across the area and the intensity of direct and indirect effects as a result of the proposed transmission line.*
- *a map of the attributes (e.g., vegetation) used to stratify the study area should be included.*
- *each unit of land delineated by the stratification should be sampled for flora and fauna.*
- *survey effort should be concentrated on, but not restricted to, those areas likely to be most impacted on by direct and indirect effects of the development.*
- *The Interim Guidelines for Targeted and General Flora and Fauna Surveys under the Native Vegetation Conservation Act 1997 (NSW DLWC 1999) provide a guide as to the minimum survey effort required.*

An earlier route selection report prepared by ERM was reviewed in order to provide background information about the flora and fauna known or likely to occur along the proposed route. Other literature pertaining to significant flora and fauna, including communities, species and populations that occur along the route was also reviewed and the information incorporated into this SIS.

The literature review includes relevant Commonwealth and State:

- Threatened species profiles and final determinations;
- Threat abatement plans;
- Recovery plans.

The few field surveys conducted within the Western Slopes area in recent years have resulted in some information being available on the flora and fauna of the locality. This information was utilised in the preparation of this report.

This chapter summarises the methods of the flora and fauna assessment, including a literature review, database analysis and six field surveys that took place between December 2004 and May 2005.

The field surveys were based upon a stratified approach which targeted areas considered most likely to support threatened or significant flora and fauna and those species that are at greatest potential risk, both direct and indirect, from the development proposal. All large patches of habitat were sampled, with all major vegetation types also being sampled. Tower areas were also surveyed in detail due to their known direct impacts. As a basis for determination of appropriate survey effort, the *Interim Guidelines for targeted and general flora and fauna surveys under the Native Vegetation Conservation Act 1997* (DLWC 1999) were considered.

3.2 Flora Investigation

3.2.1 Literature Review and Database Search

Relevant literature covering flora of the landscape surrounding the subject site was reviewed for information that was relevant to the subject site. The landscape in which the subject site occurs includes a few sites that have been subject to flora surveys. There is consequently a small amount of data available on plant species occurring in the area and habitats present. Information from these previous studies from the Western Slopes area was used extensively in this report.

Threatened species records held in databases of the DEC and DEH were obtained and reviewed for relevance to the habitats of the study area. The database analysis entailed analysis of threatened flora species records from:

- The NSW National Parks & Wildlife Services Atlas of NSW Wildlife database within the locality of the proposed route; and
- The DEH interactive map database within a polygon that incorporated the proposed route and surrounding landscapes (referred to as a Protected Matters Report).

The search area for the Protected Matters Report is shown in Figure 3.1.

The DEC NPWS Wildlife Atlas Records come from historical reports, DEC staff, survey data from major projects, consultants and the general public. While the data is extensive, it is by definition patchy. It does not provide the full distribution of a species. Except in areas where comprehensive survey information has been incorporated into the database, the search results for a particular area are based on a mix of reported sightings. Sightings

often follow patterns of human movement, such as along roads. Similarly, a common species in an area may not be recorded, because of its perceived value.

The number of recorded sightings for a species does not necessarily correspond in any way to the actual abundance of that species in NSW. Contributors often focus their efforts on recording threatened and endangered species, with the result that rare species may have more recorded sightings in the Atlas than common species.

The EPBC Protected Matters search tool is also limited in that much of the information is indicative only of what may occur in an area. It brings together information from a range of sources including government, research and community organisations. Maps have been collated from a range of sources, at various resolutions. The information on threatened species threatened species varies in resolution according to current scientific knowledge; some species are well known, while other species have yet to be fully investigated. For EEC where the distribution is well known maps have been derived from reliable sources. Where they are not well known, maps are derived from indicative data.

3.2.2 Aerial Photograph and Map Interpretation

Aerial photographs (1:4000) were utilised to define the extent of the flora and fauna habitats on the subject site and surrounding land. The analysis of aerial photography was also used to prepare preliminary maps of plant community boundaries and to plan field surveys.

3.2.3 Flora Field Surveys

DGR 1.10 - A full description of the methodology used in the fauna and flora surveys and habitat assessment shall be provided, including survey techniques and effort employed, number and location of traps, size of survey sites, dates of surveys, the time spent on surveys and weather conditions. Surveys should be undertaken during seasons and climatic conditions during which the subject species are most likely to be detected. Flora survey will be conducted in the spring and the subject area will be "spelled" from grazing for a period no less than one month prior to the survey. Each proposed pylon site will need to be surveyed for threatened flora.

Flora field surveys were conducted between the 6th to 8th of December 2004 and 26th to 27th of April 2005 in selected areas of the proposed route in order to identify flora species, survey plant communities and to survey potentially sensitive sites for significant species and communities in the subject site. The flora survey included surveys within quadrats to help characterise the vegetation at various locations on the site, target searches for threatened species, and random meanders to maximise detection of plant species.

i. Extensive Vegetation Impact Assessment and Weeds Survey

In a separate extensive survey, an ecologist from OzArk accompanied the archaeological team visiting the whole line route and access track routes over a total of fourteen (14)

days. The ecologist ground-truthed the vegetation types and habitats present, recorded vegetation details for all structure sites and the weeds status of all areas likely to be affected by the activity. Over most of the route the team was accompanied by an ecologist from International Environmental Consultants who was able to ensure that information from the various contributors was appropriately coordinated and integrated into this EIS.

The field team also included an environmental expert from TransGrid who was able to advise on the practicality of design changes to reduce impacts and to define those sections of the easement where vegetation clearing would not be required due to the height of conductors.

One particular observation made in this extensive field survey was the recording of the presence of a small patch of *Goodenia macbarronii* at one location confirming the rarity of this species also found in a targeted search result by Cumberland Ecology. TransGrid was able to adjust the transmission line design to avoid impacting on this species.

This also enabled identification of major woodland patches and enabled further refinement of survey requirements to target specific areas likely to be of interest in terms of threatened species / communities issues.

The major woodland patches were identified as requiring detailed surveys, for which the following methodologies were used.

ii. Vegetation Plots

In order to help characterise the vegetation communities in the path of the proposed alignment, plants were sampled in forty-two (42) 20 x 20 metre square quadrats located within each proposed structure location in the selected areas of the alignment. A total area of 1.68 hectares was surveyed in the vegetation plots.

15 plant communities were identified for the subject site, of which thirteen represent natural plant communities. The survey effort for each of the plant communities is indicated in Table 3.1. Within each quadrat all vascular plants present were recorded and estimations were made of the relative abundance of species. Plant specimens that were not easily identified in the field were collected and identified using Harden (1991 -1993) or sent to the Royal Botanic Gardens for identification.

Table 3.1 FLORA SURVEY EFFORT

Plant Community	Number of Quadrats
Black Cypress Pine - Broad-leaved Ironbark	3
Black Cypress Pine	0
Black Cypress Pine – White Box	1
Black Cypress Pine - Red Box	4
Black Cypress Pine - Tumbledown Red Gum	8

Table 3.1 FLORA SURVEY EFFORT

Plant Community	Number of Quadrats
Yellow Box - Blakely's Red Gum	1
Yellow Box - White Box	6
White Box - Inland Grey Box	3
White Box	5
White Box - Red Stringybark	1
Blakely's Red Gum	1
River Red Gum Riparian	0
Fuzzy Box	0
Cleared/Partially Cleared	2
Improved Pasture and Cropland	6
TOTAL	42

Plant communities are described according to structure and dominant canopy species following structural definitions by Specht (Specht 1970). No recent broad scaled vegetation mapping is available however where applicable, the plant community names follow standardised names provided in a document titled *Forest Types in NSW* (Forestry Commission of NSW 1989).

iii. Random Meander

Random meander searches were employed to search for plant species and to create lists of plants in selected areas or degraded habitats. Such searches were only conducted within selected areas, particularly those likely to have significant flora and/or those at greatest risk of impact from the proposed construction of the transmission line. Random meander searches were also conducted in areas with degraded habitat where detailed quadrat surveys were not necessary. A total of 1 kilometre was traversed using the random meander search. All plant species detected on the random meander were recorded in the total plant species list.

Figure 3.2 shows the locations of random meander searches.

3.2.4 Threatened Flora Species Surveys

Based upon the results of the literature review and database analysis, a list of potential threatened plant species were compiled for the proposed route.

The likelihood of occurrence of threatened species occurring in the subject area was determined (Table 2.1). Targeted searches were conducted for threatened species,

populations and/or communities that could potentially be at significant risk from the proposal.

Targeted searches were conducted within potential habitat areas for individual plants or populations of the species in Table 3.2. Searches were undertaken for these species during all quadrat and transect surveys.

Table 3.2 TARGETED THREATENED PLANTS

Scientific Name	Status	
	EPBC	TSC
<i>Boronia ruppia</i>		E1
<i>Bothriochloa biloba</i>	V	U
<i>Dichanthium setosum</i>	V	V
<i>Diuris tricolor</i>		V
<i>Eucalyptus cannonii</i>	V	V
<i>Goodenia macbarronii</i>	V	V
<i>Grevillea divaricata</i>		E
<i>Grevillea masonii</i>	E	E
<i>Homoranthus darwinioides</i>	V	
<i>Indigofera efoliata</i>	E	E1
<i>Philotheca ericifolia</i>	V	V
<i>Pilularia novae-hollandiae</i>		E1
<i>Pomaderris queenslandica</i>		E1
<i>Rulingia procumbens</i>	V	V
<i>Swainsona recta</i>	E	E1
<i>Swainsona sericea</i>		V
<i>Zieria ingramii</i>	E	E1
<i>Zieria obcordata</i>	E	E1

Key: V = vulnerable, E = endangered, E1 = Listed as endangered on schedule 1 of TSC Act,
U = unprotected

3.2.5 Patch Analysis

In order to provide for a more refined assessment of individual patches along the entire length of the proposed transmission line, further aerial photographic interpretation (in addition to the initial pre-survey interpretation) was undertaken post-survey. This was because it was recognised early on in the assessment process that one of the most important issues was the fragmentation that was likely to occur to various sizes of vegetation patches.

Each vegetation community had been identified via the aerial photo interpretation, vegetation plots and random meanders. The post-survey investigation consisted of additional analysis of each individual patch of vegetation along the entire proposed transmission line.

The size of each patch was determined to identify its likely relative importance and the potential for fragmentation of communities and habitats. It should be noted that this investigation was carried out by reviewing the aerial photographs provided in Project Route Plans 1-42 Volume 3. This limited the results to the field of vision as seen in those photos. However it was still considered that such an analysis provided indicative sizes of each patch and pointed to their relative importance. Total numbers of affected patches were also determined.

Patch proximity to proposed tower locations and the easement locations was determined, allowing an assessment of the likely impacts in specific areas on the various plant communities.

The results were then used to comment on the likely impacts of the transmission line in relation to both areas to be directly affected and likely fragmentation impacts.

3.3 Fauna Investigation

3.3.1 Literature Review and Database Search

The DEC National Parks and Wildlife Service *Atlas of NSW Wildlife* database was used to identify threatened and regionally significant invertebrate, frog, reptile, bird and mammal species that could occur within the locality. This database was also used to identify the occurrence of threatened fauna species in the area and those likely to occur on the proposed route. Due to the lack of overall flora and fauna survey conducted in the locality, species listed within entire map sheets were considered. Searches were conducted for both the Gulgong and Cobbora 1:100000 map sheets. Likelihood of occurrence was determined by confirming the recorded sightings of the threatened species on the *Atlas of NSW Wildlife* in combination with an estimate of habitat suitability on the study site for each species.

3.3.2 Habitat Analysis

DGR 1.8 - A description of fauna habitat components such as the frequency of tree hollows, presence of logs and groundcovers, density and structure of vegetation, soil types and presence of water points etc. within the study area shall be given. The condition of the habitat within the study area shall be discussed, including the prevalence of introduced species. Where relevant the habitat of the subject species shall be described with particular reference to the various components of their habitat (ie feeding, roosting, nesting etc.).

DGR 1.11 - Any areas that may act as corridors or habitat links between the study area and adjacent areas of likely habitat for subject species shall be identified and described.

A habitat assessment was conducted to identify potential areas where threatened and regionally significant fauna species could reside or forage. Habitat assessment and sampling occurred over several survey periods from early summer to mid autumn (6th to 8th December, 21st to 23rd March, 26th to 27th March and 10th to 11th May).

In particular potential habitats where threatened species could be present were assessed for important indicators of habitat suitability, including known species of feeding trees and shrubs and occurrence of such features as wetlands, creeks, tree hollows and fallen logs. Descriptions were also made of the structural complexity of vegetation, the age composition of the forest and the nature and extent of human disturbance in various parts of the site.

Areas that were likely to act as corridors or habitat links between the study area and adjacent areas of likely habitat for subject species were also identified and described.

i. Extensive Fauna Habitat Impact Assessment

A general overview of the vegetation types, habitats present and their condition along the proposed transmission easement alignment was required. In conjunction with the 14 day, Extensive Vegetation Impact Assessment and Weeds Survey, the ecologist made observations of fauna present and assessed impacts on fauna habitats. This included in between all proposed tower locations. Such a survey enabled identification of major woodland patches, prominent species and areas of weed growth and also enabled further refinement of survey requirements to target specific areas likely to be of interest in terms of threatened species / communities issues. The ecologist also noted any particular areas where hollow bearing trees were present in apparent higher densities (if in fact there were such areas).

The major woodland patches were identified as requiring detailed surveys, for which the following methodologies were used.

ii. Targeted fauna habitat searches

The study area was assessed for potential and actual activity by Koalas, using following set of procedures:

- A search of Atlas of NSW Wildlife database;
- An analysis of the composition of each woodland and open forest type was conducted in order to determine whether or not each woodland and open forest type supported potential Koala habitat (by determining the percentage of feed trees listed in SEPP 44 – Koala Habitat Protection); and
- Koalas were searched for during spotlighting and call playback surveys

iii. Tree Hollow Analysis

Due to their importance for the life cycles of many vertebrate fauna, specific tree hollow surveys were undertaken in 10 major habitats of the proposed route that could be at risk from the proposal. The tree hollow analysis was conducted in 20m x 100m plots. A total area of 2 hectares was surveyed. Tree species and diameter at breast height was recorded as well as number and size of hollows.

3.3.3 Fauna Field Survey

DGR 1.10 - A full description of the methodology used in the fauna and flora surveys and habitat assessment shall be provided, including survey techniques and effort employed, number and location of traps, size of survey sites, dates of surveys, the time spent on surveys and weather conditions. Surveys should be undertaken during seasons and climatic conditions during which the subject species are most likely to be detected.

A general fauna survey was conducted on the subject sites with emphasis on targeted searches for threatened subject species that were considered likely to occur in the habitats in the study area. The methods and fauna survey effort used during surveys are outlined in Table 3.3. Species targeted during these surveys are identified in the following sections of the fauna survey methods. Details of the survey locations with the study area are detailed in Figure 3.3.

Table 3.3 FAUNA SURVEY EFFORT

Survey Method	Unit	Total Effort	Other details
Spotlighting	1 hour / 10 sites / 2 persons	20 hours	Towers 15-17, 83, 88-90, 113, 162, 164, 175, 176, 195-198, 204-207, 208-211, 224-229, 268
Call playback	45 minutes / 6 nights	4.5 hours	Towers 89, 164, 197, 207, 211, 227 Cumbo Rd, Blue Springs Rd, Gum Gully Rd
Hair tube traps	340 traps / 7 nights	2380 trap nights	Towers 15, 83, 86, 88, 89, 175, 176, 197, 198, 206, 207, 209, 211, 225, 227, 268,
Anabat ZCAIM bat detectors	2 detectors / 12 hours / 4 nights 1 detector / 12 hours / 3 nights	132 hours	Towers 15, 89, 113, 162, 175, 197, 207, 211, 225, 268 Gum Gully Rd

Table 3.3 FAUNA SURVEY EFFORT

Survey Method	Unit	Total Effort	Other details
Bird survey plots	25 minutes / 41 diurnal surveys	9 ½ hours	Towers 15-17, 56-58, 83-91, 113, 162, 164, 175, 176, 193-198, 204-211, 224-228, 267, 268
Reptile survey	Diurnal searches		Towers 15, 113, 175, 176, 195-198, 162, 164, 204-211, 224-228, 267, 268

i. Spotlight Survey and Call Playback

Spotlighting for nocturnal mammals and birds was conducted using a hand held lamp with a 100W halogen globe. Walking and driving transects were undertaken within all woodland areas to ensure that the majority of the study area was sampled during the survey period. The spotlight surveys were conducted at 10 properties, incorporating 31 tower sites, by two surveyors between 29th to 31st March and 18th to 21st April. Each property was surveyed for approximately 1 hour during 7 nights of the survey period. The area traversed around each tower site was approximately 3 hectares, equalling a total area of approximately 90 hectares being sampled for the survey period.

Species of owls and arboreal mammals were surveyed using the call playback technique. Nine locations were sampled during 6 evening surveys between 18th to 21st April and 26th to 28th April. Call playback was used for species likely to occur in the area and known to return calls regularly in response to call playbacks. Taped calls were broadcast through a 15 watt amplifier and played for approximately 3 minutes periods at five minute intervals for up to 45 minutes at a given location.

Threatened species targeted using these techniques included bettongs, quolls, wallabies, Brush-tailed Phascogales, Eastern Pygmy Possums, Squirrel Gliders, Koalas, Grey-headed Flying-foxes, Barking Owl, Powerful Owl and Masked Owl

Table 3.3 provides a summary of the spotlight and call playback survey effort. Figure 3.2 shows the location of spotlight and call playback surveys.

ii. Trapping and sampling for arboreal and ground dwelling mammals

a. Mammal Trapping

Terrestrial and arboreal traps were set between 18th and 28th April 2005. Terrestrial and arboreal trap grids using single hair tube traps with a 10 – 20 metre separation were placed in 5 traps along 4 trap lines at 17 locations. The total area covered by trap grids

was approximately 5 hectares. The traps were mostly placed alternatively on the ground or in suitable trees. The tree hair tube traps were attached to tree trunks approximately 1.5 m above the ground. All traps were baited with a mixture of peanut butter, honey and rolled oats. Hair tube traps were retrieved after seven nights and hair samples were analysed by 'Scats About'.

Threatened species targeted using these techniques included quolls, Brush-tailed Phascogales, Eastern Pygmy Possums and Squirrel Gliders.

Table 3.3 provides a summary of the mammal trapping survey effort. Figure 3.2 shows the location of each hair trap grid.

b. Koala SEPP 44 Assessment

The study area was assessed for potential and actual activity by Koalas, using the following set of procedures:

- A search of Atlas of NSW Wildlife database;
- An analysis of the composition of each woodland and open forest type was conducted in order to determine whether or not each woodland and open forest type supported potential Koala habitat (by determining the percentage of feed trees listed in SEPP 44 – Koala Habitat Protection); and
- Koalas were searched for during spotlighting and call playback surveys

Figure 3.2 shows the location of spotlight and call playback surveys.

iii. *Bat survey*

Surveys were made for microchiropteran bats using ZCAIM bat detector units. Units were set for 7 nights from 29th March to 1st April, 19th, 20th and 26th April 2005, for 12 hours of recording time each night. The units were placed in 11 locations along the proposed transmission line. ZCAIM units were set approximately an hour before dusk and collected a few hours after dawn.

Table 3.3 provides a summary of the bat survey effort. Figure 3.2 shows the location of ZCAIM bat detector unit surveys.

Species targeted by this survey method included Large-eared Pied Bat, Little Pied Bat, Eastern False Pipistrelle, Eastern Bentwing-bat, Little Bentwing-bat, Eastern Freetail-bat, Greater Long-eared Bat, Yellow-bellied Sheath-tail-bat and Eastern Cave Bat.

iv. *Diurnal bird surveys (TS, 2005)*

Forty-one (41) tower sites were surveyed between the 6th and 8th of December 2004 and 27th and 28th April 2005. All bird species detected during a 20 to 30 minute survey within a

100 metre radius of each selected tower site were recorded. A total approximate area of 128 hectares was traversed during the diurnal bird surveys. Notes were made on potential habitat value during the surveys. Details of areas where possible access tracks between structures were likely to affect habitat of threatened species and their food resources were also recorded.

Table 3.3 provides a summary of the bird survey effort. Figure 3.2 shows the location of diurnal bird surveys.

Species targeted by this survey method included all bird subject species, but with particular emphasis on woodland birds including Glossy Black-cockatoo, Brown Treecreeper, Painted Honeyeater, Swift Parrot, Hooded Robin, Black-chinned Honeyeater, Turquoise Parrot, Gilbert's Whistler, Superb Parrot, Grey-crowned Babbler, Speckled Warbler, Diamond Firetail and Regent Honeyeater. Follow-up surveys were also conducted for threatened birds identified during the initial surveys.

v. *Diurnal reptile surveys (GS, 2005)*

Diurnal reptile surveys were conducted on the 21st and 22nd March 2005 at 25 proposed tower sites. A total area of approximately 24 hectares was surveyed. Surveys primarily targeted three species of reptile listed as endangered or vulnerable, although all reptile subject species were considered during these surveys. These primary three species are: the Broad-headed Snake (*Hoplocephalus bungaroides*), the Pink-tailed Worm-lizard (*Aprasia parapulchella*), and the Grassland Earless Dragon (*Tympanocryptis pinguicolla*). Tower sites that provided potential suitable habitat were searched for signs of occupation by these species. Incidental sightings of other species were recorded during the surveys. Table 3.3 provides a summary of the reptile survey effort.

The Broad-headed Snake is known from the Mudgee area although it has not been recorded in the immediate vicinity of the transmission lines. Many of the proposed towers sites are located on elevated, often rocky positions which may provide suitable habitat for the Broad-headed Snake.

The Pink-tailed Worm-lizard is known from scattered locations in Victoria and southern NSW to the Bathurst region. Although it has not been recorded from the Wollar – Wellington area it can be a difficult animal to locate, as are many of the Worm-lizards. There is a lack of reptile survey effort in the region and thus proposed tower sites that provided suitable potential habitat were surveyed.

The grassland Earless Dragon is another species with a scattered distribution from Victoria through to Bathurst. It is an inhabitant of treeless native grasslands, often with a scattering of surface rock, and prefers gentle slopes or flats, which have not been heavily grazed. Many of the proposed towers sites are located on suitable potential habitat for the Earless Dragon and were surveyed.

Figure 3.2 shows the location of diurnal reptile surveys.

vi. *Searches for signs and scratches*

Searches for signs and scratches were undertaken during mammal trapping surveys and tree hollow analysis to determine the presence or absence of arboreal mammals within the subject site and to assess the level of habitat use by species such as Koalas, Squirrel Gliders and owls. Searches were made for scratches, pockmarks and scats on and below SEPP 44 Schedule 2 Koala food trees, Grey Gum (*Eucalyptus punctata*) and White Box (*E. albens*) within survey areas. Searches were also made for scratches, feed scars and scats on and below Squirrel Glider food trees. Owl pellets and other signs such as diggings and runways were also analysed during the survey. 'Scats About' analysed any scats or pellets located during the survey.

vii. *Incidental records*

All vertebrate fauna species that were observed heard calling or otherwise detected on the basis of tracks or signs were recorded and listed in the total species list for the subject site.

3.3.4 Patch Analysis

In order to provide for a more refined assessment of individual patches along the entire length of the proposed transmission line, further aerial photographic interpretation (in addition to the initial pre-survey interpretation) was undertaken post-survey. This was because it was recognised early on in the assessment process that one of the most important issues was the fragmentation that was likely to occur to various sizes of fauna habitat patches.

The size of each patch was determined to identify its likely relative importance and the potential for fragmentation of communities and habitats. It should be noted that this investigation was carried out by reviewing the aerial photographs provided in Project Route Plans 1-42 Volume 3. This limited the results to the field of vision as seen in those photos. However it was still considered that such an analysis provided indicative sizes of each patch and pointed to their relative importance. Total numbers of affected patches were also determined.

The size of each patch was determined to identify its likely relative importance and the potential for fragmentation of habitats. Total numbers of affected patches were also determined.

Patch proximity to proposed tower locations and the easement locations was determined, allowing an assessment of the likely impacts in specific areas on the various habitat types.

The results were then used to comment on the likely impacts of the transmission line in relation to both areas to be directly affected and likely fragmentation impacts.

3.4 Weather Conditions

The weather conditions were generally fine for the duration of the surveys. It was sunny for the majority of the days and clear on most nights. Rainfall was recorded on the 6th to 8th December 2004, 22nd and 23rd March, 26th April and 11th May 2005. The temperature range for during the survey period was 5.1°C to 30.8°C. Daily temperature ranges and rainfall are provided in Table 3.4.

**Table 3.4 TEMPERATURES AND RAINFALL DURING SURVEYS
FROM LOCAL AUTOMATIC WEATHER STATION***

Date	Gulgong			Wellington		
	Min °C	Max °C	Rain (mm)	Min °C	Max °C	Rain (mm)
6-Dec-04	11.6	27.3	0.8	14.5	29.2	15.6
7-Dec-04	14.8	23.5	28.7	16.1	25.4	5
8-Dec-04	14.8	28.9	20.8	15.7	29.3	20.4
21-Mar-05	10.6	23.8	0	NA	NA	NA
22-Mar-05	11.9	22.3	1.4	NA	NA	NA
23-Mar-05	NA	24.7	5.1	NA	NA	NA
26-Mar-05	9.4	22.2	0	NA	NA	NA
27-Mar-05	7.1	25	0	NA	NA	NA
28-Mar-05	9.1	25.5	0	NA	NA	NA
29-Mar-05	10.9	22.7	0	NA	NA	NA
30-Mar-05	13.2	23	0	NA	NA	NA
31-Mar-05	10.5	22.9	0	NA	NA	NA
1-Apr-05	6.1	27.1	0	8.2	28.1	0
18-Apr-05	13.3	30.1	0	13.1	30.8	0
19-Apr-05	9	27.7	0	7.4	28.6	0
20-Apr-05	10.7	25	0	8.8	26.6	0
21-Apr-05	11.1	25	0	14.4	25.8	0
22-Apr-05	9.6	25.9	0	9.7	27	0
23-Apr-05	9.5	26.7	0	9.7	28.1	0
24-Apr-05	8.3	26.8	0	10.1	27.7	0
25-Apr-05	7.5	26.8	0	10.9	25.6	0
26-Apr-05	6.9	28.3	0.6	9.5	30.2	0
27-Apr-05	8.8	29.5	0	11.4	29.6	0
10-May-05	5.1	23.3	0	8	24.9	0
11-May-05	8.9	22.4	1.9	9	23	0.8

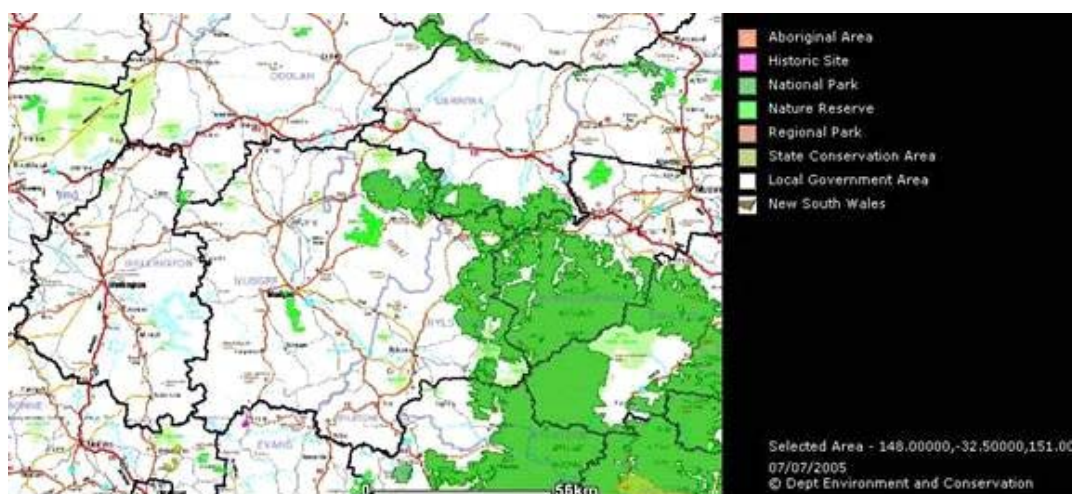
* source <http://www.bom.gov.au/climate/dwo/IDCJDW0207.shtml> accessed 3/06/2005

3.5 Limitations of Surveys

DGR 1.13 - The effect of the season and weather shall be considered with respect to the results of the survey.

The following general points regarding survey limitations can be made and these are further explained in the following text:

- Survey intensity: The majority of the likely affected subject species have been surveyed with an adequate intensity to verify their presence within the study area and to provide data about relative abundance;
- Detectability of species: many of the threatened flora and fauna considered to be at greatest risk from the transmission line are amenable to survey and have been consistently detected during surveys;
- Seasonality: the surveys were conducted in summer and autumn during an extensive drought season - thus surveys have been not been conducted in all seasons. Despite this, conditions still seemed to be relatively good for flora survey and many plants were flowering and readily identifiable during the survey.
- Weather conditions: as for seasonality surveys have been conducted in mostly dry weather conditions, with some rain periods and thus for the majority of species a narrow range of weather conditions have been experienced during surveys.
- Due to the ownership of the survey sites primarily being private, grazing was still occurring in a number of the survey sites. Regular disturbance by activities such as grazing are likely to have affected survey results to some degree.



(a) Atlas of NSW Wildlife LGA search areas



(b) EPBC Protected Matters search area

Figure 3.1 DEC and DEH database search areas

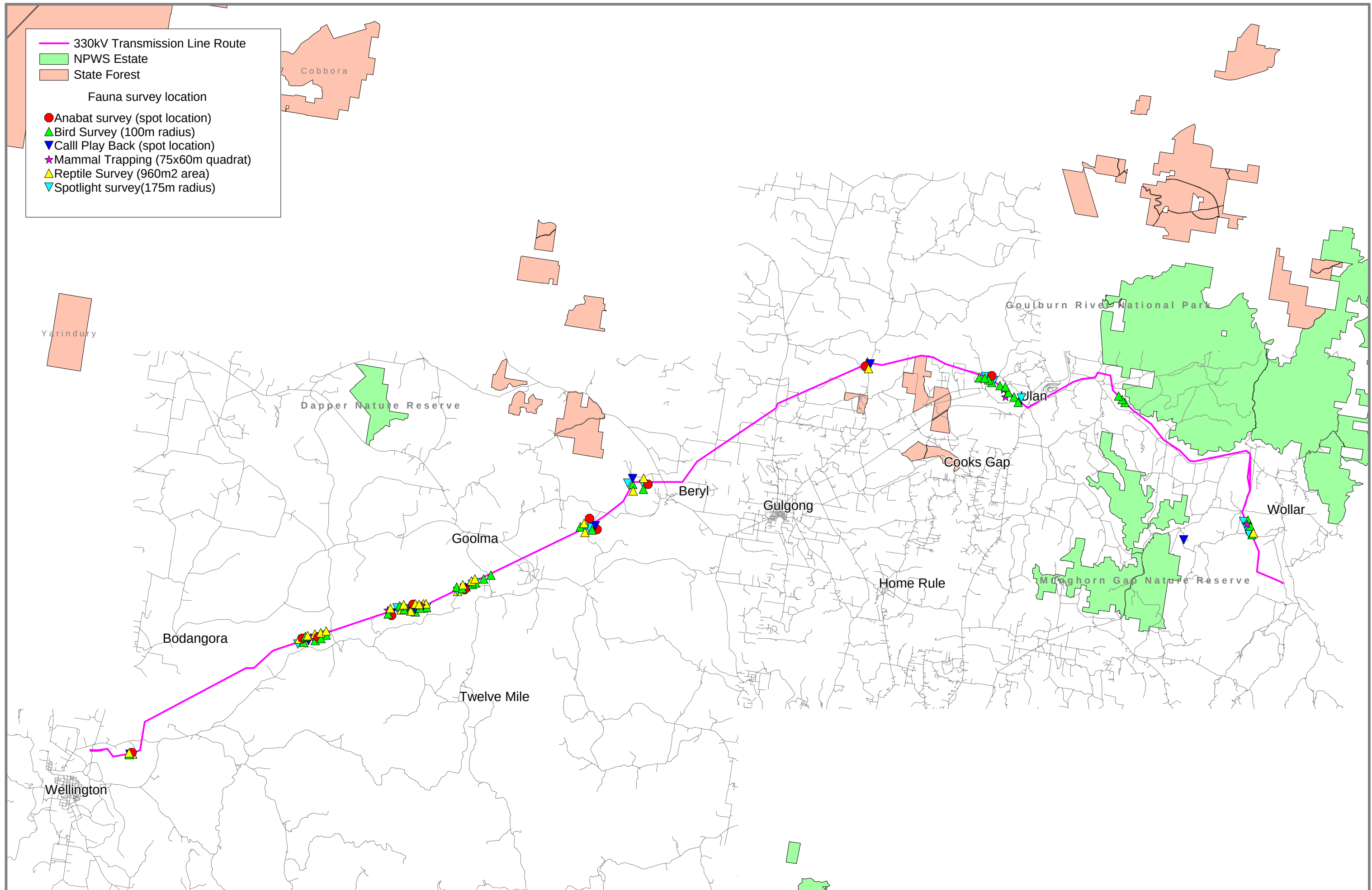


Figure 3.3 Fauna Survey Sites

Chapter 4

Survey Results

4.1 Flora Survey Results

DGR 1.12 - A full list of the flora and fauna found during the course of surveys shall be included. Such information is indicative of the habitat quality of the site.

4.1.1 Overview

A large number of native and introduced plant species were detected during the flora survey. The full results of this survey are found in Appendix B.

The dominant canopy species at each site were used to determine the vegetation communities on the subject site. These communities are described below and those communities in the White Box League have been treated as representing the TSC Act-listed White Box Yellow Box Blakely's Red Gum Woodland endangered ecological community and a combination of the EPBC Act-listed White Box Grassy Woodlands and the EPBC proposed listing of Yellow Box – Red Gum Grassy Woodland.

From the results of the flora survey, it is apparent that many introduced species occur within the study area, particularly Flatweed, Thistles, Prickly Pear, St John's Wort, Clover, Chilean Needle Grass, Wild Oats and *Vulpia* spp. This reflects the improvement of pasture in the study area and the history of grazing in the locality.

The threatened flora species, *Goodenia macbarronii*, occurs in the dry creek bed at Tower site 91, amongst low ground covers in Blakely's Red Gum Woodland. No other threatened plant species that are listed by either TSC Act or EPBC Act were recorded during the flora survey.

Fifteen plant communities occur in the study area as shown in Volume 3 Figure 6a – 6o (excluding the Cleared/Partially Cleared and Improve Pasture and Cropland communities). Of these plant communities, two State listed EECs are considered to occur within the study area. These include:

- Fuzzy Box Woodland; and
- White Box Yellow Box Blakely's Red Gum Woodland

Fuzzy Box Woodland is known to occur in two locations within the study area. This is associated with Wilpinjong Creek and near the Sandy Hollow-Maryvale Railway at the eastern extremity of the Transmission line route. The example of Fuzzy Box Woodland is highly disturbed and consists of mainly a small number of remnant trees. The understorey is not representative of the natural structure of this community. Heavy grazing in the area has led to low species diversity and the creek zone, particularly on the moist southern side has been completely invaded by weeds.

The EEC White Box Yellow Box Blakely's Red Gum Woodland includes several associations which may be further subdivided into communities which are distinguished by different species compositions. For the purposes of this SIS, 7 communities are described and mapped in the study area which all conform to this EEC, and may be described as a Yellow Box League. The communities in this league are described separately below.

The areas of each plant community are summarised in Table 4.1, which provides the following information:

1. The total area of each vegetation community mapped within the study area;
2. The total area of each vegetation community mapped within the subject site (transmission line easement);
3. The total number of towers affecting each community; and
4. An extrapolated figure from the raw mapping data relating to actual likely impact.

In relation to the last set of figures, extrapolation has occurred on the basis that, while a certain areas has been mapped as being impacted by the transmission line easement, it is known (via TransGrid calculations) that 97.5 ha will actually require clearing. This is because plant communities located in valleys underneath the proposed lines will not require clearing in certain areas. Given that assumption, the mapped data has been extrapolated on a pro-rata basis to result in estimation of actual areas of each plant community that are likely to be impacted.

The plant communities are described according to structure and dominant canopy species following structural definitions by Specht (Specht 1970). The plant communities can be grouped into four broad categories based upon topography, species composition and other habitat conditions: Open Forest, Woodland, Grassland and Exotic Vegetation. Where applicable, the plant community names follow standardised names provided in Forest Types in New South Wales (Forestry Commission of NSW 1989).

The open forest group consists of Black Cypress Pine – Broad-leaved Ironbark Open Forest Community (Community 1) in the eastern portion of the route. This community was limited to a sandstone ridgetop in the Ulan Coal property and borders to the north with Goulburn River National Park.

The woodland group consists of several types of woodland communities on a variety of hillside locations and soils. This includes four communities from the Black Cypress Pine

League [Black Cypress Pine Woodland (Community 2), Black Cypress Pine – White Box Woodland (Community 3), Black Cypress Pine – Red Box Woodland (Community 4) and Black Cypress Pine – Tumble-down Red Gum Woodland (Community 5)] and six communities from the Yellow Box – White Box - Red Gum League [Yellow Box – Blakely's Red Gum Woodland (Community 6), Yellow Box – White Box Woodland (Community 7), White Box – Inland Grey Box Woodland (Community 8), White Box Woodland (Community 9), White Box – Red Stringybark Woodland (Community 10) and Blakely's Red Gums (Community 11)]. River Red Gum Riparian Forest (Community 12) also exists along the creek lines.

The Black Cypress Pine community complex tends to occur on poorer soils with the result that they are often in more natural condition than the Yellow Box-White Box-Red Gum League communities. They generally comprise a dense cover of *Callitris endlicheri* (Black Cypress Pine) with scattered eucalypts and a shrub stratum above a generally sparse ground cover.

The Yellow Box – White Box - Red Gum League serves as indicators of good pastoral and agricultural land as members of this league mostly occurs on fairly deep soil of moderate to high fertility (Forestry Commission of NSW 1989). Therefore undisturbed examples of this league are now extremely rare (Forestry Commission of NSW 1989). Owing to the relatively fertile soils on which these communities occur, most sites have had been highly modified by clearing, with varying subsequent regeneration and weed invasion. Most comprise grassland with an open to scattered cover of trees. Some of the sites where this community remain are on poorer or stony soils that were less desirable for farming and therefore less cleared.

River Red Gum Riparian Forest occurred at several locations along the transmission line route along riparian areas. This was in various stages of condition due to previous clearing impacts.

At two locations at the eastern end of the Transmission line, tower numbers 28.2 and 42, a small number of scattered Fuzzy Box trees occur surrounding Wilpinjong Creek and near the Sandy Hollow-Maryvale Railway with an understorey dominated by exotic grasses, which have been heavily grazed. This community has been assessed as remnant Fuzzy Box Woodland (Community 13).

Cleared/Partially Cleared Grassland has been created by the clearance of woodland although it has retained most of the native understorey. It therefore occurs on a variety of soils and has a range of different species mixtures.

Improved Pasture and Cropland has also been created by the clearance of woodland, with most of the native understorey replaced by improved pasture. This community also occurs on a variety of soils although usually on more fertile soil and also supports a range of different species mixtures.

The subject sites and associated study areas are located in vegetation patches. The vegetation communities within these patches are shown in Volume 3 Figure 6a – 6o. Each of the vegetation communities found in the study area is described below. Table 4.1

provides a summary of the areas of vegetation that will be cleared as a result of the activity, and from other activities associated with the total transmission line.

4.1.2 Plant Communities

i. Black Cypress Pine –Broad-leaved Ironbark Open Forest

a. Status

This plant community is not currently listed as an endangered ecological community by either the Commonwealth EPBC Act or the State TSC Act.

b. Description

This type is found mostly in the drier parts of the Western Slopes districts and at lower altitudes on the western part of the Tablelands, with Black Cypress Pine being associated with one or other of the western Ironbarks (Forestry Commission of NSW 1989). It occurs on areas with shallow, skeletal soils (Forestry Commission of NSW 1989).

Three tower sites (56, 57 and 58) contained undisturbed open forest dominated by *Callitris endlicheri* and *Eucalyptus fibrosa*. Other canopy trees occurred locally, including *Eucalyptus rossii* (Inland Scribbly Gum), *Eucalyptus dwyeri* (Dwyer's Red Gum), *Eucalyptus agglomerata* (Bluetop Stringybark) and *Eucalyptus crebra* (Narrow-leaved Ironbark).

The community had a well-developed shrub stratum with *Allocasuarina gymnanthera*, *Epacris muticus*, *Persoonia linearis* (Narrow-leaved Geebung), *Styphelia triflora* and *Hakea dactyloides* being typical. *Lomandra glauca*, *Lomandra multiflora*, *Pomax umbellata* and various grasses formed the typical ground cover.



Photograph 4.1 Black Cypress Pine – Broad-leaved Ironbark Open Forest on a sandstone ridge top in the eastern portion of the route

ii. *Black Cypress Pine*

a. Status

This plant community is not currently listed as an endangered ecological community by either the Commonwealth EPBC Act or the State TSC Act.

b. Description

This community is clearly dominated by Black Cypress pine alone, though other tree species may be associated, including Ironbarks, Red Box, White Box and Stringybarks (Forestry Commission of NSW 1989). It is found through the Slopes and tablelands districts on steep slopes with skeletal soils (Forestry Commission of NSW 1989).

Adjacent to tower 16 an individual stand of early Black Cypress Pine regrowth occurred next to a cleared area.



Photograph 4.2 Black Cypress Pine Woodland regrowth

iii. *Black Cypress Pine – White Box Woodland*

a. Status

This plant community is not currently listed as an endangered ecological community by either the Commonwealth EPBC Act or the State TSC Act.

b. Description

In this community Black Cypress Pine is associated with White Box, other species occurring in this community including Ironbarks, Smooth-barked Apple and Red Gum (Forestry Commission of NSW 1989). This community generally occurs in more easterly location than the Black Cypress Pine – Ironbark Communities (Forestry Commission of NSW 1989).

Black Cypress Pine-White Box community was recorded in three sites: 195 and adjacent to 194 and 224, mostly on granite-derived soil in the Chesleigh Group.

Other canopy species included Tumble-down Red Gum. A low, open shrub stratum of *Hibbertia obtusifolia*, *Cassinia* sp. was typical.

The sparse ground cover varied between the sites but included native grasses and daisies such as *Aristida jerichoensis* var. *spinulifera*, *Bothriochloa decipiens* and *Vittadinia pterochaeta*. Exotic species were estimated to be less than 5% of the ground cover.



Photograph 4.3 Black Cypress Pine – White Box Woodland in the western portion of the route.

iv. *Black Cypress Pine – Red Box Woodland*

a. Status

This plant community is not currently listed as an endangered ecological community by either the Commonwealth EPBC Act or the State TSC Act.

b. Description

In this community Black Cypress Pine is associated with Red Box, other species occurring in this community include Ironbarks, Smooth-barked Apple and Red Gum (Forestry Commission of NSW 1989). This community generally occurs in more easterly locations than the Black Cypress Pine – Ironbark Communities (Forestry Commission of NSW 1989).

Black Cypress Pine-Box community was recorded in four sites: 162, 164, 175 and 176 on granite-derived soil in the Chesleigh Group.

Other canopy species included *Eucalyptus macrorhyncha* (Red Stringybark), *Allocasuarina luemannii* (Bull Oak) at Site 175 and *Angophora floribunda* occurred at site 162 and 164. A low, open shrub stratum of *Hibbertia obtusifolia*, *Cassinia* sp. was typical. Other species occurred variably, especially *Lissanthe strigosa* (Peach Heath) and *Melichrus urceolata*.

The sparse ground cover varied significantly between the sites but included: *Danthonia* spp., *Goodenia hederacea*, *Wahlenbergia* spp. and *Aristida* spp. Exotic species were estimated to be less than 5% of the ground cover.



Photograph 4.4 Black Cypress Pine – Red Box Woodland

v. *Black Cypress Pine – Tumble-down Red Gum Woodland*

a. Status

This plant community is not currently listed as an endangered ecological community by either the Commonwealth EPBC Act or the State TSC Act.

b. Description

This community was the most common form of Black Cypress Pine woodland/open forest, being recorded in ten proposed tower sites (84, 85, 86, 87, 88, 90, 204, 205). These tended to be rocky hilltops with extensive granite (84-88, 90) or metamorphic outcropping (204, 205).

In addition to the two main canopy species, *Allocasuarina verticillata* (Drooping She-oak) was common in most sites.

Common shrub species included: *Hibbertia obtusifolia*, *Astroloma humifusum* (Cranberry Heath), *Cassinia arcuata*, and *Melichrus urceolata*. *Bursaria spinosa* (Blackthorn), *Persoonia linearis* and *Dillwynia juniperina* (Prickly Parrot Pea) were some of the more variably distributed species.

The ground covers varied according to the geology. However *Aristida* spp. and *Austrostipa scabra* were the most common throughout all sites. *Gonocarpus elatus*, *Podolepis neglecta* and *Plantago hispida* were common in or near Sites 84-88 and 90. *Dichondra repens* (Kidney Weed) and *Goodenia hederacea* were fairly common in Sites 204 and 205.



Photograph 4.5 Black Cypress Pine – Tumble-down Red Gum Woodland

vi. *Yellow Box – Blakely's Red Gum Woodland*

a. Status

This plant community is part of a currently listed endangered ecological community by both Commonwealth EPBC Act and State TSC Act. Under the EPBC Act it is under nomination as Yellow Box/Red Gum Grassy Woodland and under the TSC Act it is listed as part of the White Box – Yellow Box – Blakely's Red Gum Woodland.

b. Description

The Yellow Box – Blakely's Red Gum community occurs as either tall or savanna woodland on undulating topography with fairly well-drained, deep soils of moderate fertility along the western side of the Tablelands and into the adjoining Western Slopes (Forestry Commission of NSW 1989). The community is dominated by Yellow Box and Blakely's Red Gum and associated species include Apple Box, Red Box, White Box, Rough-barked Apple, Red Stringybark and various other northern Stringybarks (Forestry Commission of NSW 1989).

This community was recorded at proposed Tower 89 only. It was located in a shallow dip at the change of geology from granite to sandstone.

The canopy appears to have been thinned to promote grass for grazing purposes. Most of the tree cover occurred outside the proposed tower location. *Eucalyptus melliodora* and *Angophora floribunda* (Rough-barked Apple) were the main canopy trees. A couple of small trees (*Acacia implexa* [Hickory Wattle] and *Callitris endlicheri* [Black Cypress Pine] were present.

The shrub stratum was absent although shrubs were scattered through the site. Common species were: *Melichrus urceolata*, *Astroloma humifusum* (Cranberry Heath), *Cassinia arcuata* (Sifton Bush) and *Hibbertia obtusifolia*.

A grassy ground cover was dominated by *Aristida* spp. and other native grasses with exotic Asteraceae being common.



Photograph 4.6 Yellow Box – Blakely's Red Gum Woodland

vii. Yellow Box – White Box Woodland

a. Status

This plant community is part of a currently listed endangered ecological community by both Commonwealth EPBC Act and State TSC Act. Under the EPBC Act it is listed as White Box Grassy Woodland and under nomination as Yellow Box/Red Gum Grassy Woodland and under the TSC Act it is listed as part of the White Box – Yellow Box – Blakely's Red Gum Woodland.

b. Description

The Yellow Box – White Box community occurs as either tall or savannah woodland on undulating topography with well-drained, deep soils of moderate fertility along the western side of the Tablelands and into the adjoining Western Slopes (Forestry Commission of

NSW 1989). The community is dominated by Yellow Box and White Box and associated species include Blakely's Red Gum, Rough-barked Apple and various other northern Stringybarks (Forestry Commission of NSW 1989).

Yellow Box-White Box community was recorded at tower sites: 197, 198, 207, 227 and 228. The first three of these occurred on soils derived from Devonian – Crudine Group – Turondale Formation bedrock. Site 227 was on a Carboniferous intrusion of Wuuluman Granite. All sites appear to be marginal for this community. They were either on poorer granite-derived soils or contained a high proportion of rock. Sites 197, 198 and 207 contained significant weed populations, while 227 and 228 contained an estimated 10% cover of exotic species in the ground cover.

Eucalyptus albens, *Eucalyptus melliodora* and *Angophora floribunda* were the main canopy trees, although the canopy was more open than in most natural community owing to previous clearing for grazing. *Eucalyptus dealbata* (Tumble-down Red Gum) and *Eucalyptus macrorhyncha* (Red Stringybark) were present in or near the sites, indicating marginal growing conditions for the community.

Shrubs were uncommon and the ground cover mainly comprised grasses, especially *Aristida* spp., *Austrostipa scabra* and *Danthonia eriantha* (a Wallaby Grass). *Microlaena stipoides* (Weeping Meadow-grass) was very common at Towers 197 and 198, as were the introduced *Nassella neesiana* (Chilean Needle-grass) and *Avena fatua* (Wild Oats).



Photograph 4.7 Yellow Box – White Box Woodland

viii. *White Box – Inland Grey Box Woodland*

a. Status

This plant community is part of a currently listed endangered ecological community by both Commonwealth EPBC Act and State TSC Act. Under the EPBC Act it is listed as part of the White Box Grassy Woodland and under the TSC Act it is listed as part of the White Box – Yellow Box – Blakely's Red Gum Woodland.

b. Description

This community provides a link between the Yellow Box – White Box – Red Gum league and the Western Box- Ironbark league, occurring towards the western limits of the former league's occurrence (Forestry Commission of NSW 1989). It forms savannah woodland in which White Box is associated with one or more species of other Boxes, including Fuzzy, Pilliga, Narrowleaved and Western Grey Box as dominants (Forestry Commission of NSW 1989). Other associates may include various Ironbarks, Red Gum, Yellow Box, Kurrajongs and Bull Oak (Forestry Commission of NSW 1989).

Three sites (Towers 17, 113 and 193) contained White Box-Inland Grey Box woodland.

Eucalyptus microcarpa (Inland Grey Box) was the main canopy tree in both sites. *Eucalyptus albens*, *Eucalyptus blakelyi* and *Angophora floribunda* occurred nearby and were considered to have been a natural part of the original community.

The three sites had mainly grassy understoreys and a shrub cover of less than 5%. *Themeda australis* dominated the ground cover at Tower 17. *Danthonia* sp. (a Wallaby Grass), *Juncus usitatus*, *Aristida vagans* and *Carex appressa* were the principal herb species at Tower 113. Exotic species were rare in all three sites.



Photograph 4.8 White Box – Inland Grey Box Woodland

ix. *White Box Woodland*

a. Status

This plant community is part of currently listed endangered ecological communities by both Commonwealth EPBC Act and State TSC Act. Under the EPBC Act it is listed as the White Box Grassy Woodland and under the TSC Act it is listed as part of the White Box – Yellow Box – Blakely's Red Gum Woodland.

b. Description

In this community White Box clearly dominates the stand, with such species as Blakely's Red Gum, Yellow Box and Kurrajong occurring as relatively occasional associates (Forestry Commission of NSW, 1989). The community tends to be found in sites that are either climatically or topographically drier than sites required by the Yellow Box – Blakely's Red Gum woodland (Forestry Commission of NSW 1989). This woodland is wide spread in the Western Slopes (Forestry Commission of NSW 1989).

White Box woodland was recorded at five tower sites: 15, 208, 209, 211, and 268. The communities at two other sites (83 and 206) were considered to be ecotones between White Box and Black Cypress Pine communities. Site 15 possibly represented an ecotone between White box and a sandstone community.

Within the study area this community typically comprised native pasture with high proportions of exotic herbs (40-60%), with scattered trees including *Eucalyptus albens*. Shrubs were generally absent. Ground covers were variable although *Austrostipa scabra*, *Danthonia* spp. were representative.

There were variations in the characteristics of these two ecotones– the community occurring at Site 83 was on deep granite-derived soil (much of which had been quarried) while that occurring at Site 206 occurred on a quartz vein in metamorphic bedrock, upslope of better grazing land. Both had low concentrations of exotic species.



Photograph 4.9 White Box Woodland

x. *White Box – Red Stringybark Woodland*

a. Status

This plant community forms part of currently listed endangered ecological communities by both Commonwealth EPBC Act and State TSC Act. Under the EPBC Act it is listed as part of White Box Grassy Woodland and under the TSC Act as part of White Box – Yellow Box – Blakely's Red Gum Woodland.

b. Description

White Box and a Stringybark dominate this community, which occur on more skeletal soils in area where more favourable site carry the White Box woodland community (Forestry

Commission of NSW 1989). Other associated species include Silverleaved and Red Ironbarks, Red Gum, Western New England Blackbutt and Black Cypress Pine (Forestry Commission of NSW 1989).

In the study area this community occurs at one tower site (225) in the western portion of the route and is dominated by White Box (*Eucalyptus albens*) and Red Stringybark (*Eucalyptus macrohyncha*) in association with Roughbarked Apple (*Angophora floribunda*) and Black Cypress Pine (*Callitris endlicheri*).

The shrub layer is dense with *Acacia vestita* and the groundcover contains mainly native Weeping Meadow-grass (*Microlaena stipoides*) and exotics such as Chilean Needle Grass (*Nassella neesiana*) and Patterson's Curse (*Echium plantagineum*).



Photograph 4.10 White Box – Red Stringybark Woodland

xi. Blakely's Red Gum Woodland

a. Status

This plant community is part of a currently listed endangered ecological community by both Commonwealth EPBC Act and State TSC Act. Under the EPBC Act it is under nomination as Yellow Box/Red Gum Grassy Woodland and under the TSC Act it is listed as part of the White Box – Yellow Box – Blakely's Red Gum Woodland.

b. Description

This community is dominated by one of the inland species of Red Gum (Forestry Commission of NSW 1989). The species involved may be Blakely's Red Gum, Baradine Red Gum or Tumbledown Gum (Forestry Commission of NSW 1989). Stands of this community with the first two species dominant are usually on lower lying sandy sites where they may be associated with Roughbarked Apple, while Tumbledown Gum stands usually favour more upland sites (Forestry Commission of NSW 1989).

The western half of one site (91) was dominated by *Eucalyptus blakelyi* (Blakely's Red Gum) and *Angophora floribunda*. *Eucalyptus albens* was observed nearby. A small intermittent creek passed through the western edge of the quadrat and weedy native pasture occurred in the eastern section. The western section of the site contained an estimated 10% exotic species.

Shrubs were fairly common along the creek edge: *Leptomeria* sp., *Cassinia arcuata*, *Melaleuca thymifolia* and *Acacia ausfieldii*. The threatened *Goodenia macbarronii* occurred in the dry creek bed amongst low ground covers.

Echinopogon caespitosus (a Hedgehog Grass), *Arundinella nepalensis* (Reedgrass), *Microlaena stipoides* and *Juncus* sp. were the main ground covers in the wooded section of the site. *Panicum effusum*, *Eragrostis cilianensis* (Stinkgrass) and *Hypochaeris radicata* (Flatweed) were the most common pasture species.

xii. River Red Gum Riparian Forest

a. Status

This plant community is not currently listed as an endangered ecological community by either the Commonwealth EPBC Act or the State TSC Act.

b. Description

Some areas of riparian forest occur on the subject site. Most of the riparian zones lack any canopy cover, and are dominated by invasive weed species. However, degraded River Red Gum Riparian Forest does occur at several locations in the study area.

xiii. Fuzzy Box Woodland

a. Status

This plant community is listed as an endangered ecological community by the State TSC Act.

b. Description

Fuzzy Box Woodland is known to occur in two locations within the study area. This is associated with Wilpinjong Creek and near the Sandy Hollow-Maryvale Railway at the eastern extremity of the Transmission line route. The example of Fuzzy Box Woodland is highly disturbed and consists of mainly a small number of remnant trees. The understorey is not representative of the natural structure of this community. Heavy grazing in the area has led to low species diversity and the creek zone, particularly on the moist southern side has been completely invaded by weeds.

xiv. *Cleared / Partially Cleared*

a. Status

This plant community is not listed as an endangered ecological community by either the Commonwealth EPBC Act or the State TSC Act.

b. Description

This community covers land which was originally forested and which is now maintained in an open condition by grazing and periodic burning (Forestry Commission of NSW 1989). The land often carries remnant trees and clumps of trees and the grazing land is unimproved (Forestry Commission of NSW 1989). Left without grazing and burning, these sites will usually start to revert towards forest vegetation (Forestry Commission of NSW 1989).

This community occurs in patches across the study area and would originally have contained plant communities from the Yellow Box – White Box – Red Gum League.



Photograph 4.11 Partially cleared woodland showing native grasses and regenerating shrubs in the foreground.

xv. *Improved Pasture and Cropland*

a. Status

This plant community is not listed as an endangered ecological community by either the Commonwealth EPBC Act or the State TSC Act.

b. Description

This community includes areas which are used for annual agricultural crops or which have clearly been converted to permanent and improved pasture (Forestry Commission of NSW 1989).

In the study area this community occurs mostly in the western portion of the study area.



Photograph 4.12 Exotic Pasture with broad leaved weeds including Fieldcress, Horehound and Saffron Thistle.

4.1.3 Plant Community Impacts

The following table provides an assessment of the predicted impacts of the proposed transmission line upon each of the identified plant communities. Such calculations include for EEC's. These impacts are discussed following the table.

Table 4.1 PLANT COMMUNITY AREA MAPPING DATA AND EXTRAPOLATED IMPACT ASSESSMENT RESULTS

EPBC Act EEC	TSC Act EEC	Community Name	Mapped Vegetation in Study Area (ha)	Mapped Vegetation in Subject Site (ha)	Total No. of Towers Impacted	Pro- rata Area cleared (ha)
		Black Cypress Pine - Broad-leaved Ironbark (community 1)	397.9	7.8	5	5.8
		Black Cypress Pine (community 2)	145.9	7.4	1	5.5
		Black Cypress Pine -White Box (community 3)	339.0	10.3	3	7.7

Table 4.1 PLANT COMMUNITY AREA MAPPING DATA AND EXTRAPOLATED IMPACT ASSESSMENT RESULTS

EPBC Act EEC	TSC Act EEC	Community Name	Mapped Vegetation in Study Area (ha)	Mapped Vegetation in Subject Site (ha)	Total No. of Towers Impacted	Pro- rata Area cleared (ha)
		Black Cypress Pine - Red Box (community 4)	275.6	7.7	4	5.8
		Black Cypress Pine - Tumbledown Red Gum (community 5)	719.1	17.8	7	13.4
YRG	WYG	Yellow Box - Blakely's Red Gum (community 6)	463.8	20.6	12	15.4
YRG	WYG	Yellow Box - White Box (community 7)	178.6	10.9	9	8.2
GW	WYG	White Box - Inland Grey Box (community 8)	1037.3	17.6	6	13.2
GW	WYG	White Box (community 9)	689.7	23.4	8	17.5
GW	WYG	White Box - Red Stringybark (community 10)	14.3	0.5	2	0.4
YRG	WYG	Blakely's Red Gum (community 11)	24.7	2.8	1	2.1
		River Red Gum Riparian Forest (community 12)	104.9	1.3	1	1.0
	FB	Fuzzy Box Woodland (community 13)	11.7	0.5	2	0.3
		Unidentified Community (community 0)	36.1	1.7		1.2
		Cleared/Partially Cleared			134	
		Improved Pasture and Cropland			81	
		total towers with woodland	4438.6	130.1	61	97.5
		total Black Cypress Pine - Broad- leaved Ironbark	397.9	7.8	5	5.8
		total Black Cypress Pine League communities	1479.6	43.2	15	32.4
		total Yellow Box –White Box – Red Gum League EECs	2408.4	75.8	38	56.8

Table 4.1 PLANT COMMUNITY AREA MAPPING DATA AND EXTRAPOLATED IMPACT ASSESSMENT RESULTS

EPBC Act EEC	TSC Act EEC	Community Name	Mapped Vegetation in Study Area (ha)	Mapped Vegetation in Subject Site (ha)	Total No. of Towers Impacted	Pro- rata Area cleared (ha)
		total river red gum	104.9	1.3	1	1.0
		total fuzzy box EEC	11.7	0.5	2	0.3

Key: EPBC Act EECs: YRG = Yellow Box/Red Gum Grassy Woodland, GW = Grassy White Box Woodlands

TSC Act EECs: WYG = White Box Yellow Box Blakely's Red Gum Woodland, FB = Fuzzy Box Woodland

i. Black Cypress Pine – Broad-leaved Ironbark Open Forest

As previously indicated, this common plant community occurs in the eastern portion of the route on a sandstone ridgetop. As estimated 5.8 ha of this community is likely to be impacted by the proposal. This equates to an estimated 1.5% clearance of this community within the study area.

ii. Black Cypress Pine League

The remainder of the Black Cypress Pine communities are grouped into one League. These plant communities are not listed as endangered under the EPBC Act or TSC Act. In terms of overall impacts, the proposal is likely to impact upon and estimated 32.4ha. In total, this equates to an impact upon 2.0% of the occurrence of these communities within the study area.

iii. The Yellow Box – White Box - Red Gum League

This League is comprised of a mixture of EEC's listed under both the EPBC Act and the TSC Act. As the individual communities are important in terms of their conservation value, impact assessments provided hereunder refer to the specific communities rather than the League.

a. Yellow Box - Blakely's Red Gum

This plant community is listed as endangered under both the EPBC Act and the TSC Act. Under the EPBC Act it is classified as Yellow Box/Red Gum Grassy Woodland, while under the TSC Act it is classified as White Box Yellow Box Blakely's Red Gum Woodland. 463.8 ha of this community are estimated to occur within the study area. Of this, 15.4 ha (or 3.3%) is likely to be affected as a result of the proposed transmission line.

b. Yellow Box - White Box

This plant community is listed as endangered under both the EPBC Act and the TSC Act. Under the EPBC Act it is classified as Yellow Box/Red Gum Grassy Woodland, while under the TSC Act it is classified as White Box Yellow Box Blakely's Red Gum Woodland. 178.6 ha of this community are estimated to occur within the study area. Of this, 8.2 ha (or 4.6%) is likely to be affected as a result of the proposed transmission line.

c. White Box - Inland Grey Box

This plant community is listed as endangered under both the EPBC Act and the TSC Act. Under the EPBC Act it is classified as Grassy White Box Woodlands, while under the TSC Act it is classified as White Box Yellow Box Blakely's Red Gum Woodland. 1037.3 ha of this community are estimated to occur within the study area. Of this, 13.2 ha (or 1.3%) is likely to be affected as a result of the proposed transmission line.

d. White Box

This plant community is listed as endangered under both the EPBC Act and the TSC Act. Under the EPBC Act it is classified as Grassy White Box Woodlands, while under the TSC Act it is classified as White Box Yellow Box Blakely's Red Gum Woodland. 689.7 ha of this community are estimated to occur within the study area. Of this, 17.5 ha (or 2.5%) is likely to be affected as a result of the proposed transmission line.

e. White Box - Red Stringybark

This plant community is listed as endangered under both the EPBC Act and the TSC Act. Under the EPBC Act it is classified as Grassy White Box Woodlands, while under the TSC Act it is classified as White Box Yellow Box Blakely's Red Gum Woodland. 14.3 ha of this community are estimated to occur within the study area. Of this, 0.4 ha (or 2.8%) is likely to be affected as a result of the proposed transmission line.

f. Blakely's Red Gum

This plant community is listed as endangered under both the EPBC Act and the TSC Act. Under the EPBC Act it is classified as Yellow Box/Red Gum Grassy Woodland, while under the TSC Act it is classified as White Box Yellow Box Blakely's Red Gum Woodland. 24.7 ha of this community are estimated to occur within the study area. Of this, 2.1 ha (or 8.5%) is likely to be affected as a result of the proposed transmission line.

iv. *River Red Gum Forest*

This plant community is not listed under the EPBC Act or TSC Act. It is limited in occurrence to along the drainage lines and creek lines and 104.9 ha of this community are estimated to occur within the study area. Of this, 1.0ha is likely to be impacted, which accounts for 1% of the estimated occurrence within the study area.

v. *Fuzzy Box Woodland*

This plant community is listed as endangered under the TSC Act, although is not listed under the EPBC Act. 11.7 ha of this community are estimated to occur within the study area. Of this, 0.3 ha (or 2.6%) is likely to be affected as a result of the proposed transmission line.

vi. *Cleared/Partially Cleared Grassland Improved Pasture and Cropland*

These heavily disturbed communities have not been subject to detailed mapping due to their poor ecological value. In terms of area affected by the proposed transmission line, these plants communities comprise the vast majority of the impacted area.

4.2 Fauna Habitat Values

DGR 1.8 - A description of fauna habitat components such as the frequency of tree hollows, presence of logs and groundcovers, density and structure of vegetation, soil types and presence of water points etc. within the study area shall be given. The condition of the habitat within the study area shall be discussed, including the prevalence of introduced species. Where relevant the habitat of the subject species shall be described with particular reference to the various components of their habitat (ie feeding, roosting, nesting etc.).

4.2.1 Description of fauna habitat components

i. *Tree hollows*

The mean number of trees with hollows is 20 (± 5.6) per hectare, although most sites have fewer than 20 trees with hollows per hectare (Table 4.2). The variation in the density of tree hollows occurs throughout all vegetation communities with no single community containing many hollows at all of the sites that were sampled.

Most trees within the study area do not contain hollows and the mean dbh is 19.5cm (± 1.8). This reflects the regrowth nature of the vegetation of the study area, with areas of woodland and forest regenerating after previous clearing for agricultural activities. The size of hollows also reflects the age of the trees present with 62% of all hollows recorded being less than 15cm diameter across the opening of the hollow.

Studies have shown that fauna species that use hollows usually depend on deeper hollows and that hollows usually only form in trees older than 100 years. It has also been shown that the frequency of hollows in forests and woodland increases when the area has not been subject to past disturbance such as logging or clearing for agriculture (Gibbons and Lindenmayer 2002). As such, the vegetation occurring within the study area does not

provide ideal habitat for large forest birds and arboreal mammals that require large hollows for nesting, with the exception of microchiropteran bats.

No particularly valuable areas of old growth trees likely to contain large old hollows were noted during the walkover of the entire transmission line by the ecologist.

The full results of the tree hollow survey are provided in Appendix D.

Table 4.2 SUMMARY OF TREE HOLLOW DATA

Tower	Community	Trees per hectare	Trees with hollows per hectare	Hollows per hectare	Mean dbh (cm)	Dbh Standard Error
175	Black Cypress Pine - Red Box	355	10	25	23.1	2.19
164	Black Cypress Pine - Red Box	455	20	35	21.3	1.15
195	Black Cypress Pine - Tumble Down Red Gum	130	20	35	19.2	2.05
197	Yellow Box - White Box	120	0	0	10.8	0.89
209	White Box	185	20	55	18.1	1.86
207	Yellow Box - White Box	145	10	25	17.6	2.13
86	Black Cypress Pine - Tumble Down Red Gum	280	5	5	12.7	1.71
225	White Box - Red Stringybark	65	15	40	32.7	4.11
113	White Box - Inland Grey Box	725	70	105	16.5	0.78
56&57	Black Cypress Pine - Broad-leaved Ironbark	315	30	50	17.8	1.23
15	White Box	110	15	30	25.2	1.93
Mean		262.3	19.5	36.4	19.5	
Standard Error		59.0	5.6	8.5	1.8	

ii. Presence of logs

Logs are present in most areas across the subject site and throughout the study area. Logs occur at similar frequencies to tree hollows but are not prevalent, probably due to firewood collection within the study area. As the average dbh of trees is small (Table 4.1), the diameter of logs is also small. Most logs are not hollow or partially hollow and would be

provide shelter for small ground-dwelling fauna, particularly in the absence of deep litter or thick vegetation in the ground stratum.

iii. Presence of groundcovers

Ground covers vary throughout the site from sparse and low vegetation with rock out-cropping to a high percentage cover of grasses and low herbs. Generally ground covers can be divided by vegetation league, with the Black Cypress League occurring where there is much rock out-cropping and the Yellow Box League having a grassy ground stratum. Table 4.3 describes in more specific detail the ground cover in each community.

Rock-outcropping provides shelter and basking habitat for reptile species.

**Table 4.3 GROUND COVER OF EACH VEGETATION COMMUNITY
(PFC=PROJECTIVE FOLIAGE COVER)**

Vegetation Community	Rock-outcropping	Ground vegetation
Black Cypress Pine – Broad-leaved Ironbark		Up to 1m tall, 20% PFC
Black Cypress Pine		
Black Cypress Pine – White Box		
Black Cypress Pine – Red Box	Present – approximately 60% of cover	Up to 1m tall, 10% PFC
Black Cypress Pine – Tumbledown Red Gum	Present	Up to 1m tall, 20% PFC
Yellow Box – Blakely's Red Gum		
Yellow Box – White Box		
White Box – Inland Grey Box		
White Box		
White Box – Red Stringybark		
Blakely's Red Gum		Up to 0.5m tall, 30% PFC
Riparian Woodland		
Cleared/Partially Cleared		
Exotic Pasture and Cropland		

iv. Density and structure of vegetation

The vegetation is divided into woodland and grassland habitats. The woodland habitats have much more complex structures than grassland with the presence of different strata.

Table 4.4 provides a summary of the projective foliage cover (PFC) of each strata of each vegetation community. Communities with more strata provide more complex habitats for fauna and are likely to host a range of fauna. Strata with higher PFC also provide more shelter for fauna. Grassland communities are more likely to provide transitory habitat for larger animals or habitat for small, ground-dwelling animals.

Table 4.4 AVERAGE PROJECTIVE FOLIAGE COVER (PFC, EXPRESSED AS PERCENTAGE) FOR VEGETATION COMMUNITIES OF THE STUDY AREA

Vegetation Community	Canopy	Shrub layer	Ground cover
Black Cypress Pine – Broad-leaved Ironbark	15-20	20-40	20
Black Cypress Pine			
Black Cypress Pine – White Box			
Black Cypress Pine – Red Box	10	5 (variable occurrence throughout the community)	10
Black Cypress Pine – Tumbledown Red Gum	20	5 (odd scattered shrub)	20
Yellow Box – Blakely's Red Gum	10	1 (variable occurrence throughout the community)	50
Yellow Box – White Box			
White Box – Inland Grey Box			
White Box			
White Box – Red Stringybark			
Blakely's Red Gum	30	10	30
Riparian Woodland			
Cleared/Partially Cleared			
Exotic Pasture and Cropland			

Communities of the Yellow Box League have a canopy height of 10-20m, while communities of the Black Cypress Pine League have a canopy height of 8-12m. The shrub layer, which was sparse or absent in some Black Cypress Pine communities, is generally 1-2m in height. Black Cypress Pine communities have sparser ground layers but this stratum tends to be higher (0-1m) than in Yellow Box communities (0-0.5m), probably due to the inaccessibility of these areas for grazing.

v. *Soil types*

Soils in the study area tend to reflect the soils of the region with shallow and stony soils on ridge tops and hills. Downslope, subsoils are derived from the underlying rock material and topsoils contain coarse material derived from upslope. The valley slopes tend to have alluvial sands and loams, rather than clay, and have poor drainage, often resulting in the accumulation of soluble salts (NSW NPWS 2003a). The soil type has been classified in detail in Volume 1 Chapter 5.3, 5.4 and 5.5.

vi. *Presence of water points*

The proposal crosses 7 minor creeks but there are no major rivers, creeks or impoundments in the study area. The hydrology of the transmission line is detailed in Volume 1 Chapter 5.6.

4.2.2 Condition of habitat within the study area

The condition of habitat within the study area ranges from highly modified, in the case of exotic pasture, to relatively undisturbed woodland. Introduced plant species were not recorded in the canopy or shrub strata at any site. Generally, sites where the Black Cypress Pine League was recorded were in good condition. These sites either had no introduced species at all or had 5% or less introduced species in the ground layer, with the exception of one site which had 20% introduced species in the ground layer.

Sites where the White Box League was recorded all had introduced species recorded in the ground layer but across a wide range of densities. Ten out of the sixteen sites of this league had 10% or less weed species in the ground layer and the other sites varied from 30-80%. The presence of weeds in the ground cover at these sites reflects the pastoral use of the study area.

Sites recorded as Cleared/Partially Cleared and Exotic Pasture and Cropland have a high level of disturbance and are not in good condition. There are high levels of weed invasion (70-90% in ground layer) either as a result of grazing animals disturbing the area and creating opportunities for weed invasion, or through the improvement of pasture with exotic species. One site, however, only recorded 10% introduced species in the ground layer. Of the Cleared/Partially Cleared sites, one site is regenerating as Black Cypress Pine Woodland.

Records of weed condition and habitat modification of each site can be found in Appendix E.

4.3 Corridors and Habitat Links

DGR 1.11 - Any areas that may act as corridors or habitat links between the study area and adjacent areas of likely habitat for subject species shall be identified and described.

Corridor and habitat links may be described in on various scales and which achieve different purposes. Corridors may consist of discontinuous areas or patches of habitat acting as stepping stones across the landscape, continuous lineal strips of vegetation, or connected areas of known habitat of importance to local fauna. For the purpose of linking areas of habitat in the immediate locality and provide for species movement, local or minor corridors aid connectivity. At a much larger scale, regional corridors are primary landscape connections between larger, regionally significant areas of habitat (Scotts 2003).

Both types of corridors have been identified in the study area. Individual patches, which form stepping stones and discreet areas of habitat, have also been identified.

i. Local corridors

There are several types of local corridors that pass through the study area and which may be affected by the proposal. These include:

- Woodland patches of various sizes;
- Riparian corridors; and
- Roadside verges.

The corridors provide linkages between other corridors, including riparian corridors, and woodland patches of various quality and size. Some of the corridors will be affected by a reduction in connectivity, a reduction in the proximity of habitat areas and fragmentation of linkages. For example, the connectivity of the riparian corridor and proximate lightly wooded patches near towers 218-221 will be reduced. Table 4.5 further identifies corridor locations according to the nearest tower and describes the type of corridor and the impacts the proposal will have on the corridor. This information is sourced from the patch analysis, which was undertaken in part to identify impacts upon corridors likely to result from the proposal.

Table 4.5 CORRIDOR TYPES AND IMPACTS OF THE PROPOSAL ON HABITAT LINKAGES

Tower location	Type of corridor	Impact on corridor
14-18	Large woodland patch	Reduce proximity to small woodland patch and create edge through existing patch
22	Narrow link between	Reduce proximity of two patches to each other by

Table 4.5 CORRIDOR TYPES AND IMPACTS OF THE PROPOSAL ON HABITAT LINKAGES

Tower location	Type of corridor	Impact on corridor
	two large patches	the width of the easement
54-55	Riparian	Clear vegetation across riparian area
55-59	Large woodland patch	Fragment large patch
60-66	Large woodland patch	Fragment large patch
76-77	Roadside verge	Fragment roadside verge
79-80	Riparian	Fragment appendage joining large woodland
81-82	Small riparian	
82-92	Large woodland patch	Fragment large patch
91-92	Large woodland patch	Fragment appendage joining large woodland
99-100	Lightly wooded riparian	Reduce proximity of 2 large patches to each other
100-103	Large woodland patch	Reduce connectivity between two large patches
107-109	Small patch	Reduce connectivity between two small patches
112-114	Large woodland patch	Reduce connectivity between large patches
116-117	Riparian	Low quality vegetation – no significant impact
127-128	Roadside verge & riparian	Reduce connectivity to large woodland patch
134-135	Riparian	Reduce connectivity to riparian corridor
143-144	Roadside verge	Minimally reduce connectivity of sparsely wooded verge
145-146	Roadside verge	Minimally reduce connectivity of sparsely wooded verge
161-163	Sparsely wooded patch	Reduce proximity of two large patches
163-165	Large woodland patch	Reduce proximity to riparian corridor
166-167	Large woodland patch	Reduce proximity of two large patches & riparian corridor
171-172	Roadside verge & riparian	Reduce connectivity of lightly wooded corridors
172-173	Large woodland patch	Reduce connectivity to roadside verge
174-177	Large woodland patch	Fragment large patch
180-181	Riparian corridor	Reduce connectivity sparsely wooded corridor
185-186	Riparian corridor	Reduce connectivity sparsely wooded corridor
189-190	Riparian corridor	Reduce connectivity sparsely wooded corridor
195-200	Large woodland patch	Reduce connectivity to riparian corridor
202-203	Riparian corridor	Reduce connectivity of riparian corridor
203-212	Large woodland patch	Reduce connectivity of sparsely wooded patches

**Table 4.5 CORRIDOR TYPES AND IMPACTS OF THE PROPOSAL ON
HABITAT LINKAGES**

Tower location	Type of corridor	Impact on corridor
218-219	Riparian corridor	Reduce connectivity of lightly wooded patches and riparian
220-221	Riparian corridor	Reduce connectivity of lightly wooded patches and riparian corridor
224-230	Large woodland patch	Reduce connectivity of sparsely to lightly wooded patches and riparian corridor
235-237	Riparian corridor	Reduce connectivity of sparsely to lightly wooded patches and riparian corridor
242-244	Large woodland patch & riparian	Reduce connectivity of lightly wooded large patches
251-253	Roadside verge	Reduce connectivity of lightly wooded verge which connects with large lightly wooded patch

Where local corridors are to be crossed by the Transmission corridor, native shrubs and grasses will be planted or retained beneath the transmission line where possible. Hollow-bearing trees within the easement will be retained, although the trees will be killed and the crown removed. This will maintain a vegetated movement/sheltered corridor within which species can travel to interconnected and proximate areas of habitat.

ii. Regional Corridors

Two regional corridors have been identified in the study area. For the purposes of this SIS these regional corridors have been described as the Eastern Corridor and Central Corridor.

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A major continuous regional corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected.

Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line. However, the removal of areas of vegetation within this relatively narrow easement, will not significantly impact on regional connectivity.

iii. Patch Analysis

The patch analysis identified sizes of each major identifiable patch of woodland along the transmission line route. Each of these patches was allocated a unique number in order to provide for comparison in Table 4.6. Although the size of each patch has been estimated, such size estimations are limited to the field of view contained in the aerial photography in Project Route Plans 1-42. For locations of these patches, refer to Figures 6a – 6o of the EIS.

Table 4.6 PATCH ANALYSIS RESULTS

Locations of Patches in Relation to Towers	Patch No.	Minimum. Size (ha)
South of towers 6- 12	1	165
South of 14 and middle of towers 15-17	2	135
South of towers 18-28	3	705
North of towers 49-55 and middle of towers 56-59	4	269
South of tower 61 and middle of towers 62-65	5	275
South of towers 76-80	6	280
Middle of towers 83-90	7	800
North of towers 91-102	8	635
South of towers 103-104	9	126
North of towers 103-105	10	205
South of towers 110-112 and middle of towers 112-113	11	55
South of towers 159-164 and east of towers 164-166	12	160
North of towers 173 and middle of towers 174-176	13	130
Middle of towers 194-197	14	140
Middle of towers 198-200	15	200
Middle of towers 203-211	16	700 (scattered)
Middle of towers 219-220	17	155
Middle of towers 224-228	18	300

Patch size is important in regards to habitat value, particularly for woodland birds such as the Speckled Warbler and Brown Treecreeper. It has been demonstrated that where

patches are fragmented to sizes less than 300 ha, a significant decline in woodland birds such as the Brown Treecreeper is experienced, at least partly because females disperse from these areas or die preferentially and are not replaced (Forestry Commission of NSW 1989).

Of issue therefore is the impact that the location of the transmission line route would have upon such large patches. The patch analysis indicates that there are approximately 10 patches that are at least 300 ha in size, therefore providing seemingly optimum habitat for threatened woodland birds. Such expectations are validated by the results of the bird surveys, where species such as Speckled Warbler, Brown Treecreeper and Diamond Firetail were recorded in various locations.

The transmission line will bisect such patches in some locations, while in others it will skirt the edges of the patches. This can have the effect of increasing processes such as the edge effect. Although it could at first impression be assumed that the area of impact is only 60 metres wide along the route, in terms of ecological effects it is in fact likely to be more substantial than this.

As an example, an existing patch of 300 ha that is bisected by the transmission line could be assumed to result in two patches of approximately 150 ha each. While this may be the case, the actual impact from birds adapted to open environments (such as Australian Ravens and Pied Currawongs) and from other predators such as foxes and cats is likely to increase as a result of an increase in exposure to these species. Species such as Speckled Warbler spend significant amounts of time on the ground and low in the shrub layer. Where such species are put into the position of having to navigate open spaces between areas of habitat, it is likely that behaviour would be affected, in turn affecting breeding success and / or survival rates. Such effects could potentially result in the reduction in viability of such woodland birds.

4.4 Fauna Survey Results

DGR 1.12 - A full list of the flora and fauna found during the course of surveys shall be included. Such information is indicative of the habitat quality of the site.

A range of fauna species was detected on the subject site using different survey methods. Table 4.6 provides a summary of the numbers of species detected during the fauna surveys. Considering that the surveys only provided a snapshot of fauna that occurred along the easement, the numbers of species found was considerable and, based upon the available data from DEC database records, shown in Figure 4.1, and from the recent surveys conducted for the Wilpinjong Coal Project EIS, many more species occur within the study area. A composite fauna species list is found in Appendix C.

Table 4.7 FAUNA SPECIES RECORDED IN STUDY AREA DURING EIS/SIS SURVEYS

Fauna Class	Number of Species Identified
Amphibians	6
Reptiles	14
Birds	85
Mammals	30
Total	135

A number of threatened species were detected during the fauna surveys. The locations of the records are shown on Figure 4.2, and more detailed locations are shown in Volume 3 Figures 6a to 6o.

The most abundant vertebrates were birds, particularly birds of woodland and more open grassland habitats. This was followed by mammal species and reptiles. Frogs showed low species diversity, due largely to the dryness of the landscape through which the proposed easement passes.

Six species of frogs were detected including Bibron's Toadlet, *Pseudophryne bibroni*, Striped Marsh Frog, *Limnodynastes peronii*, Common Eastern Froglet *Crinia signifera*, Peron's Tree Frog, *Litoria peronii*, Rocket Frog, *L. nasuta*, and Broad-palmed Frog *L. latopalmata*. Of these species, Bibron's Toadlet was detected under a rock on a dry hillside in the east of the proposed transmission corridor. The other species were detected in association with farm dams and soaks on the easement.

Reptiles were more abundant than reptiles with fourteen species recorded during the surveys. Based upon database records for the region and the nature of habitats found more species are expected. The species found during the surveys are typical of dry woodland environments and rocky hillsides. Species were dominated by skinks including Robust Ctenotus *Ctenotus robustus* (found at 13 sites), Cunningham's Spiny-tailed Skink *Egernia cunninghami* (1 site), Tree Crevice-skink *Egernia striolata* (5 sites), White's Rock-skink *Egernia whitii* (2 sites), South-eastern Morethia Skink *Morethia boulengeri* (7 sites). The burrowing skink Two-clawed Worm-skink *Anomalopus leuckartii* was also found at 2 sites. Four species of geckos were also found including Eastern Stone Gecko *Diplodactylus vittatus* (1 site), Variegated Dtella *Gehyra variegata* (8 sites), Lesueur's Velvet Gecko *Oedura lesueurii* (1 site) and Thick-tailed Gecko *Underwoodisaurus milii* (1 site). Only one species of snake, the Red-naped Snake *Furina diadema* was detected during the surveys and this species was only found at one site.

A total of just over 80 bird species was detected during the surveys, which was relatively low compared with high quality habitats in the region such as occur at Munghorn Gap Nature Reserve. The low diversity of birds is attributable to several factors including:

- The disturbed nature of many of the survey sites, which have been heavily grazed by livestock and which are dominated by relatively young trees;
- The fact that habitats were predominantly dry woodland and did not include any creek or wetland areas;
- The timing of some surveys, which were conducted in April, after most migrant birds would have left the area.

Several Vulnerable bird species were detected in larger woodland patches along the transmission line and these included:

- Glossy Black-cockatoo *Climacteris picumnus* Site S56, between S84 and S85
- Brown Treecreeper *Climacteris picumnus* Sites S15, S164, S198 & S209
- Speckled Warbler *Chthonicola sagittata* Sites S84, between S84 and S85, S85, S164, S194 & S195
- Diamond Firetail *Stagonopleura guttata* Sites S15 & S209

Several other declining woodland bird species were also recorded. These species are not yet listed as endangered or vulnerable, but may be listed in the near future. The declining woodland bird species detected (shown in blue in the table) were:

- Southern Whiteface *Aphelocephala leucopsis*
- Jacky Winter *Microeca fascians*
- Restless Flycatcher *Myiagra inquieta*

The following species (shown in green in the table), protected under the Bonn Convention for Migratory Animals, were also detected during surveys:

- Rainbow Bee-eater *Merops ornatus*
- Dollarbird *Eurystomus orientalis*

Many of the sites contained mature White Box forest and this is an important foraging habitat for the threatened Regent Honeyeater *Xanthomyza phrygia* and the Swift Parrot *Lathamus discolor* during the winter. The eastern portions of the study area are close to areas where both species are regularly recorded and it is possible that these two species would have been detected had the surveys been undertaken in winter. It is likely that species diversity would have been greater had all surveys been conducted in late winter to mid spring.

Twenty-seven mammal species were detected across the study area and, based upon literature review and database analysis more species are expected to occur (see SIS in Volume 2). Kangaroos and wallabies included Eastern Grey Kangaroo *Macropus*

giganteus, Red Necked Wallaby *Macropus rufogriseus*, Wallaroo *Macropus robustus*, and Swamp Wallaby *Wallabia bicolor*. Of these, Eastern Grey Kangaroos were the most abundant and widespread. Other native ground mammals included Short-beaked Echidna *Tachyglossus aculeatus*, Wombat *Vombatus ursinus*, Brown Antechinus *Antechinus stuartii* and Common Dunnart *Sminthopsis murina*.

Tree dwelling marsupials that were detected included three species: Sugar Glider *Petaurus breviceps*, Brush-tail Possum *Trichosurus vulpecula* and Ring-tail Possum *Pseudocheirus peregrinus*.

At least eleven bat species were positively identified and these include:

- Large-eared Pied Bat *Chalinolobus dwyeri*
- Gould's wattled bat *Chalinolobus gouldii*
- Gould's Wattled Bat *Chalinolobus gouldii*
- Common bentwing bat *Miniopterus schreibersii*
- Common Bentwing Bat *Miniopterus schreibersii*
- Eastern Horseshoe Bat *Rhinolophus megaphyllus*
- Yellow-bellied Sheath-tail Bat *Saccolaimus flaviventris*
- White-striped Freetail bat *Tadarida australis*
- Large Forest Bat *Vespadelus Darlington*
- Southern Forest Bat *Vespadelus regulus*
- Little forest bat *V. vulturnus*

Three other species were also tentatively identified from their calls and these included:

- Eastern Freetail Bat *Mormopterus norfolkensis*
- Eastern Cave Bat *Vespadelus troughtoni?*
- Chocolate Wattled Bat *Chalinolobus morio?*

Introduced vertebrates were abundant at many places in the study area, as is typical of the bioregion. One exotic bird was found: Common Starling *Sturnus vulgaris*. Exotic mammals found include Red Fox *Vulpes vulpes*, Feral Cat *Felis catus*, Rabbit *Oryctolagus cuniculus*, Brown Hare *Lepus capensis*, House Mouse *Mus musculus* and Black Rat *Rattus rattus*.

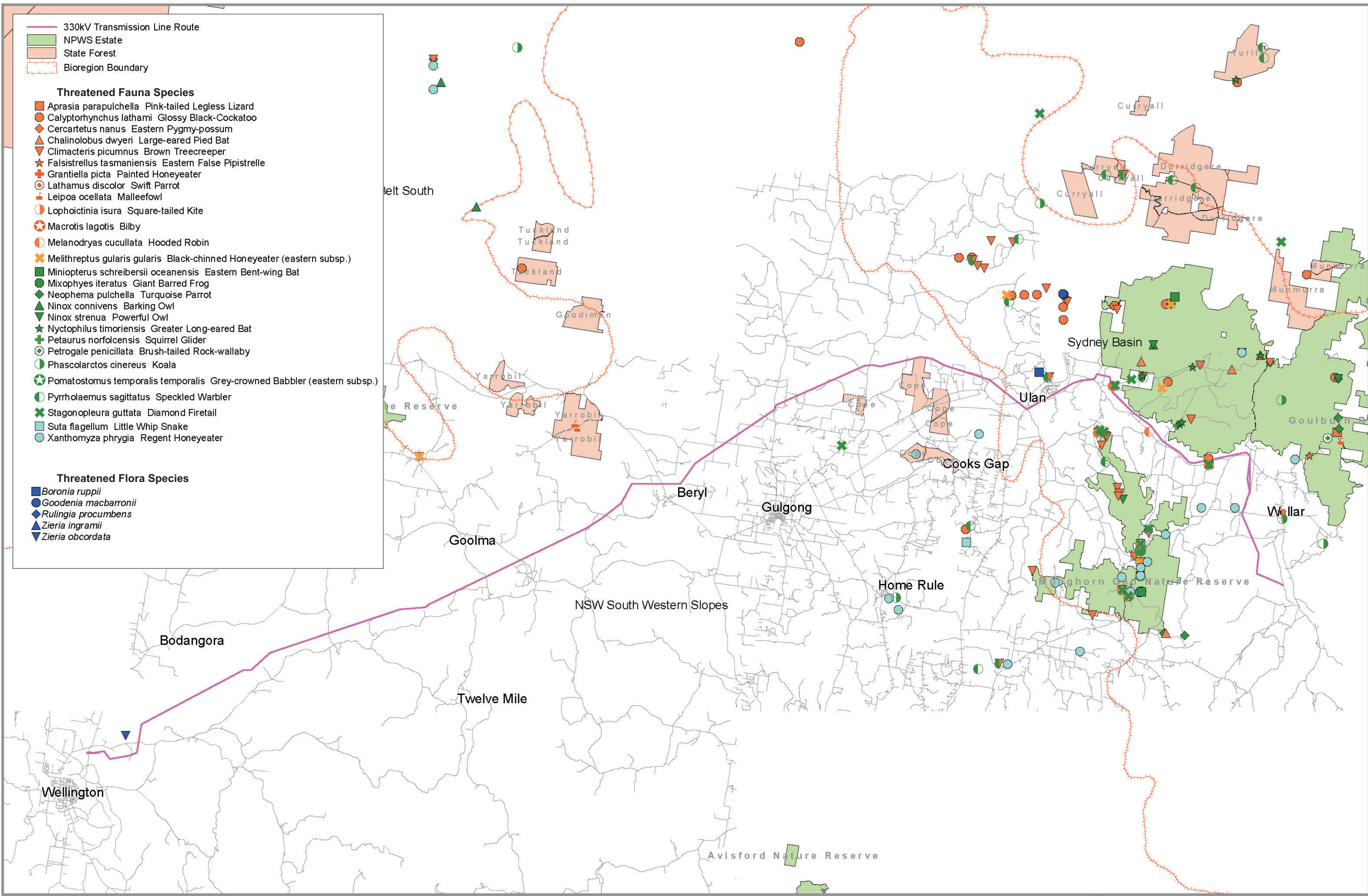


Figure 4.1 DEC Threatened Flora and Fauna Database Records

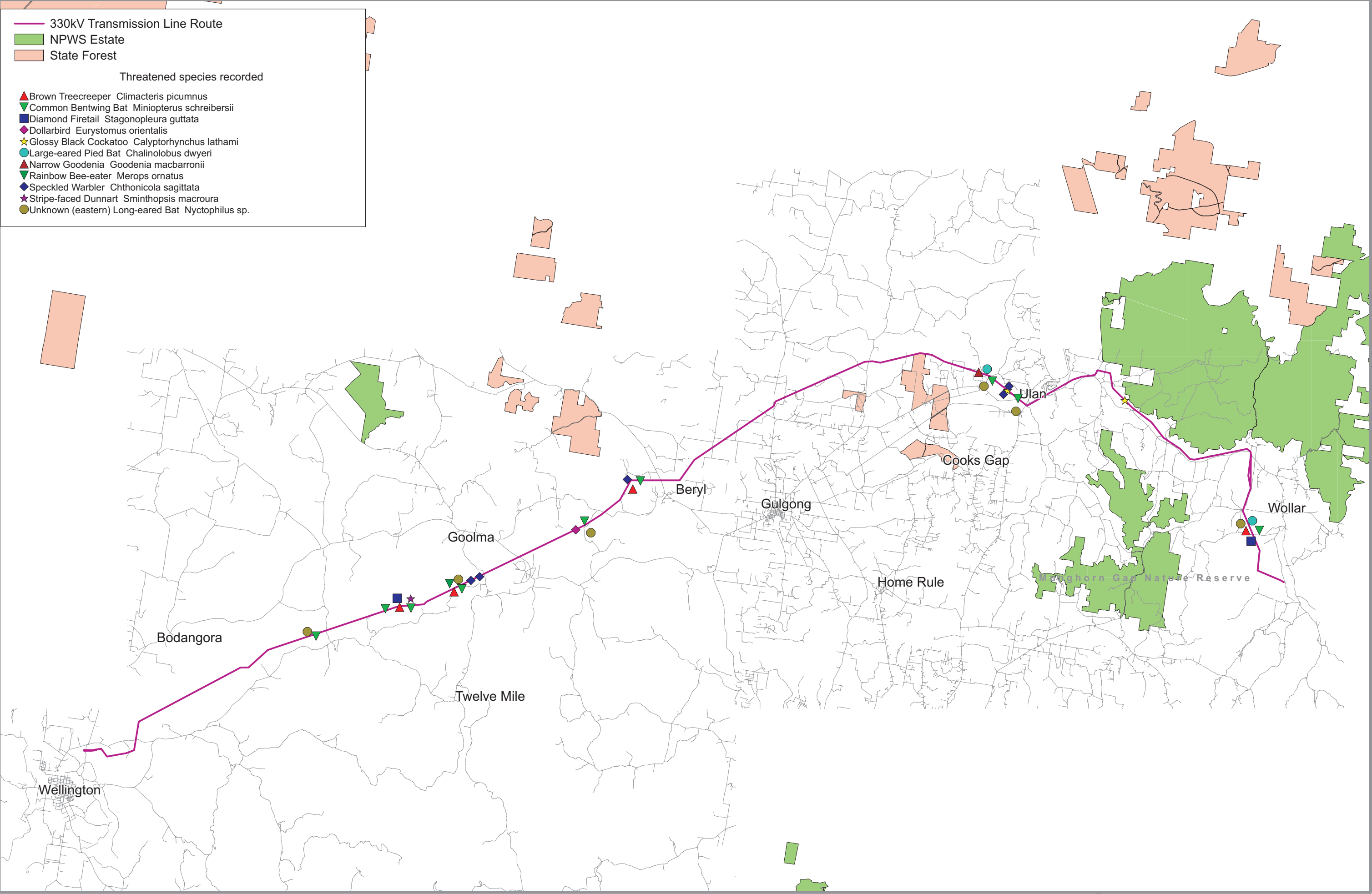


Figure 4.2 Locations of recorded threatened species

4.5 Habitat of Threatened Species

4.5.1 Locations of threatened species

DGR 1.15 - The location of any threatened species recorded during the SIS survey shall be represented on a map of the study area.

The locations of threatened species recorded during the SIS survey are represented on the Figure 6a – 6o, Volume 3 of this EIS.

4.5.2 Descriptions of habitats within the region

DGR 1.16 - A description of the habitats occupied within the region by each of the subject species should be provided. This description should include not only floristic and structural information but also information on the condition of the habitats.

Woodland providing habitat for arboreal mammals is scarce throughout the bioregion due to extensive clearing for agriculture (NSW NPWS 2003a). Remnants of woodland that have been previously cleared, but now exist as stands as 40-50 years, do not contain hollows and so do not provide quality habitat for arboreal mammals that require hollows, such as the Squirrel Glider and some species of microchiropteran bats.

Vegetation within the South West Slopes Bioregion has been heavily modified through two centuries of agricultural activity. The area has been intensively cleared and cultivated, now consisting mostly of fragmented vegetation, and now only contains 16% native vegetation cover. Yellow Box, Blakely's Red Gum and White Box now occur at less than 10% of their pre-European distribution. Landscape was originally open with scattered shrubs and a grassy understorey. Original grasses were kangaroo grass and tussock grass, which were eaten out under moderate stocking levels. These grasses have been replaced by Red-grass and Purple Wire Grass (NSW NPWS 2003a). All woodland within the study area is considered to be habitat for all the subject species (refer to Figures 6a-6o in Volume 3 of the EIS).

Two-thirds of the bioregion's vegetation has not been mapped to suitable standard for a comprehensive bioregional assessment. Suitable habitat for flora and fauna species occurs throughout the region within National Parks and Nature Reserves. Diverse topography and geology ensure that several habitats are made available for threatened species.

Large areas dominated by Red-Yellow Box occur in Munghorn Gap and Goulburn River National Parks. Species include mugga ironbark, *E. sideroxylon*, *E. fibrosa*, *E. oblonga*, *E. dwyeri*, *E. punctata*, *E. agglomerate* and *E. caleyi*. Eucalyptus woodland is potential habitat favoured by arboreal mammals such as Koala and Squirrel Glider, woodland birds including Diamond Firetail, Swift Parrot, Hooded Robin, Regent Honeyeater, Speckled Warbler, Turquoise Parrot and Black-chinned Honeyeater (which uses nectar from

Eucalypts) and also by the Barking Owl and Masked Owl. Significant areas of White Box occur in the study area (Resource Strategies 2005b).

Casuarina cunninghamiana in association with *E. crebra*, *E. dawsonii*, *E. blakelyi* and *Angora floribunda* can be found within several parks in the region. Low woodland dominated by *Acacia doratoxylon* also exists which is a flora species favoured by the Painted Honeyeater and Grey-crowned Babbler.

Black cypress pine (*Callitris endlicheri*), white cypress pine (*C. columellaris*) and tumble down gum (*E. dealbata*) occur within Weddin Mountains National Park- habitat which is particularly suitable for the Speckled Warbler. Fuzzy Box, Grey Box, White Box and Blakely's Red Gum dominate this area. Each of these box communities could also support Regent Honeyeater, Squirrel Glider, Masked Owl and Barking Owl.

Large areas of *Allocasuarina diminuta* ssp. *diminuta* also occur in Weddin Mountains NP which is conducive to the Glossy-black Cockatoo habitat requirements. Ridged gullies within this park are suitable habitat for the Turquoise Parrot.

Areas of dry shrub, moist grasses, sedge herb forest and remnant vegetation occur in Benambra National Park and Tabletop National Park

Timbered water courses and sandstone cliffs along the Goulburn River is suitable habitat for the Square-tailed Kite

Areas of open forest throughout the region and forest areas subject to logging may support bat species, as well as sandstone cliffs and caves which are found within Goulburn River National Park.

Skeletal soils with poor drainage are found within the region which may be suitable for threatened flora species *Goodenia macbarronii*.

4.5.3 Descriptions of habitats within the study area

DGR 1.17 - In the same way, a description of the habitats occupied within the study area by each of the subject species should be provided. A comparison of the available habitats within the study area in relation to the region should then be undertaken.

DGR 1.18 - The habitat of each of the subject species within the study area shall be represented on a map.

Vegetation varies considerably across the study area but in general areas of Eucalyptus woodland and Black cypress pine throughout the study area are suitable habitat for several threatened species. In particular these woodland areas would provide habitat for a number of woodland bird species, bats and several owl species. The threatened flora species known to occur in the area was detected within the woodland areas and other similar woodland patches would provide habitat for this species. All woodland in the study area is considered to be potential habitat for all subject species, as mapped in Figures 6a-

60 in Volume 3 of the EIS. The exception is the *Goodenia macbarronii*, for which the species profile in Chapter 7 identifies its species habitat requirements.

The mature White Box *Eucalyptus albens* forest with sparse understorey that occurs on many of the sites would be used by the Brown Treecreeper and Diamond Firetail and would be important foraging habitat for the Regent Honeyeater *Xanthomyza phrygia* and the Swift Parrot *Lathamus discolor* during the winter. Stands of *Allocasuarina gymnanthera* and *Allocasuarina verticillata* provide suitable feeding habitat for the Glossy-Black Cockatoo. The stands of *Callitris endlicheri* would provide shelter for small bushland birds such as the Brown Treecreeper and Speckled Warbler.

A small proportion of the trees (<8%/ha) within the study area had hollows. These and any dead trees would provide suitable roosting habitat for owls, bats and many woodland birds. Rocky outcrops occur with a high density of *Allocasuarina verticillata* and a high abundance of Speckled Warblers.

Most of the sites surveyed were within habitat remnants. It is possible that many of these open woodland and regeneration areas could provide important habitat for Hooded Robin and Diamond Firetail.

More detailed habitat assessment for the study area has previously been provided in this Chapter (i.e. patch assessment, tree hollow descriptions etc.) please refer to the previous sections for additional information.

4.5.4 Condition of habitats

DGR 1.20 - The condition of the habitats should be determined, described and recorded e.g. structural complexity of the vegetation, evidence of grazing/ browsing damage, presence of flora species susceptible to grazing, fire history. The condition and regional distribution of similar habitats outside the study area should also be recorded.

Condition of native vegetation within the study area is variable. Remnant vegetation is dominated by eucalypt woodland and forests. Natural vegetation is restricted to steep slopes, and land along watercourses is highly disturbed. Much of the area consists of cleared agricultural land and has been subject to overgrazing. Most regrowth is relatively young.

Yellow Box and Blakely's Red Gum Woodland is comprised mainly of regeneration from past clearing practices. This community has almost disappeared from farmed areas, with cleared farmland in poor condition having been extensively cleared and grazed. Some areas have been semi-cleared recently; others have a good canopy cover. In areas of continuous canopy cover and where understorey is good, weed levels are low. There is a good representation of herbs and grasses in the understorey despite heavy grazing (Resource Strategies 2005b).

Roadside remnants of this community are highly fragmented but do contain mature trees. Grazing pressure tends to be less on these remnants, therefore the understorey

comprised of native species has been retained, eg. Kangaroo Grass *Themeda triandra* (Resource Strategies 2005b).

Remnants of the Grassy White Box Woodlands have also been a high semi-cleared and are now subject to heavy grazing, however, trees remain in a moderately good condition. The understorey retains a high level of diversity of native grasses, especially *Austrodanthonia* species. Due to the occurrence of poor soils as a result of overgrazing, the understorey is not dense. Introduced species exist but do not dominate.

Rough-barked Apple (*Angophora floribunda*), commonly associates with Yellow Box and Blakely's Red Gum Woodland on the valley floor. Extensive areas of this community occur on shallow stony soils on semi cleared hills. Soils on which this community occurs are unsuitable for pasture improvement.

Roadside remnants of Rough-barked Apple are in poor condition with a lot of weeds. When occurring on footslopes and gullies of sandstone ranges, this vegetation community appears to be in excellent condition. Little disturbance has occurred and grazing pressure is low or absent. Canopy thinning has occurred on the edges of this community, and grazing takes place where it adjoins cleared land (Resource Strategies 2005b).

Wild fires in the study area generally occur between September and December, although the fire season can extend until May (Resource Strategies 2005a). Goulburn River NP & Munghorn Gap NR Fire Management Plan has been prepared by the National Parks division of DEC. This management plan documents the fire history and addresses management issues in the vegetation communities of these large conservation areas in the study area. Although long-term spatial fire history is not available for this area, anecdotal evidence suggests a fire regime of one major fire approximately every 40 years. In the 17 years of recorded fire history, wildfires have occurred during 5 fire seasons. During the fire season of 1997/1998, 23,990 hectares of these reserves were burnt, in what was the most extensive fire event recorded to date. Prescribed burns were carried out in 1993-94, 1995-96 and recently in 2001 (NSW NPWS 2004b).

Chapter 5

Economic and Social Impacts

5.1 Introduction

This chapter summarises information about the economic and social impacts that are predicted to be associated with the proposed transmission line. Detailed information on the economic and social impacts is provided in Volume 1 Chapter 7.

5.2 Economic Impacts

DGR 1.21 - The economic costs likely to be incurred and the benefits likely to accrue to the proponent as a result of this development shall be addressed in the SIS. This shall include a discussion of the sensitivity of the analysis to any assumptions made in the calculation of the benefits/costs.

5.2.1 Land Ownership

Ownership of the land that will be traversed by the proposed transmission line falls into the categories of privately owned by individuals, private and public companies. Publicly owned land is held by State Forests, crown land, the State of NSW, State Rail Authority, the Roads and Traffic Authority, and local Councils of Mudgee, Merriwa and Wellington.

i. Surrounding Land Uses and Impacts

The proposed transmission line is located in an agricultural region. The principal existing land uses in the region are:

- Mining industries;
- Agricultural activities including grazing and horticulture;
- Urban development including towns, villages and industry areas;
- Recreational uses including National Parks and Nature Reserves; and
- Forestry.

5.2.2 Mining Industries

The transmission line traverses the Ulan to Wilpinjong coal belt and several mining leases. The towers were located to;

- Avoid future coal sterilisation;
- Minimise impacts on existing mining infrastructure;
- Avoid interaction with future mining infrastructure; and
- Minimise impacts on ancillary activities such as habitat compensation areas.

5.2.3 Agricultural Suitability

The Department of Agriculture defines agricultural stability in five classes, taking into account biophysical parameters (climate, topography, soils) social factors (labour availability, land tenure) and economic considerations (production potential, long-term viability, return on capital and present land use).

The majority of the land along the line is Class 3 grazing land, which is land well suited to pasture improvement. The overall production level on Class 3 is moderate because of edaphic or environmental constraints. Erosion hazard, soil structural breakdown or other factors, including climate, may limit the capacity for cultivation and soil conservation. Volume 1 Chapter 7 concluded that there would be no impediment to the ongoing land use as a result of the proposed transmission line.

The proposed line will not cause any significant decline in agricultural productivity due to the following factors:

- the operation of the line will have little effect on the behaviour, health or productivity of livestock;
- there will be no erroneous easement restrictions that would materially affect current agricultural or horticultural pursuits;
- maintenance and the need for line access would be infrequent and this would not interfere with general livestock or pasture management.

There will be some minor impacts on agricultural activities during the construction phase as a result of the movement of vehicles, construction workers and associated machinery along the transmission line route. These activities will result in minor and temporary loss of pasture production and some inconvenience to landholders who choose to relocate stock for the duration of the activities.

5.2.4 Urban Development and Industry

The main urban centres along or near the transmission line are Wollar, Wellington, Ulan and Cadonia Estate. The population in the region has increased substantially in recent years, resulting in an increase in services and facilities.

A range of primary and manufacturing industries also operate in the area. These include mining, engineering, steel fabrication and commercial services. In addition, a number of government departments operate in the major town centres.

Rural and urban impacts have been considered in terms of amenity and visual quality. The proposed line will have some impact on the existing view catchments of towns, villages and subdivision areas.

5.2.5 Recreation and Tourism

Tourism is an important feature of the region. Gulgong and Wellington attract tourism by the wineries and vineyards, scenic beauty, historic interests and National Parks. The proposed transmission line will not impact on local tourism or recreation in the region.

5.2.6 Forestry

The proposed transmission line will traverse the perimeter of Cope State Forest for approximately 900m. Only minor vegetation clearance will be required. Approval will be required for this work.

5.2.7 Visual Impact Assessment

Visual impact was the main concern for the transmission line and has been assessed in detail in Volume 1 Chapter 7.3. The greatest impact will occur for residents close to the proposed transmission line. Mitigation measures to reduce the visual impacts will be implemented, including the colouring of all towers green in areas close to residences, minimising light reflection by using dull finished conductors, planting trees selectively and avoiding woodland areas.

5.3 Social Impacts

DGR 1.22 - An evaluation of the social consequences of the development shall be carried out. This will consider who gains and who loses from the action and where those people are located, i.e. distributional considerations. Social impacts may include those that affect the net welfare of society and those that impact on the individual or group.

Community profiles for each of the affected local government areas are summarised in Volume 1 Chapter 7 Table 7.2.

The 2001 Census shows that there has been a steady increase in the population of Mudgee Shire; Merriwa has remained stable while there has been a slight decline in Dubbo. A similar pattern has been observed in the employment figures for these areas.

Volume 1 Chapter 7 also considers the effect of the transmission line construction and maintenance on;

- Employment generation;
- Accommodation arrangements for workers;
- Social amenity issues;
- Access issues to work sites;
- Property and landuse effects;
- Compensation to landowners for easement rights;
- Transmission line easement issues, such as access and activities allowed near transmission lines;
- Interference with television and radio reception; and
- Electrical safeguards to ensure safety of community and maintenance staff.

Chapter 6

Ecologically Sustainable Development

6.1 Ecologically Sustainable Development Principles

DGR 1.23 - The principles of ecologically sustainable development are described in section 6(2) of the Protection of the Environment Administration Act 1991. The SIS must seek to demonstrate how this development satisfies these principles or how the development could be modified to address these principles.

6.2 Ecologically Sustainable Development Principles in a Regional Context

DGR 1.24 - The regional context of the effects of this development on the ESD principles i.e. off-farm must also be considered.

Ecologically Sustainable Development (ESD) calls for the effective integration of economic and environmental considerations in the decision-making processes. It takes into account social, environmental and economic factors so as to achieve a long-term sustainable balance between environmental and economic objectives.

Volume 1 Chapter 3.10 demonstrates how the development satisfies the Precautionary Principle by finding no serious or significant threat of irreversible damage to environmental, social and economic values of the subject area. Sensitive ecological communities were avoided at the individual tower level. Mitigation measures are integrated where potential degradation has been identified.

Volume 1 Chapter 3.10 also addresses the principle of Intergenerational Equity. The transmission line will ensure reliable power generation for present and future generations while implementing measures to protect and maintain;

- Items of historical and Aboriginal heritage values; and
- Environmental values, including ecology, soils and water.

Volume 1 Chapter 3.10 considers the implementation of ESD principles in a context of the western NSW region, by minimising the reduction and degradation of exiting forests, soils and water resources. Ecological offsets, such as the planting of woodland areas, will be implemented.

Volume 1 Chapter 3.10 also identifies the costs to the community, namely the loss of some vegetation, habitat and increased visual impacts. Strategies to reduce and mitigate these issues have been incorporates into the overall design of the transmission line.

Chapter 7

Impact Assessment for Significant Flora and Fauna Species

7.1 Impacts of the Proposed Transmission Line

This chapter provides profiles on the subject species that summarise the impacts the proposed transmission line would have upon them. It covers the DGRs 2.1 to 2.3 and Sections 109 and 110 of the TSC Act.

A record of all threatened flora and fauna species found in the locality is provided in Appendix B and C of this report. Each profile contains the following information in order to comply with the DGRs and Sections 109 and 110 of the TSC Act:

i. Description

TSC (Section 110(2)(a)(b)) - A general description of the threatened species or populations known or likely to be present in the area that is the subject of the action and in any area that is likely to be affected by the action and an assessment of which threatened species or populations known or likely to be present in the area are likely to be affected by the action,

DGR 2.1 - For all subject species, the SIS shall state the following:

- *the location, nature and extent of habitat removal or modification which may result from the proposed action;*
- *the potential impact of the removal of habitat on the species, population or ecological community; and*
- *the likely contribution of the proposed action to the threatening processes acting on populations of those species in the locality.*
- *measures proposed to ameliorate the impacts of the proposal.*
- *the extent to which the proposal is consistent with relevant, draft or approved Recovery Plans or Threat Abatement Plans.*

ii. Conservation Status

TSC (Section 110(2)(c)) - For each species or population likely to be affected, details of its local, regional and State-wide conservation status, the key threatening processes generally affecting it, its habitat requirements and any threat abatement plan applying to it.

iii. *Regional Abundance and Locality Abundance*

TSC (Section 110 (2)(d)) - An estimate for the local and regional abundance of those species or populations.

DGR 2.2 - A discussion of other populations of threatened species in the region shall be provided. The long term security of the other habitats shall be examined as part of this discussion. The relative significance of the subject site for subject species in the local context shall be provided.

iv. *Impact Assessment: Assessment of Impacts to Habitat*

v. *Extent of Habitat Removal and Conservation by Proposal*

TSC (Section 110(2)(f)) - A full description of the type, location, size and condition of the habitat (including critical habitat) of those species and populations and details of the distribution and condition of similar habitats in the region.

vi. *Consideration of Habitat Corridors and Connectivity*

DGR 2.3 - If movement corridors for subject species are present within the subject site, the impact of the proposal on these areas shall be discussed.

- Hectares cleared;
- Corridor; and
- Other indirect impacts

The following species profiles are provided for the affected threatened flora and fauna species occurring or potentially occurring within the study area for the Wollar to Wellington 330kV Transmission Line Project.

These have been based on the Director General Requirements and Sections 109 and 110 of the TSC Act (see 7.1 above)

7.2 *Bothriochloa biloba*

7.2.1 *Description*

Bothriochloa biloba is a tufted perennial grass which occurs in a variety of woodland and grassland associations. A member of the genus Poaceae, it grows between 50-100cm tall. Leaves are 7-20cm long, and are hairless and smooth below. Leaves with sheath

loose, keeled, glabrous; ligule 1-2 mm long, ciliate; blade 3-5 mm wide, glabrous or with scattered tubercle-based hairs.

This grass flowers in autumn. The species has a broad distribution from in northern NSW, and many records exist from the Brigalow Belt South and Nandewar bioregions (NSW Scientific Committee 2004c).

7.2.2 Conservation status

i. Local

Bothriochloa biloba occurs in extremely low numbers within the locality. Only 1 record of the species occurs within the Mid-Western Regional LGA and 1 within Wellington LGA. One record of this species occurs at the edge of Goulburn River National Park, therefore it is likely that suitable habitat occurs there.

The local conservation status of the species is unknown.

ii. Regional

There are 171 records in the Atlas of NSW Wildlife for the grass *Bothriochloa biloba* across NSW. These records occur mostly in east and north-eastern NSW. The conservation status of the species is unknown.

iii. Threatened Species Status

Bothriochloa biloba has been removed from the Schedule 2 of the TSC Act which listed it previously as a vulnerable species as it does not currently satisfy the criteria for vulnerable species listing. Abundance and distribution of the species now appears more than previously recorded.

The species is listed as VULNERABLE under the EPBC Act.

iv. Key threatening processes listed under the NSW TSC Act 1995;

- Clearance of native vegetation;

Threats to this species include:

- Invasion and competition from *Hyparrhenia hirta*; and
- Spread of *Hyparrhenia hirta* along travelling stock routes;

- a. Contribution to threatening processes as a result of the proposal

Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland.

- v. *Threat Abatement Plans*

No Threat Abatement Plans are relevant to *Bothriochloa biloba*.

- a. Relevance to proposal

Not Applicable

- vi. *Recovery Plans*

No draft or final Recovery Plans exist for the *Bothriochloa biloba*.

- a. Relevance to proposal

Not Applicable

- vii. *Habitat requirements*

This grass species shows a preference for heavily textured soils which are favoured for clearing and conversion to clearing (NSW Scientific Committee 2004c). It occurs in a variety of woodland and grassland associations, and has occurrences the ecological community White Box Yellow Box Blakely's Red Gum Woodland.

7.2.3 Local and Regional Abundance

- i. *Local*

This species was not recorded during the recent targeted survey of the subject site by Cumberland Ecology, or by Florasearch during autumn, winter and spring surveys of the study area (Resource Strategies 2005b). One record of *Bothriochloa biloba* on the Atlas of NSW Wildlife exists within the Mid-Western Regional LGA and 1 record within Wellington LGA. These results suggest a low abundance of the species within the locality.

- ii. *Regional*

As there is only one known population in the region, it is therefore likely that the regional abundance of this species is very low.

- iii. *Populations*

- a. Distribution of local populations of threatened species recorded from the study area

Not recorded.

b. Other populations within the region

Targeted surveys within the known range of the species in NSW have located many occurrences (NSW Scientific Committee 2004c){#2697}, however, few of these records appear to be from this region.

c. Long-term security of other habitats

The security of populations outside the conservation areas in the study area is unknown.

d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas of potential habitat contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares. However, the locality is not known to be a significant area of habitat for this species.

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as “stepping stones” to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The spread of genetic material is not likely to be impeded by the severance of these corridors due to the retention and replanting of understorey vegetation in the easement where appropriate.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

The known distribution of the grass *Bothriochloa biloba* is such that it is not likely to become endangered. Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve.

Munghorn Gap is a rugged sandstone plateau which is conducive to this species' requirements. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. Location, nature and extent of habitat removal or modification that would result from proposed action

The proposed transmission line will result in the clearance of habitat within areas of woodland/forest. See Section 1.3.1 for further details.

Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture.

a. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003a). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.3 *Dichanthium setosum*

7.3.1 *Description*

Dichanthium setosum is an erect perennial which grows to < 1 m high.

Leaves with sheath glabrous except at the nodes; ligule to 1 mm long; blade 2-3.5 mm wide, with tubercle-based hairs or glabrescent (Botanic Gardens Trust 2004).

Racemes 1-3, to 8 cm long. Lowest pairs of spikelets male; joints and pedicels ca 2 mm long, ciliate with hairs increasing upwards to 2 mm long. Sessile spikelets 5-6 mm long; callus obtuse, often densely bearded with hairs to 1 mm long. Lower glume pilose with a subhyaline area at the apex, long ciliate on the keels and on a transverse subapical arch

with tubercle-based hairs to 3.5 mm long. Lower lemma 2.5 mm long; upper lemma stipe-like, 1-nerved, with an awn ca 25 mm long. Pedicellate spikelets male, 5-6 mm long. Lower glume with long tubercle-based hairs; upper glume subequal, 3-nerved. Lower lemma ca 4 mm long (Harden 1991).

7.3.2 Conservation status

i. Local

One record of *Dichanthium setosum* occurs in the locality within the Mid-Western Regional LGA, east of Mudgee. There are no records within the Wellington LGA.

The local conservation status of the species is unknown.

ii. Regional

There is only one record of this species in the region. The regional conservation status of the species is unknown.

iii. Threatened Species Status

Dichanthium setosum is listed as VULNERABLE on the Schedule 2 of the NSW TSC Act. It is also listed as a ROTAP species.

This species is listed as VULNERABLE under the EPBC Act.

iv. Key threatening processes listed under the NSW TSC Act 1995;

- Clearance of native vegetation;

a. Contribution to threatening processes as a result of the proposal

Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland.

v. Threat Abatement Plans

No Threat Abatement Plans are relevant to *Dichanthium setosum*.

a. Relevance to proposal

Not Applicable

vi. Recovery Plans

No draft or final Recovery Plans exist for *Dichanthium setosum*.

a. Relevance to proposal

Not Applicable

vii. Habitat requirements

Dichanthium setosum occurs mainly in woodland and grassland areas.

7.3.3 Local and Regional Abundance

i. Local

This species was not recorded during the recent targeted survey of the subject site by Cumberland Ecology, or by Florasearch during autumn, winter and spring surveys of the study area (Resource Strategies 2005b). One record of *Dichanthium setosum* on the Atlas of NSW Wildlife exists within the Mid-Western Regional LGA and no records within Wellington LGA. These results suggest a very low abundance of the species within the locality.

ii. Regional

Only one record of this species occurs within the region. There are no occurrences of this species within Munghorn Gap or Goulburn River Nature Reserve in the region. The species has not been recorded in any other conservation areas in the region. Therefore, the regional abundance of this species is likely to be low.

iii. Populations

a. Distribution of local populations of threatened species recorded from the study area

There is only one known population of this species within the area.

b. Other populations within the region

No other populations have been recorded in the region (DEC (NSW) 2005a).

c. Long-term security of other habitats

As there are no known occurrences within conservation areas in the region it is unknown if habitat for this species is secure. However, the one record of this species in the region comes from an area near to Avisford National Park, therefore it is possible that habitat for this species occurs there.

d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas of potential habitat contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares. However, the locality is not known to be a significant area of habitat for this species.

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as “stepping stones” to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The spread of genetic material is not likely to be impeded by the severance of these corridors due to the retention and replanting of understorey vegetation in the easement where appropriate.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

Habitat for this species is suspected to be very limited in the region and study area. Potential habitat occurs in the study area, however, known habitat does not occur. The description, type, location, size and condition of similar habitats are not known in the study area or region. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species

then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.4 *Eucalyptus cannonii* (Capertee Stringybark)

7.4.1 Description

Eucalyptus cannonii is a member of the genus Myrtaceae. It occurs as a 10-15 metre high tree with a persistent stringy bark. Leaves are lanceolate, 9 - 15cm long and 1.5 - 2.5cm wide. Buds and peduncles are angular, and fruits are greater than 10mm diameter with a distinct rim around the middle (NSW NPWS 2000). Mature trees can survive hot fires and can be found in ecotonal areas such as the boundaries of Tablelands Grassy Woodland Complex communities and Talus Slope Woodland vegetation.

7.4.2 Conservation status

i. Local

Capertee Stringybark occurs in low numbers within the locality. 26 records of the species occur within the Mid-Western Regional LGA and no records within Wellington LGA.

The conservation status of the species is unknown.

ii. Regional

There are 87 records in the Atlas of NSW Wildlife (DEC (NSW) 2005a) for the Capertee Stringybark across NSW. These records occur mostly within the NSS bioregion and the Sydney bioregions.

The conservation status of the species within the region is unknown, although it is likely to be inadequately conserved.

iii. Threatened Species Status

Eucalyptus cannonii is listed as VULNERABLE on the Schedule 2 of the NSW TSC Act (NSW NPWS 2000).

This species is listed as VULNERABLE under the EPBC Act.

iv. Key threatening processes listed under the NSW TSC Act 1995;

- Clearance of native vegetation

Threats to this species include:

- Loss of habitat;
- Inappropriate fire regimes;
- Overgrazing; and
- Logging.

a. Contribution to threatening processes as a result of the proposal

Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland.

v. *Threat Abatement Plans*

No Threat Abatement Plans are relevant to the Capertee Stringybark.

a. Relevance to proposal

Not Applicable

vi. *Recovery Plans*

No draft or final Recovery Plans exist for the Capertee Stringybark.

a. Relevance to proposal

Not Applicable

vii. *Habitat requirements*

Eucalyptus cannonii occurs in woodland dominated by Red Stringybark (*E. macrohyncha*) and Long-leaved Box (*E. gonicalyx*) on metasediments and coarse conglomerates (NSW NPWS 2000). The species can occur on a variety of geological types and soil substrates across a wide altitudinal range. It is also commonly found on footslopes (NSW NPWS 2000).

7.4.3 *Local and Regional Abundance*

i. *Local*

This species was not recorded during the recent targeted survey of the subject site by Cumberland Ecology. A population of *Eucalyptus cannonii* was recorded by Florasearch 2km south of the proposed transmission line within the Wilpinjong Project area (Resource Strategies 2005b). There are 26 records of *Eucalyptus cannonii* on the Atlas of NSW Wildlife within the Mid-Western Regional LGA and no records within Wellington LGA. These results suggest a moderate abundance of the species within the locality.

ii. Regional

There are records of this species within Avisford Nature Reserve. The species is rare and localised by nature, generally occupying a few square metres (DEC (NSW) 2004). The total reserved population is estimated to exceed 20,000 plants in at least 14 separate populations. These figures are from Avisford NR which is within the bioregion, and from one Reserve and one National Park outside the bioregion. Therefore exact abundance within the bioregion cannot be determined, however it is likely to be relatively high.

iii. Populations

a. Distribution of local populations of threatened species recorded from the study area

One population is known in the study area, 2 km south of the transmission line.

b. Other populations within the region

Population distribution of *Eucalyptus cannonii* is isolated and only records for the species occur in Avisford Nature Reserve. Known suitable habitat therefore occurs in this area which comprises an area of approximately 2,437 ha. {#2697}

c. Long-term security of other habitats

Populations have been recorded in Avisford Nature Reserve. This habitat is secured in the long-term under management of the DEC and would contain significant areas of habitat for this species.

d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas of potential habitat contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares. This species is not known to occur on the subject site, therefore the significance of this area is not high in the local context.

iv. Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in

State Forests or private land and connecting larger areas of habitat. These patches act as “stepping stones” to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The spread of genetic material is not likely to be impeded by the severance of these corridors due to the retention and replanting of understorey vegetation in the easement where appropriate.

v. Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area

There is only one other known population within the region in Avisford Nature Reserve. Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. Munghorn Gap is a rugged sandstone plateau which is conducive to this species' requirements. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. Location, nature and extent of habitat removal or modification that would result from proposed action

The proposed transmission line will result in the clearance of habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.5 *Goodenia macbarronii* (Narrow Goodenia)

7.5.1 Description

Goodenia macbarronii is an erect glabrous herb to 30 cm high with a short tap-root and well developed secondary root system. The leaves are thick, narrow-obovate to linear-oblongate 5-11cm long and occur as a flat to semi-erect rosette. It usually flowers between October and March (Harden 1992). It can grow as an annual, with one flowering period, or as a short-lived perennial.

This species is generally found in small, isolated populations in damp sandy to clay/silt soils on the inland foothills of the Great Dividing Range. It tends to grow in clonal colonies in seasonally wet or damp soils within intact vegetation. Its range extends north-east Victoria, through the western slopes and plains of NSW to the Darling Downs in western Queensland (DSE (Vic) 2005).

7.5.2 Conservation status

i. Local

There are 3 records of the *Goodenia macbarronii* within the Mid-Western Regional LGA and no records within Wellington LGA.

The local conservation status of the species is unknown.

ii. Regional

There are 17 records in the NSW Wildlife Atlas database for the *Goodenia macbarronii* across NSW. These records occur mostly within the NSS bioregion and the Brigalow Belt South bioregion. The species is not considered to be at the limits of its range in the study area. Weddin Mountains National Park has one record and Goobang National Park 6 records, both parks occurring within the bioregion (DEC (NSW) 2005a).

The regional conservation status of the species is unknown.

iii. Threatened Species Status

Goodenia macbarronii is listed as VULNERABLE on the schedules of the NSW TSC Act (DEC (NSW) 2004).

This species is listed as VULNERABLE under the EPBC Act.

iv. *Key threatening processes listed under the NSW TSC Act 1995;*

- Clearance of native vegetation;

Threats to this species include:

- European Rabbit grazing and competition;
- Change in fire frequencies; and
- Clearing of native vegetation.

a. Contribution to threatening processes as a result of the proposal.

Most of the affected area is exposed to European Rabbit grazing and competition. The proposal will not result in an increase of this process.

The proposal is not expected to contribute to a change in fire frequencies, and the impact of a change in fire frequency.

Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The species was recorded in Ulan Coal Mine property on the edge of unimproved pasture and creek zone, with pale sandy silty soil. The proposal will result in the clearing and fragmentation of native vegetation. The proposal is expected to contribute to this threatening process.

v. *Threat Abatement Plans*

No Threat Abatement Plans are relevant to the Narrow Goodenia.

a. Relevance to proposal

Not Applicable

vi. *Recovery Plans*

No draft or final Recovery Plans exist for the Narrow Goodenia.

a. Relevance to proposal

Not Applicable

vii. *Habitat requirement*

Preferred habitat of the species is in permanently damp and wet sandy to silty clay soils, within intact vegetation. It is also found on poor skeletal soils and broken rock associated with Cypress Pine, Mugga Ironbark and Narrow leaf Ironbark.

7.5.3 Local and Regional Abundance

i. Local

This species was recorded at 1 location during the recent targeted survey of the subject site by Cumberland Ecology, or by Florasearch during autumn, winter and spring surveys of the study area (Resource Strategies 2005b). There are 4 records of *Goodenia macbarronii* on the Atlas of NSW Wildlife exists within the Mid-Western Regional LGA in Gulgong and no records within Wellington LGA. It has also been found recently in Munghorn Gap NR. These results suggest a low abundance of the species within the locality.

ii. Regional

There are several records of the species within Goobang NP, Weddin Mountains NP, Narra Lake NR and Pillaga NR. The species has also been recently found in Wingen Cemetery. The species is rare and localised by nature, generally occupying a few square metres (DEC (NSW) 2004). These records suggest a low regional abundance.

iii. Populations

a. Distribution of local populations of threatened species recorded from the study area

Populations have been recorded in Gulgong and Munghorn Gap NR. It has also been found in this SIS at the Ulan Coal Mine lands. The species is rare and localised, often occupying a few square metres. It is also often clonal, therefore populations may be easily overestimated.

b. Other populations within the region

Other populations occur within Goobang NP, Weddin Mountains NP, Narra Lake NR, Pillaga NR and Wingen Cemetery. The species has also been recorded in unreserved land in Muswellbrook. {#2697}

c. Long-term security of other habitats

The populations within Munghorn Gap NR, Goobang NP, Weddin Mountain NP, Narra Lake NR, Pillaga NR and Wingen Cemetery provide secure long-term habitats for the species. The security of populations outside this area is not ensured.

d. Significance of subject site in local context

The area of potential habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas of habitat contained within local national parks

and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares.

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as “stepping stones” to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The spread of genetic material is not likely to be impeded by the severance of these corridors due to the retention and replanting of understorey vegetation in the easement where appropriate.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

Population distribution of *Goodenia macbarronii* is isolated. Records only exist in the aforementioned national parks and at the location of tower 91. Known suitable habitat therefore occurs in these areas which comprises an area of approximately 20,000 ha. The location of tower 112 has identical soil and characteristics as tower 91 and would also be suitable habitat for the species.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

National Parks where *Goodenia macbarronii* occurs are not expected to be affected by the proposal, nor the area where tower 91 occurs which contains known habitat. *Goodenia macbarronii* will be susceptible to any land management practices which affect hydrology. Tower 112 pertains suitable habitat characteristics for the species and may be removed as a result of the proposal.

a. **Potential Impacts**

The original location of tower 91 would have disturbed the known habitat for the species at tower 91 in the Ulan Coal Mine Lands. The species is known to grow in intact vegetation

and occur in small isolated patches. The potential impact is the loss of the individual or population at the location

b. Ameliorative measures

The location of tower 91 has been moved to totally avoid the habitat of the Narrow Goodenia.

7.6 *Zieria obcordata*

7.6.1 Description

Zieria obcordata is a multi-stemmed, small rounded shrub up to 0.5m in height with aromatic trifoliate leaves which are opposite and hairy. The upper surfaces are covered in small warts. The central leaflet is flattish, broad-oval to wedge-shaped. The leaf tip is blunt and heart shaped.

The inflorescences are shorter than the leaves, and the inflorescence stalk is hairy. Flowers are arranged singly or in small clusters in the leaf axils, 5-6mm across and petals are white or pale pink. The fruit is a hairy capsule divided into four chambers. This species is endemic to NSW (DEC (NSW) 2005b).

Conservation status

i. Local

The small local population of *Zieria obcordata* occurs in the study area more than 1.5 km north of the Tower 268, at the western end of the proposed transmission line. The local conservation status of the species is unknown.

ii. Regional

One *Zieria obcordata* population occurs near Wellington within the region. There are only five recorded populations of *Zieria obcordata* in NSW. One population occurs near Wellington while the others occur around Bathurst (DEC (NSW) 2005b).

This species is inadequately conserved within the region.

iii. Threatened Species Status

Zieria obcordata is listed as ENDANGERED on Schedule 1 of the TSC Act (NSW Scientific Committee 2004e1). This species is listed as ENDANGERED under the EPBC Act.

This species is listed as ENDANGERED under the EPBC Act.

iv. *Key threatening processes listed under the NSW TSC Act 1995;*

- Clearance of native vegetation

Threats to this species include:

- Weed invasion;
- Clearance of habitat;
- Inappropriate fire management; and
- Stochastic environmental events.

a. Contribution to threatening processes as a result of the proposal

Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland.

v. *Threat Abatement Plans*

No Threat Abatement Plans are relevant to *Zieria obcordata*.

a. Relevance to proposal

Not Applicable

vi. *Recovery Plans*

A draft Recovery Plan exists for *Zieria obcordata*. The objectives of the plan are:

- To determine the status and distribution of *Z. obcordata* across NSW;
- Protect all populations from known and potential threats;
- Ensure there is no loss of the species as a result of human induced disturbance;
- Improved knowledge and understanding of its habitat requirements;
- Establish a viable ex-situ seed bank and
- Encourage co-operation between landholders.

a. Relevance to proposal

Not Applicable

vii. *Habitat requirements*

This species occurs around the base of granite boulders, in crevices between boulders and in eucalypt woodland with an open low shrub understorey on moderately rocky slopes (DEC (NSW) 2005b). It also grows on moderately steep, north to west facing slopes on altitudes of 500-800metres. Soil types are sandy gravelly loams with a substrate of outcropping or exposed granite, and the species has also been described on skeletal soils (DEC (NSW) 2005b).

7.6.2 *Local and Regional Abundance*

i. *Local*

This species was not recorded during the recent targeted survey of the subject site by Cumberland Ecology, or by Florasearch during autumn, winter and spring surveys of the study area (Resource Strategies 2005b). The exact location of the population in the locality has been mapped by DEC. There are 220 plants at a site near Wellington. The local abundance is therefore considered to be moderate.

ii. *Regional*

One small population is known to occur in the region. The species is extremely rare with very low population numbers. No populations exist within conservation reserves. Regional abundance is very low.

iii. *Populations*

a. Distribution of local populations of threatened species recorded from the study area

This species has a geographic range of 110km from Bathurst to Wellington. All recorded populations are from Evans and Wellington LGAs. This known habitat in the study area occurs more than 1.5 km north of Tower 268.

b. Other populations within the region

Zieria obcordata has distribution restricted to the Central Western Slopes and Central tablelands of NSW. At present, 5 separate existing populations are known from two separate locations. No populations have been recorded in this area since Spring 2002 (DEC (NSW) 2005b).

c. Long-term security of other habitats

The security of populations outside this mapped area covered by the draft recovery plan is unknown, and no records occur within nature reserves or conservation areas.

d. Significance of subject site in local context

The area of potential habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas of potential habitat contained within local

national parks and nature reserves. Microhabitat features for this species such as granite boulders, are absent from the subject sites within the narrow range of the Wellington population. Therefore, the subject site is not a significant area in the local context.

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The spread of genetic material is not likely to be impeded by the severance of these corridors due to the retention and replanting of understorey vegetation in the easement where appropriate.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

Zieria obcordata occurs on west to north facing slopes at sites with granite outcropping (DEC (NSW) 2005b). This habitat occurs on lower slopes in the region (NSW NPWS 2003a) and is in a deteriorated condition due to the extensive clearing and agricultural use of the region. Although the known site of the Wellington population has an intact canopy stratum, the site is invaded with the exotic species, Tree of Heaven. This is the only known habitat of *Z. obcordata* in the region.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

This species is not likely to be affected by the proposed plan, and no records of the species were found during a recent survey of the area.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km

easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.7 Stripe-faced Dunnart (*Sminthopsis macroura*)

7.7.1 Description

The Stripe-faced Dunnart is widespread throughout inland central and northern mainland Australia, as well as scattered localities in arid and semi-arid regions. Much of its range lies within areas of highly variable rainfall suggesting fluctuating populations.

The Stripe-faced Dunnart is a marsupial in the Family Dasyuridae. The species is distinguished by its long, fat tail which is about 1.25 times the length of its head and body. A swollen base at the tail often indicates a well-nourished individual (Strahan 1995). A dark stripe runs from between the eyes to between the ears (Strahan 1995).

It occurs in a wide variety of arid to semi-arid habitats, and can be found in low shrublands of saltbush and bluebush, in tussock grassland on clay, sandy or stony soils, in spinifex grassland, *Acacia* shrublands and low, rocky ridges, though appears to favour tussock grasslands (Strahan 1995).

The dunnart is nocturnal, resting by day under shelter or in soil crevices and can become torpid for several hours, particularly during winter. At night it preys upon arthropods, especially termites (Menkhorst and Knight 2001) and possibly small vertebrates. Little is known about breeding in the wild, but it is probably dependant on unpredictable rainfall and consequent resource availability (Strahan 1995). In captivity, breeding occurs between June and February and two litters can be raised per year (Strahan 1995, Maynes and Sharman 1983).

7.7.2 Conservation status

i. Local

There are no records of the Stripe-faced Dunnart within the Wellington and Mid-Western Regional LGAs (DEC (NSW) 2005a). The local conservation status of the species is unknown.

ii. Regional

There are 50 records for the Stripe-faced Dunnart in the NPWS Wildlife Atlas across NSW, the eastern most from the Narrabri district, approximately 300km north-west of the locality (DEC (NSW) 2005a). Previous records are generally north and west of the locality and none occur within NSS bioregion. The record from this SIS is the eastern most record for this species and the sparse distribution and low level of abundance suggests the species is at the limit of its range.

The regional conservation status of the species is unknown, though the species is considered common within its previously known range (Strahan 1995).

iii. Threatened Species Status

The Stripe-faced Dunnart is listed as VULNERABLE on the schedules of the NSW TSC Act (NSW Scientific Committee 2004z). The species is listed because its population has been severely reduced and it faces severe threatening processes.

The species is not listed under the EPBC Act.

iv. Key threatening processes listed under the NSW TSC Act 1995;

- Clearance of native vegetation;

Threats to this species include:

- Feral Cat predation;
- Red Fox predation;
- European Rabbit grazing and competition; and
- Clearing of native vegetation.

a. Contribution to threatening processes as a result of the proposal

- Cats have been recorded in the study area and it is likely that predation by cats would impact upon native mammals. The proposal will not lead to an increase cat

numbers on the subject site and therefore will not increase the impact of cat predation on native mammals.

- A Red Fox has been recorded on the subject site and it is likely that predation by Red Foxes would impact upon native mammals. The proposal will not lead to an increase fox numbers on the subject site and therefore will not increase the impact of fox predation on native mammals.
- European rabbits have been recorded in the study area and it is likely that grazing and competition would impact upon native mammals. The proposal will not lead to an increase in cat numbers on the subject site and therefore will not increase the impact of European rabbit grazing on native mammals.
- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The species was recorded in a lightly wooded area of Yellow Box - White Box woodland, with a mixed native and exotic understorey, including tussock grasses. The proposal will result in the clearing and fragmentation of habitat for this species.

v. *Threat Abatement Plans*

Predation by the Red Fox – Threat Abatement Plan:

Under the Threatened Species Conservation Act, the NSW NPWS produced a threat abatement plan aimed at:

- Reducing the impacts of red foxes on threatened species; and
- Helping conserve biodiversity more generally

a. Relevance to proposal

The Stripe-faced Dunnart is not considered a high priority species to be targeted in fox control methods outlined in the Red Fox Threat Abatement Plan (NSW NPWS 2001)

vi. *Recovery Plans*

No draft or final Recovery Plan exists for the Stripe-faced Dunnart.

a. Relevance to proposal

Not Applicable

vii. Habitat requirements

Preferred habitat of the species is uncertain, but the most dense populations have been found in tussock grasslands (Strahan 1995). It also occurs in low shrublands of saltbush and bluebush, in spinifex grassland, in sparse Acacia shrublands and on low, rocky ridges (Strahan 1995).

7.7.3 Local and Regional Abundance

i. Local

There are no recordings of the Stripe-faced Dunnart within Wellington and Mid-Western Regional LGAs. The record from this SIS is the eastern most record of this species and the only formal record within the NSS bioregion. Local abundance is therefore unknown.

ii. Regional

There are no recordings of the Stripe-faced Dunnart within any of the National Parks or Nature Reserves within the bioregion. Regional abundance is therefore unknown.

iii. Populations

a. Distribution of local populations of threatened species recorded from the study area

The recorded sighting occurred near Tower 207, which has a large patch of woodland, with a tussock grassland understorey and rocky shelters, occurring to the north and less extensively to the south. The distribution of the local population is unknown, but expected to utilise of this large suitable area of habitat.

b. Other populations within the region

There are no other known populations of the species within the region.

c. Long-term security of other habitats

There are no other known habitats within the region. The Stripe-faced Dunnart is known from three other National Parks in NSW including, Willandra NP, Mutawintji NP and Sturt NP. Several other National Parks and Nature Reserves would also provide suitable habitat for this species. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species.

d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature

reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares.

iv. Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)

The proposed transmission line will result in the removal of suitable habitat for the species from one tower location. Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

Where corridors are to be severed, native shrubs and grasses will be planted or retained beneath the transmission line where possible.

v. Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area

This species would forage and nest in woodland/grassland communities. See Section 4.5.2 and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. Location, nature and extent of habitat removal or modification that would result from proposed action

The proposed transmission line will result in the removal of suitable foraging habitat for the Stripe-faced Dunnart through the clearance of vegetation.

a. Potential Impact

The potential impact of this proposal will arise from the minimal removal and fragmentation of habitat. The species prefers tussock grasslands and shrublands, which will not require clearing, however during the construction phase there will be localised disturbance to the grassland in the vicinity of tower 207 where this species was recorded, and some clearing or lopping of taller trees. The impact to the species habitat will be localised and minimal. The immediate surrounding woodland/grassland provides significant habitat at the local scale, which will not be disturbed by construction or maintenance of the proposal.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.8 Squirrel Glider (*Petaurus norfolcensis*)

7.8.1 Description

The Squirrel Glider is distributed over eastern Australia, from north Queensland through eastern NSW to Victoria. The species is found inland as far as the Grampians in Victoria and the Pilliga and the Coonabarabran areas of NSW (NSW NPWS 2002b). Suitable habitat also exists in the River Red Gum Forests and Yellow Box woodlands of the Murray Darling Basin (NSW NPWS 2002b).

The Squirrel Glider commences breeding in August and typically gives birth to two young that remain in the pouch for 70 days. They are then left in the group nest for another 30 days and generally become independent at 7-10 months (Strahan 1995).

The Squirrel Glider feeds at night on sap from trees tapped by the Yellow-bellied Glider, and also takes nectar, pollen and insect material. It appears the gliders are restricted to stands of mixed forest that contain at least one species of winter-flowering Eucalypt or Banksia that can contribute to a reliable, year-round food supply (NSW NPWS 2002b).

7.8.2 Conservation status

i. Local

There are only a few records of this species in the locality. There are some large areas of habitat reserved in national parks where it has been recorded although most of the vegetation in the locality has experienced a high level of disturbance. Due to these clearing activities and relatively young age of regrowth there are only few hollows available for nesting for this species. Even so, the Squirrel Glider is known to occur in the locality and is not at the edge of its distribution (^{NSW NPWS 1999g}). The local conservation status of this species is unknown.

ii. *Regional*

Due to the extensive clearing of woodland areas in this region the available habitat has been greatly reduced. This species occurs from Victoria to Queensland (^{NSW NPWS 1999g}) and is not at the edge of its distribution however it probably has low abundance in the region. It has only been recorded in two of the national parks in the region. The conservation status of the Squirrel Glider is unknown.

iii. *Threatened Species Status*

The Squirrel Glider (*Petaurus norfolcensis*) is listed as VULNERABLE under Schedule 2 of the NSW Threatened Species Conservation Act, 1995.

The species is not listed under the EPBC Act.

iv. *Key threatening processes listed under the NSW TSC Act 1995;*

- Clearance of native vegetation;
- Removal of dead wood and dead trees;
- Predation by feral cats; and
- Predation by the European red fox (*Vulpes vulpes*)

Threats to this species include;

- Clearing and fragmentation of forest habitat;
- Loss of mature and old-growth trees reducing the availability of hollows;
- Loss of nest sites and food resources through frequent fire; and
- Predation by foxes and feral cats.

a. Contribution to threatening processes as a result of the proposal

- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site.
- Due to extensive clearing activities associated with cattle grazing there are a low number of hollowed trees remaining on the subject site. Most of the hollows that do remain are small, providing limited habitat for Squirrel Gliders. The proposal will result in the removal of some of these hollowed trees.

- Cats have been recorded in the study area and it is likely that predation by cats would impact upon native mammals. The proposal will not lead to an increase cat numbers on the subject site and therefore will not increase the impact of cat predation on native mammals.
- A Red Fox has been recorded on the subject site and it is likely that predation by Red Foxes would impact upon native mammals. The proposal will not lead to an increase fox numbers on the subject site and therefore will not increase the impact of fox predation on native mammals.
- The proposal will result in the clearing and fragmentation of habitat for this species.
- Due to the high level of disturbance in the area there are a low number of hollowed trees in the locality. Some of these may be removed as a result of this proposal, however, these trees are still relatively young and do not constitute high quality habitat.
- The proposal will not increase the risk of fire in the study area. In fact, the vegetation management and monitoring will ensure that the risk of high frequency fires will probably decrease.

v. *Threat Abatement Plans*

Predation by the Red Fox – Threat Abatement Plan:

Under the Threatened Species Conservation Act, the NSW NPWS produced a threat abatement plan aimed at:

- Reducing the impacts of red foxes on threatened species; and
- Helping conserve biodiversity more generally

a. Relevance to proposal

The Squirrel Glider is not considered a high priority species to be targeted in fox control methods outlined in the Red Fox Threat Abatement Plan (NSW NPWS 2001).

vi. *Recovery Plans*

No draft or final Recovery Plan exists for the Squirrel Glider.

a. Relevance to proposal

Not applicable

vii. *Habitat requirements*

In coastal areas the Squirrel Glider occupies Blackbutt, Bloodwood and Ironbark Eucalypt forest with heath understorey. Inland the species is found predominantly in Box-Ironbark woodlands and River Red Gum forest. Preservation of remnant vegetation along roadsides and creek and river frontages in cleared pasture may be vital for the future survival of the species. In Queensland the Squirrel Glider occurs in some of the wet areas bordering on rainforest.

It sleeps in tree hollows in a nest of leaves and shredded bark during the day and forages in the canopy at night. They typically live in family groups and require abundant tree-hollows for refuge and nest sites. The gliders are more likely to inhabit mature or old-growth forest because of the abundance of hollows.

7.8.3 Local and Regional Abundance

i. *Local*

No Squirrel Gliders were recorded in the recent fauna surveys by Cumberland Ecology. Only one individual was recorded in twelve survey sites in Autumn and Spring surveys conducted by Mount King Ecological Surveys (Resource Strategies 2005b). Only one animal has been recorded in the DEC Wildlife Atlas with Mid Western Regional and Wellington LGAs. There is only one DEC Wildlife Atlas record of a Squirrel Glider at the Goulburn River National Park and no records from Munghorn Gap Nature Reserve. These records suggest there is a very low abundance of Squirrel Gliders in the locality.

ii. *Regional*

The regional abundance of the Squirrel Glider is unknown. The species has been recorded in several locations within the region although due to habitat fragmentation and clearance of hollow-bearing trees it is unlikely this species occurs in high numbers.

iii. *Populations*

a. Distribution of local populations of threatened species recorded from the study area

Not recorded

b. Other populations within the region

This species has been recorded at the Rock National Park and the Goulburn River National Park. Only one record exists for each area. It is unknown whether these are viable populations.

c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term.

d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares.

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Where corridors are to be severed, native shrubs and grasses will be planted or retained beneath the transmission line where possible. Hollow-bearing trees within the easement will be retained, although the trees will be killed and the crown removed. This will maintain a vegetated movement/sheltered corridor within which woodland birds can travel to interconnected and proximate areas of habitat.

Arboreal mammals are likely to be restricted to movement corridors with continuous vegetation. The revegetation of narrow corridors between proximate patches of woodland will increase connectivity and act as movement corridors for this species. Therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

This species would forage and nest in woodland/forest communities. See Section 4.5.2 and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture. As much of the woodland is regrowth (containing few hollows) and has been highly disturbed by grazing then the habitat to be cleared is not likely to be locally or regionally significant for the Squirrel Glider.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site.

Nesting boxes will be used in adjacent habitat areas and fauna rescue procedures used where necessary. 16 nest boxes are to be erected for this species near towers 56, 83-89, 91-100 and 174-176.

Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.9 Koala (*Phascolarctos cinereus*)

7.9.1 Description

The koala is a large arboreal foliovore that feeds predominantly upon but not only upon eucalypts.

The Koala has a disjunct distribution over much of the eastern portion of Australia from southern Victoria and Adelaide/Kangaroo Island in the south to north-west of Ingham, Queensland in the north. The extent of its range has been reduced probably through clearing of suitable habitat and the outbreak of disease. One of the main strongholds of the species at present is in the far north coast of New South Wales.

Most mating occurs from October to February and one young is born. The young spend five to six months in the pouch (Strahan 1995). Koalas reach sexual maturity at two years of age, however most males do not mate until three to four years of age, as they are generally excluded from mating by the dominant male (Martin and Handasyde 1990, NSW NPWS 1999i).

Koalas spend the majority of their time resting in the forks of trees and are most active in the first few hours following sunset (NSW NPWS 1999i). They live in complex groups and individual animals have overlapping home range areas (Strahan 1995).

7.9.2 Conservation status

i. Local

There are about 20 records of this species in the locality, with a few in Goulburn National park and Munghorn Gap Nature Reserve. It was not recorded in recent surveys in the study area by Cumberland Ecology or Mount King Ecological Surveys (Resource Strategies 2005b). There are some large areas of habitat reserved in national parks where it has been recorded although most of the vegetation in the locality has experienced a high level of disturbance. Due to these clearing activities and highly fragmented nature of the woodland Koalas are not thought to be high numbers. Even so, the Koala is known to occur in the locality and is not at the edge of its distribution (NSW NPWS 1999e). The local conservation status of this species is unknown.

ii. Regional

The conservation status of koalas on the western slopes and plains is unknown although in most areas, clearing and degradation of koala habitat is continuing (NSW NPWS 2003c). Habitat fragmentation is extreme in many parts of this region and numbers are probably continuing to decline outside conservation areas. They are unlikely to be adequately conserved in the region.

iii. *Threatened Species Status*

The Koala (*Phascolarctos cinereus*) is listed as VULNERABLE on Schedule 2 of the TSC Act (NSW Scientific Committee 2004r). The species was listed because:

- Its population and distribution have been severely reduced;
- It faces severe threatening processes;
- It is an ecological specialist (it depends on particular types of diet or habitat); and
- It has poor recovery potential.

The species is not listed under the EPBC Act.

iv. *Key threatening processes listed under the NSW TSC Act 1995;*

The Koala is at threat from the following:

- Clearing of native vegetation;
- High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition; and
- Predation by the Red Fox *Vulpes vulpes*.

Other processes recognised as threatening to Koalas include vehicle injuries/deaths; attacks by dogs, logging, disease and severe weather conditions.

a. Contribution to threatening processes as a result of the proposal

- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site.
- The proposal will not increase the risk of fire in the study area. In fact, the vegetation management and monitoring will ensure that the risk of high frequency fires will probably decrease.
- A Red Fox has been recorded on the subject site and it is likely that predation by Red Foxes would impact upon native mammals. The proposal will not lead to an increase fox numbers on the subject site and therefore will not increase the impact of fox predation on native mammals.

v. *Threat Abatement Plans*

Predation by the Red Fox – Threat Abatement Plan:

Under the Threatened Species Conservation Act, the NSW NPWS produced a threat abatement plan aimed at:

- Reducing the impacts of red foxes on threatened species; and
- Helping conserve biodiversity more generally

a. Relevance to proposal

The Koala is not considered a high priority species to be targeted in fox control methods outlined in the Red Fox Threat Abatement Plan (NSW NPWS 2001).

vi. *Recovery Plans*

A draft Recovery Plan for the Koala has been prepared (NSW NPWS 2003c)

a. Relevance to proposal

Although some potential habitat for the Koala may be removed as a result of the proposal it will not impinge upon the objectives of the draft Recovery Plan for the Koala (NSW NPWS 2003c)The transmission line route design was decided after assessing woodland areas for potential Koala habitat (ERM 2003).

vii. *Habitat requirements*

The natural habitat of the Koala comprises open eucalypt forest and woodland, being less common in forest where the tree canopy is continuous or closed and particularly in areas with more productive soils (Phillips 1990). The species still occurs in some urban areas where sufficient habitat trees remain, however in such areas predation by dogs makes the species vulnerable. The species occurs at greatest concentration in coastal lowlands (Phillips 1990). The suitability of forests or woodland habitats for Koalas is influenced by the tree size and the species present, soil nutrients, climate, rainfall, and the size and disturbance history of the habitat (NSW NPWS 1999i).

Koalas are primarily tree dwellers and feed almost entirely on the foliage of a range of eucalypts. The Koala tends to favour a variety of tree species in the one area utilising different species during different seasons. Koalas have been recorded feeding on over 69 species of eucalypt and almost 30 non-eucalypt species.

7.9.3 Local and Regional Abundance

i. *Local*

No Koalas were recorded in the recent fauna surveys by Cumberland Ecology. Only one individual was recorded in twelve survey sites in Autumn and Spring surveys conducted by Mount King Ecological Surveys (Resource Strategies 2005b). Up to 20 animals have

been recorded in the DEC Wildlife Atlas within the Mid Western Regional and Wellington LGAs. There is one DEC Wildlife Atlas record of a Koala at the Goulburn River National Park and three records from Munghorn Gap Nature Reserve. These records suggest there is a very low abundance of Koalas in the locality.

ii. Regional

The regional abundance of the Koala is unknown although a population of koalas occurs along the Murrumbidgee River at Narrandera (NSW NPWS 2003c) and several have been recorded at Munghorn Gap Nature Reserve. The species has been recorded in several locations within the region although due to habitat fragmentation and clearance of suitable habitat trees it is unlikely this species occurs in high numbers.

iii. Populations

- a. Distribution of local populations of threatened species recorded from the study area

Not recorded

- b. Other populations within the region

A population of Koalas occurs along the Murrumbidgee River at Narrandera (NSW NPWS 2003c)

- c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forests in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term.

- d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares.

iv. Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn

River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as “stepping stones” to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Where corridors are to be severed, native shrubs and grasses will be planted or retained beneath the transmission line where possible. Hollow-bearing trees within the easement will be retained, although the trees will be killed and the crown removed. This will maintain a vegetated movement/sheltered corridor within which woodland birds can travel to interconnected and proximate areas of habitat.

Arboreal mammals are likely to be restricted to movement corridors with continuous vegetation. The revegetation of narrow corridors between proximate patches of woodland will increase connectivity and act as movement corridors for this species. Therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

This species would forage and nest in woodland/forest communities. See Section 4.5.2 and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. **Potential Impact**

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km

easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture. As much of the woodland is regrowth (containing few hollows) and has been highly disturbed by grazing then the habitat to be cleared is not likely to be locally or regionally significant for the Koala.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Fauna rescue procedures used where necessary. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

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

7.10.1 Description

This is a microchiropteran bat with large ears and curly wattles; it has uniform glossy black fur on the back; the belly is washed with brown, usually with a band of bright white fur along the sides of the body.

A combination of relatively short broad wings and low weight ratio is indicative of manoeuvrable flight and an ability to forage for insects below the canopy (Strahan 1995).

Little information is known of the reproductive biology of this species with the current knowledge based on intermittent observation on the Copeton Mine tunnels which has since been flooded (Strahan 1995). The Copeton colony assembled deep in the tunnel in early spring with births taking place in late November and early December. Most females gave birth to two young which are suckled until late January. The colony was seen to disperse during Autumn and Winter. Females are known to give birth at twelve months of age however it is uncertain whether mating occurs in winter or spring (Strahan 1995).

7.10.2 Conservation status

i. Local

There are a moderate number of records of this species within the locality. There are some large areas of habitat reserved in national parks where it has been recorded although most of the vegetation in the locality has experienced a high level of disturbance. Even so, the Large-eared Pied Bat is known to occur in the locality and is not at the edge of its distribution (DEC (NSW) 2005a). The local conservation status of this species is unknown.

ii. Regional

Due to the extensive clearing of woodland areas in this region the available habitat has been greatly reduced. This species occurs from South-eastern Queensland to New South Wales from the coast to the western slopes of the Divide (Churchill 1998) and is not at the edge of its distribution. This species has a moderate abundance in the region. The conservation status of the Large-eared Pied Bat is unknown.

iii. Threatened Species Status

The Large-eared Pied Bat is listed as VULNERABLE on Schedule 2 of the TSC Act. The species was listed because:

- Its population and distribution are suspected to be reduced;
- It faces severe threatening processes;
- It is an ecological specialist (it depends on particular types of diet or habitat); and
- It concentrates (individuals within populations of the species congregate or aggregate at specific locations).

The Large-eared Pied Bat is also listed as VULNERABLE under the EPBC Act, 1999.

iv. Key threatening processes listed under the NSW TSC Act 1995;

a. Key threatening processes listed under the NSW TSC Act 1995;

- Clearance of native vegetation; and
- High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition

This species is at threat from the following:

- Clearing and isolation of forest and woodland habitats near cliffs, caves and old mine workings for agricultural or residential development;
- Loss of foraging habitat close to cliffs, caves and old mine workings from forestry activities and too-frequent burning, usually associated with grazing;
- Damage to roosting and maternity sites from mining operations;
- Disturbance to roosting and maternity sites from recreational caving activities; and
- Use of pesticides (NSW NPWS 2002b).

b. Contribution to threatening processes as a result of the proposal

- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site;
- No mine sites are known to occur on the subject site;
- The proposed transmission line does not occur near cliffs or known mines;
- Fire frequency is not likely to be increased by the proposed transmission line as the maintenance of the transmission line will include the control of combustible materials such as leaf litter; and
- No pesticides will be used for the proposed transmission line.

v. *Threat Abatement Plans*

None are known

a. Relevance to the proposal

Unknown

vi. *Recovery Plans*

None are known from the National Parks division of DEC homepage

a. Relevance to proposal

Unknown

vii. Habitat requirement

It is generally found in drier habitats such as dry sclerophyll forests and woodlands however recent records are from sub-alpine woodland and rainforest edges. The Large-eared Pied Bat is known to utilise daytime roosts including caves, mine tunnels, crevices in cliffs and abandoned bottle-shaped mud nests of Fairy Martins (Strahan 1995, NSW NPWS 2002b). Within known roost caves it has been observed to favour positions close to the entrance which contrasts with most other cave dwelling bats (Strahan 1995). It is likely that this species has specific requirements for roof architecture and microclimate as only a small percentage of the available caves and mine tunnels are used (Australian Museum Business Services 1995). They frequent low to mid elevation dry open forest and woodland close to these features (NSW NPWS 2002b).

7.10.3 Local and Regional Abundance

i. Local

Large-eared Pied Bat was detected at one site and possibly detected at another site during the recent Cumberland Ecology survey. A total of 60 echolocation calls of the Large-eared Pied Bat at 7 sites were recorded during both Spring and Autumn surveys conducted by Greg Richards and Associates (Resource Strategies 2005b). There are less than 20 records of this species in the DEC Wildlife Atlas with Mid Western Regional and Wellington LGAs. These records suggest there is a moderate abundance of Large-eared Pied Bat in the locality.

ii. Regional

There are a moderate number of records of the Large-eared Pied Bat from National Parks and Nature Reserves within the region. There is one DEC Wildlife Atlas record of a Large-eared Pied Bat at the Goulburn River National Park and 9 records from Munghorn Gap Nature Reserve. The moderate number of records from the locality suggests that this may be higher. These records suggest there is a moderate abundance of Large-eared Pied Bat in the region.

iii. Populations

a. Distribution of local populations of threatened species recorded from the study area

Not recorded

b. Other populations within the region

There is only one known population of Large-eared Pied Bat within the region. Records in the region are from 2 locations.

c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forests in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term.

d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares.

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Highly mobile species such as bats are not likely to be restricted to movement corridors with continuous forest/woodland. Areas of habitat in the locality will remain proximate; therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

This species would forage in woodland/forest communities, and may utilize mine site in the locality. See Section 4.5.2 and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture. As much of the woodland is regrowth and has been highly disturbed by grazing then the habitat to be cleared is not likely to be locally or regionally significant for the Large-eared Pied Bat.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Nesting boxes may be used in adjacent habitat areas and fauna rescue procedures used where necessary. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.11 Eastern False Pipistrelle (Falsistrellus tasmaniensis)

7.11.1 Description

This is a large and robust bat; the fur is dark brown to reddish brown on the back with a slightly paler grey belly; the muzzle is slightly haired (Churchill 1998). It is a bat species

that inhabits sclerophyll forests from the Great Dividing Range to the coast in South-eastern Queensland, New South Wales, Victoria and Tasmania (Churchill 1998).

7.11.2 Conservation status

i. Local

There are a low-moderate number of records of this species within the locality. There are some large areas of habitat reserved in national parks where it has been recorded although most of the vegetation in the locality has experienced a high level of disturbance. Due to these clearing activities and relatively young age of regrowth there are only few hollows available for nesting for this species. Even so, the Eastern False Pipistrelle is known to occur in the locality and is not at the edge of its distribution (DEC (NSW) 2005a). The local conservation status of this species is unknown.

ii. Regional

Due to the extensive clearing of woodland areas in this region the available habitat has been greatly reduced. This species occurs from South-eastern Queensland, New South Wales, Victoria and Tasmania (Churchill 1998) and is not at the edge of its distribution. This species is likely to have a low to moderate abundance in the region. The conservation status of the Eastern False Pipistrelle is unknown.

iii. Threatened Species Status

The Eastern False Pipistrelle is listed as VULNERABLE on Schedule 2 of the TSC Act (NSW Scientific Committee 2004j). The NSW Scientific Committee's reasons for listing the species were:

- Its population and distribution are suspected to be reduced;
- It faces severe threatening processes; and
- It is an ecological specialist (it depends on particular types of diet or habitat).

The species is not listed under the EPBC Act.

iv. Key threatening processes listed under the NSW TSC Act 1995;

- Clearance of native vegetation; and
- Removal of dead wood and dead trees;

Threats to this species include:

- Clearing and fragmentation of forest habitat;
 - Loss of mature and old-growth trees reducing the availability of hollows; and
 - Loss of nest sites and food resources through frequent fire.
- a. Contribution to threatening processes as a result of the proposal
- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site;
 - Hollow-bearing trees are infrequent on the site. Few if any old-growth trees with hollows or dead trees and wood will be cleared for the proposed transmission line; and
 - Fire frequency is not likely to be increased by the proposed transmission line as the maintenance of the transmission line will include the control of combustible materials such as leaf litter.

v. *Threat Abatement Plans*

None are known

- a. Relevance to the proposal

Unknown

vi. *Recovery Plans*

None are known from the National Parks division of DEC homepage

- a. Relevance to proposal

Unknown

vii. *Threat Abatement Plans*

None are known

- a. Relevance to the proposal

viii. *Habitat requirement*

The Eastern False Pipistrelle utilises a range of habitats from warm to cool wet to dry sclerophyll forest (Strahan 1995) and rainforest, particularly at high elevations in the

northern part of its range. The species typically roosts in tree hollows in areas of higher rainfall within its range although it is found in Jenolan Caves and in abandoned buildings in other areas. It is thought that some populations hibernate while others may migrate in winter from the hinterlands to the warmer coastal area (Strahan 1995).

7.11.3 Local and Regional Abundance

i. Local

Eastern False Pipistrelle was not detected during the recent Cumberland Ecology survey. A total of 8 echolocation calls of the Eastern False Pipistrelle at 2 sites were recorded during a Spring survey and was not detected during a Autumn survey conducted by Greg Richards and Associates (Resource Strategies 2005b). There are less than 10 records of this species in the DEC Wildlife Atlas with Mid Western Regional and Wellington LGAs. These records suggest there is a low-moderate abundance of Eastern False Pipistrelle in the locality.

ii. Regional

There are a low-moderate number of records of the Eastern False Pipistrelle from National Parks and Nature Reserves within the region. There is only 1 DEC Wildlife Atlas record of an Eastern False Pipistrelle at the Goulburn River National Park, and no records from other National Parks and Nature Reserves in the region. The low-moderate number of records from the locality suggests that this may be higher. These records suggest there is a low abundance of Eastern False Pipistrelle in the region.

iii. Populations

a. Distribution of local populations of threatened species recorded from the study area

This species was recorded at 2 sites by Greg Richards in the study area, although it is assumed that they are from the same population due to the large range and mobility of this species.

b. Other populations within the region

There is only one known population of Eastern False Pipistrelle within the region. Records in the region are from 1 location.

c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant

areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term.

d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares.

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line route will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Highly mobile species such as bats are not likely to be restricted to movement corridors with continuous forest/woodland. Areas of habitat in the locality will remain proximate; therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region*

This species would forage and roost in woodland/forest communities. See Section 4.5.2 and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. *Potential Impact*

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture. As much of the woodland is regrowth (containing few hollows) and has been highly disturbed by grazing then the habitat to be cleared is not likely to be locally or regionally significant for the Eastern False Pipistrelle.

b. *Ameliorative measures*

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site.

Nesting boxes will be used in adjacent habitat areas and fauna rescue procedures used where necessary. 16 nest boxes are to be erected for this species (and other microchiropteran bats) near towers 56, 83-89, 91-100 and 174-176.

Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

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

7.12.1 Description

According to descriptions by Churchill, this ubiquitous microchiropteran bat has dark reddish-brown to dark brown fur on the back; slightly lighter on the body. It has a distinctly short muzzle and domed head; the ears are short, rounded and roughly triangular (Churchill 1998).

Eastern Bent-wing Bats are found in eastern Australia, from north Queensland to far southeast South Australia. In NSW they are found from the coast to the western slopes, including high elevations of the Great Divide (NSW NPWS 2002b).

In early spring, females of a population form a nursing colony and travel from numerous widely scattered roost sites to specific nursery caves that provide the high temperature and humidity requirements for raising their young. These nursery caves are highly significant (NSW NPWS 2002b). This species has the unique ability during hibernation for delayed implantation of a fertilised egg. The capacity for delayed implantation enables mating over a long period whilst the timing of the birth is relatively fixed, usually in December (Strahan 1995).

7.12.2 Conservation status

i. Local

There are a moderate-high number of records of this species within the locality. There are some large areas of habitat reserved in national parks where it has been recorded although most of the vegetation in the locality has experienced a high level of disturbance. Even so, the Eastern Bent-wing Bat is known to occur in the locality and is not at the edge of its distribution (DEC (NSW) 2005a). The local conservation status of this species is unknown.

ii. Regional

Due to the extensive clearing of woodland areas in this region the available habitat has been greatly reduced. This species occurs close to the coast from North Queensland, New South Wales, Victoria and the south-eastern corner of South Australia (Churchill 1998) and is not at the edge of its distribution. This species is likely to have a moderate abundance in the region as they occur to the south of the Divide. The conservation status of the Eastern Bent-wing Bat is unknown.

iii. Threatened Species Status

The Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*) is listed as VULNERABLE on Schedule 2 of the TSC Act (NSW Scientific Committee 2004h). The species was listed because:

- Its population has been reduced to a critical level, but is suspected to be stable;
- It faces severe threatening processes;
- It is an ecological specialist (it depends on particular types of diet or habitat); and

- It concentrates (individuals within populations of the species congregate or aggregate at specific locations).

The species is not listed under the EPBC Act.

iv. *Key threatening processes listed under the NSW TSC Act 1995;*

- Clearance of native vegetation

Threats to this species include:

- Disturbance of colonies, especially in nursery or hibernating caves, may be catastrophic;
- Destruction or modification of caves that are seasonal or potential roosting sites;
- Rehabilitation of derelict mines;
- Changes to forest habitat, especially surrounding maternity caves; and
- Insecticide use (NSW NPWS 2002b).

a. Contribution to threatening processes as a result of the proposal

- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site;
- No mine sites or cave are known to occur on the subject site;
- The forest to be cleared is not known to surround any mine or cave sites which are suitable Bentwing-bat habitat; and
- No insecticides will be used for the proposed transmission line.

v. *Threat Abatement Plans*

None are known

a. Relevance to the proposal

Unknown

vi. *Recovery Plans*

None are known from the National Parks division of DEC homepage

a. Relevance to proposal

Unknown

vii. *Threat Abatement Plans*

None are known

a. Relevance to the proposal

viii. *Habitat requirement*

The habitats utilised by this species are diverse; ranging from tropical to cool-temperate wet and dry sclerophyll forest to open habitats and woodland. Roosting occurs in caves or tunnels with highly specific environmental requirements for nursing young (Strahan 1995). They live in colonies and roost in caves, old mines, storm-water channels and occasionally buildings. Regional movements can be as great as several hundred kilometres.

The Eastern Bent-wing Bat is insectivorous and is typically found hunting for small insects above the canopy in well timbered valleys (Strahan 1995).

7.12.3 Local and Regional Abundance

i. *Local*

Eastern Bentwing-bat was detected at one site, probably detected at five sites and possibly detected at two sites during the recent Cumberland Ecology survey. A total of over 600 echolocation calls of the Eastern Bentwing-bat at 18 sites were recorded during an Autumn and Spring survey conducted by Greg Richards and Associates (Resource Strategies 2005b). There are 6 records of this species in the DEC Wildlife Atlas with Mid Western Regional and Wellington LGAs. These records suggest there is a moderate-high abundance of Eastern Bentwing-bat in the locality.

ii. *Regional*

There are a low number of records of the Eastern Bentwing-bat from National Parks and Nature Reserves within the region. There is only 1 DEC Wildlife Atlas record of an Eastern Bentwing-bat at the Goulburn River National Park, and 1 record from Munghorn Gap Nature Reserve. The moderate-high number of records from the locality suggests that this may be higher. These records suggest there is a moderate abundance of Eastern Bentwing-bat in the region.

iii. *Populations*

- a. Distribution of local populations of threatened species recorded from the study area

This species was recorded at 8 locations in the study area and 18 sites by Greg Richards; although it is assumed that they are from the same population due to the large range and mobility of this species.

- b. Other populations within the region

There is only one known population of Eastern Bentwing-bat within the region.

- c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term.

- d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares.

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring

between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Highly mobile species such as bats are not likely to be restricted to movement corridors with continuous forest/woodland. Areas of habitat in the locality will remain proximate; therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region*

This species would forage in woodland/forest communities. See Section 4.5.2 and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture. As much of the woodland is regrowth and has been highly disturbed by grazing then the habitat to be cleared is not likely to be locally or regionally significant for the Eastern Bentwing-bat.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Nesting boxes may be used in adjacent habitat areas and fauna rescue procedures used where necessary. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.13 Little Bentwing-bat (*Miniopterus australis*)

7.13.1 Description

This is a microchiropteran bat that has uniform chocolate-brown on the back; slightly lighter fur on the belly; distinctly domed head; ears are short, rounded and roughly triangular

The Little Bent-wing Bat occurs over most of the eastern and north eastern coastal zone of Australia, its distribution becoming increasingly restricted towards the coast in the southern limit of its range in New South Wales.

Like the Eastern Bent-wing Bat, the Little Bent-wing Bat is dependent upon specific nursery sites to rear its young (Strahan 1995). The Little Bent-wing Bat mates around August with pregnant females congregating soon after in specific nursery caves. Such caves are often shared with the Common Bent-wing Bat. In December the female gives birth to one young (Strahan 1995) which is abandoned by its mother at night and left clinging to cave walls, packed together with other young in huge pink masses. The temperature of the nursery may reach 37°C, which is uncomfortable for the adult bats who move to cooler areas near the cave entrance (Strahan 1995).

The species is insectivorous, favouring well timbered habitats for foraging both above and below the canopy (Strahan 1995).

7.13.2 Conservation status

i. Local

There are a low-moderate number of records of this species within the locality. There are some large areas of habitat reserved in national parks where it has been recorded although most of the vegetation in the locality has experienced a high level of disturbance. Even so, the Little Bent-wing Bat is known to occur in the locality and is not at the edge of its distribution (DEC (NSW) 2005a). The local conservation status of this species is unknown.

ii. Regional

Due to the extensive clearing of woodland areas in this region the available habitat has been greatly reduced. This species occurs from Cape York south through coastal eastern Queensland to the Central Coast of NSW (NSW NPWS 2005), and is not at the edge of its distribution. This species is likely to have a low abundance in the region as they generally occur to the east of the Divide closer to the coast and further north. The conservation status of the Little Bent-wing Bat is unknown.

iii. *Threatened Species Status*

The Little Bent-wing Bat (*Miniopterus australis*) is listed as VULNERABLE on Schedule 2 of the TSC Act (NSW Scientific Committee 2004s). The species was listed because:

- Its population has been reduced, but is suspected to be stable;
- It faces severe threatening processes;
- It is an ecological specialist (it depends on particular types of diet or habitat); and
- It concentrates (individuals within populations of the species congregate or aggregate at specific locations) (NSW Scientific Committee 2004s).

The species is not listed under the EPBC Act.

iv. *Key threatening processes listed under the NSW TSC Act 1995;*

- Clearance of native vegetation

Threats to this species include:

- Disturbance of colonies, especially in nursery or hibernating caves, may be catastrophic;
- Destruction of caves that provide roosting sites or potential roosting sites;
- Changes to habitat, especially surrounding maternity caves; and
- Use of pesticides (NSW NPWS 2002b).

a. Contribution to threatening processes as a result of the proposal

- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site;
- No mine sites or cave are known to occur on the subject site;
- The forest to be cleared is not known to surround any mine or cave sites which are suitable Bentwing-bat habitat; and
- No pesticides will be used for the proposed transmission line.

v. *Threat Abatement Plans*

None are known

a. Relevance to the proposal

Unknown

vi. *Recovery Plans*

None are known from the National Parks division of DEC homepage

a. Relevance to proposal

Unknown

vii. *Threat Abatement Plans*

None are known

a. Relevance to the proposal

viii. *Habitat requirements*

This species forages in well timbered habitats including rainforest, dense coastal Banksia scrub, Melaleuca swamps and dry sclerophyll forests roosting during the day in caves and tunnels (Strahan 1995). The Little Bent-wing Bat has specific requirements for its choice of maternity roosts in terms of humidity and temperature fluctuations. These roost sites are often shared with the Eastern Bent-wing Bat however the Little Bent-wing Bat is more limited to caves which are associated with dense forests (Gilmore and Parnaby 1994).

7.13.3 Local and Regional Abundance

i. *Local*

Little Bentwing-bat was not detected during the recent Cumberland Ecology survey. A total of over 200 echolocation calls of the Little Bentwing-bat at 10 sites were recorded during an Autumn and Spring survey conducted by Greg Richards and Associates (Resource Strategies 2005b). There are no records of this species in the DEC Wildlife Atlas with Mid Western Regional and Wellington LGAs. These records suggest there is a moderate abundance of Little Bentwing-bat in the locality.

ii. *Regional*

There are no records of the Little Bentwing-bat from National Parks and Nature Reserves within the region. The moderate number of records from the locality suggests that this may be higher. These records suggest there is a low-moderate abundance of Little Bentwing-bat in the region.

iii. *Populations*

- a. Distribution of local populations of threatened species recorded from the study area

This species was recorded at 10 sites in the study area, although it is assumed that they are from the same population due to the large range and mobility of this species.

- b. Other populations within the region

There is potentially one population of Little Bentwing-bats within the region.

- c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term.

- d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares.

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower

numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Highly mobile species such as bats are not likely to be restricted to movement corridors with continuous forest/woodland. Areas of habitat in the locality will remain proximate; therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

This species would forage in woodland/forest communities. See Section 4.5.2 and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture. As much of the woodland is regrowth and has been highly disturbed by grazing then the habitat to be cleared is not likely to be locally or regionally significant for the Little Bentwing-bat.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Nesting boxes may be used in adjacent habitat areas and fauna rescue procedures used where necessary. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.14 Eastern Freetail-bat (*Mormopterus norfolkensis*)

7.14.1 Description

This is a microchiropteran bat with dark brown to reddish brown fur on the back; slightly lighter fur on the belly, with pale bases and hairs (Churchill 1998). It is distinguished from Beccari's Freetail-bat by its longer fur and lighter build.

Most records for the Eastern Freetail-bat originate from dry eucalypt forest and woodland east of the Great Dividing Range, mainly from southern New South Wales to south east Queensland (Strahan 1995). However some confusion exists with this species and other little freetail-bats as no adequate taxonomic description has been carried out (Australian Museum Business Services 1995). Virtually nothing is known of the biology of this distinctive species; therefore very few records have been authenticated and some records may be from other species whose distribution overlaps. Current confusion about the identification of this species has caused uncertainty regarding its habitat and distribution (NSW NPWS 2002b).

No information is available on the diet and foraging of this species except that it hunts insects above the forest canopy or in clearings at the edge of the forest (Strahan 1995).

Little is known of its reproductive cycle but suggestion is made that sexes separate at certain times of the year, perhaps for birth and raising of young (Strahan 1995). A single young is born in summer.

7.14.2 Conservation status

i. Local

There are a low-moderate number of records of this species within the locality. There are some large areas of habitat reserved in national parks where it has been recorded although most of the vegetation in the locality has experienced a high level of disturbance. Due to these clearing activities and relatively young age of regrowth there are only few hollows available for roosting for this species. Even so, the Eastern Freetail-bat is not known to occur in the locality however, the subject site it is not at the edge of its distribution (DEC (NSW) 2005a). The local conservation status of this species is unknown.

ii. Regional

Due to the extensive clearing of woodland areas in this region the available habitat has been greatly reduced. This species occurs along the east coast of New South Wales from south of Sydney extending north into south-eastern Queensland (Churchill 1998), and is not at the edge of its distribution. This species is likely to have a low abundance in the region as they generally occur much closer to the coast. The conservation status of the Eastern Freetail-bat is unknown.

iii. *Threatened Species Status*

The Eastern Freetail-bat (*Mormopterus norfolkensis*) is listed as VULNERABLE on Schedule 2 of the TSC Act (NSW Scientific Committee 2004k). The species was listed because:

- Its population and distribution are suspected to be reduced;
- It faces moderate threatening processes ; and
- It is an ecological specialist (it depends on particular types of diet or habitat).

The species is not listed under the EPBC Act.

iv. *Key threatening processes listed under the NSW TSC Act 1995;*

- Clearance of native vegetation

Threats to this species include:

- Loss of mature hollow-bearing trees and changes to the structure of forests and woodlands that would lead to fewer such trees in the future.
- Clearing of forest and woodland habitat for agricultural, residential and infrastructure development; and
- Use of pesticides.

a. Contribution to threatening processes as a result of the proposal

- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site;
- Hollow-bearing trees are infrequent on the site. Few if any old-growth trees with hollows or dead trees and wood will be cleared for the proposed transmission line; and
- No pesticides will be used for the proposed transmission line.

v. *Threat Abatement Plans*

None are known

a. Relevance to the proposal

Unknown

vi. *Recovery Plans*

None are known from the National Parks division of DEC homepage

a. *Relevance to proposal*

Unknown

vii. *Threat Abatement Plans*

None are known

a. *Relevance to the proposal*

Unknown

viii. *Habitat requirements*

The Eastern Freetail-bat is likely to utilise habitats ranging from warm temperate to subtropical sclerophyll forest and woodlands. The roost information from the few recorded are from small colonies found in tree hollows and under loose bark (Australian Museum Business Services 1995). Forest and woodland habitats in the study area have been subject to logging, partial clearing and other disturbances but nevertheless are in relatively good condition to support bat species. Logging has impacted the age structure of these habitats by removing some of the old growth, but trees with hollows are still scattered throughout these areas.

7.14.3 Local and Regional Abundance

i. *Local*

Eastern Freetail-bat was not detected during the recent Cumberland Ecology survey. A total of 60 echolocation calls of the Eastern Freetail-bat at 5 sites were recorded for Autumn and Spring surveys conducted by Greg Richards and Associates (Resource Strategies 2005b). There are no records of this species in the DEC Wildlife Atlas with Mid Western Regional and Wellington LGAs. These records suggest there is a low-moderate abundance of Eastern Freetail-bat in the locality.

ii. *Regional*

There are no records of the Eastern Freetail-bat from National Parks and Nature Reserves within the region. The moderate number of records from the locality suggests that this may be higher. These records suggest there is a low abundance of Eastern Freetail-bat in the region.

iii. *Populations*

- a. Distribution of local populations of threatened species recorded from the study area

This species was recorded at 5 sites in the study area, although it is assumed that they are from the same population due to the large range and mobility of this species.

- b. Other populations within the region

There is only one known population of Eastern Freetail-bat within the region.

- c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term.

- d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares.

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower

numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Highly mobile species such as bats are not likely to be restricted to movement corridors with continuous forest/woodland. Areas of habitat in the locality will remain proximate; therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region or study area*

This species would forage in woodland/forest communities. See Section 4.5.2 and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture. As much of the woodland is regrowth (containing few hollows) and has been highly disturbed by grazing then the habitat to be cleared is not likely to be locally or regionally significant for the Eastern Freetail-bat.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site.

Nesting boxes will be used in adjacent habitat areas and fauna rescue procedures used where necessary. 16 nest boxes are to be erected for this species (and other microchiropteran bats) near towers 56, 83-89, 91-100 and 174-176.

Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and

Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.15 Greater Long-eared Bat (*Nyctophilus timoriensis*)

Note: This species common name under the final determination is Eastern Long-eared Bat. It is more commonly known as the Greater Long-eared Bat and as such this latter terminology has been used in this SIS.

7.15.1 Description

The Greater Long-eared Bat has dark grey-brown fur, a low ridge on the muzzle with a shallow vertical groove. It can be confused with the similar but smaller *Nyctophilus gouldii*. It has a broad range and is found within various habitats within mainland Australia and Tasmania.

7.15.2 Conservation status

i. Local

There are a moderate number of records of this species within the locality. There are some large areas of habitat reserved in national parks where it has been recorded although most of the vegetation in the locality has experienced a high level of disturbance. Due to these clearing activities and relatively young age of regrowth there are only few hollows available for roosting for this species. Even so, the Greater Long-eared Bat is known to occur in the locality and it is not at the edge of its distribution (DEC (NSW) 2005a). The local conservation status of this species is unknown.

ii. Regional

Due to the extensive clearing of woodland areas in this region the available habitat has been greatly reduced. This species occurs across southern mainland Australia and north – eastern Tasmania (Churchill 1998) and is not at the edge of its distribution. This species is likely to have a low abundance in the region. The conservation status of the Greater Long-eared Bat is unknown.

iii. Threatened Species Status

The Greater Long-eared Bat (*Nyctophilus timoriensis*) is listed as VULNERABLE on the schedules of the NSW Threatened Species Conservation Act (NSW Scientific Committee 2004I). The species was listed because:

- Its population and distribution are suspected to be reduced;
- It faces severe threatening processes; and
- It is an ecological specialist (it depends on particular types of diet or habitat)

The species is not listed under the EPBC Act.

iv. Key threatening processes listed under the NSW TSC Act 1995;

- Clearance of native vegetation; and
- Removal of dead wood and dead trees;

Threats to this species include:

- Clearing and fragmentation of forest habitat;
- Loss of mature and old-growth trees reducing the availability of hollows; and
- The use of pesticides.

a. Contribution to threatening processes as a result of the proposal

- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site;
- Hollow-bearing trees are infrequent on the site. Few if any old-growth trees with hollows or dead trees and wood will be cleared for the proposed transmission line; and
- No pesticides will be used for the proposed transmission line.

v. Threat Abatement Plans

None are known

a. Relevance to the proposal

Unknown

vi. Recovery Plans

None are known from the National Parks division of DEC homepage

a. Relevance to proposal

Unknown

vii. *Threat Abatement Plans*

None are known

a. Relevance to the proposal

Unknown.

viii. *Habitat requirements*

On the mainland of Australia they can be found in tall eucalypt forests as well as mallee, open savannah and Black box woodland (Churchill 1998). It feeds on moths and beetles. Favoured hunting areas are over water bodies such as dams, in arid habitats (Strahan 1995).

Roost sites include tree hollows, fissures in branches, and under dried sheets of bark attached to the tree (Churchill 1998).

7.15.3 Local and Regional Abundance

i. *Local*

Long-eared Bats (*Nyctophilus* species) which may have been/or included *N. timoriensis*, was detected at 3 sites and possibly detected at 3 other sites during the recent Cumberland Ecology survey. Two *Nyctophilus* species were recorded for Autumn and Spring surveys conducted by Greg Richards and Associates (Resource Strategies 2005b), although not confirmed as *N. timoriensis*. There are less than 10 records of this species in the DEC Wildlife Atlas with Mid Western Regional and Wellington LGAs. This number of records suggests there is a moderate abundance of Greater Long-eared Bat in the locality.

ii. *Regional*

There are a no records of the Greater Long-eared Bat from National Parks and Nature Reserves within the region. The potential records from the locality suggest that this may be higher. These records suggest there may be a low abundance of Greater Long-eared Bat in the region.

iii. *Populations*

- a. Distribution of local populations of threatened species recorded from the study area

This species may have been recorded at 6 locations in the study area, although it is assumed that they would likely be from the same population due to the large range and mobility of this species.

- b. Other populations within the region

There is only one known population of Greater Long-eared Bat within the region.

- c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term.

- d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares.

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring

between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Highly mobile species such as bats are not likely to be restricted to movement corridors with continuous forest/woodland. Areas of habitat in the locality will remain proximate; therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region or study area*

This species would forage and roost in woodland/forest communities. See Section 4.5.2 and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture. As much of the woodland is regrowth and has been highly disturbed by grazing then the habitat to be cleared is not likely to be locally or regionally significant for the Greater Long-eared Bat.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site.

Nesting boxes will be used in adjacent habitat areas and fauna rescue procedures used where necessary. 16 nest boxes are to be erected for this species (and other microchiropteran bats) near towers 56, 83-89, 91-100 and 174-176.

Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.16 Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*)

7.16.1 Description

This is a large species of microchiropteran bat that is characterised by rich shiny black fur on the back and contrasting bright white or yellow fur on the belly (Churchill 1998).

7.16.2 Conservation status

i. Local

There are a moderate-high number of records of this species within the locality. There are some large areas of habitat reserved in national parks where it has been recorded although most of the vegetation in the locality has experienced a high level of disturbance. Due to these clearing activities and relatively young age of regrowth there are only few hollows available for roosting for this species. Even so, the Yellow-bellied Sheath-tail Bat is known to occur in the locality and it is not at the edge of its distribution (DEC (NSW) 2005a). The local conservation status of this species is unknown.

ii. Regional

Due to the extensive clearing of woodland areas in this region the available habitat has been greatly reduced. This species occurs through tropical Australia extending into south-eastern Australia (Churchill 1998) and is not at the edge of its distribution. This species is likely to have a high abundance in the region. The conservation status of the Yellow-bellied Sheath-tail Bat is unknown.

iii. Threatened Species Status

The Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*) is listed as VULNERABLE on Schedule 2 of the TSC Act (NSW Scientific Committee 2004d1). The species was listed because:

- Its population is suspected to have been reduced; and
- It is an ecological specialist (it depends on particular types of diet or habitat).

The species is not listed under the EPBC Act.

iv. Key threatening processes listed under the NSW TSC Act 1995;

- Clearance of native vegetation; and
- Removal of dead wood and dead trees;

Threats to this species include:

- Clearing and fragmentation of forest and woodland habitat;
 - Loss of mature hollow-bearing trees and changes to the structure of forests and woodlands that would lead to fewer such trees in the future; and
 - Use of pesticides (NSW NPWS 2002b).
- a. Contribution to threatening processes as a result of the proposal
- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site;
 - Hollow-bearing trees are infrequent on the site. Few if any old-growth trees with hollows or dead trees and wood will be cleared for the proposed transmission line; and
 - No pesticides are known to be used for the proposed transmission line.

v. Threat Abatement Plans

None are known

a. Relevance to the proposal

Unknown

vi. Recovery Plans

None are known from the National Parks division of DEC homepage

a. Relevance to proposal

Unknown

vii. Threat Abatement Plans

None are known

a. Relevance to the proposal

Unknown

viii. Habitat requirements

The Yellow-bellied Sheathtail Bat utilises tropical to cool temperate rainforest to woodland and open country. It usually forages high above the forest canopy but in mallee or open areas it feeds lower to the ground. This species has been found to roost in tree hollows and has been recorded in the abandoned nests of Sugar Gliders (Strahan 1995).

7.16.3 Local and Regional Abundance

i. Local

Yellow-bellied Sheathtail Bat was detected at 1 site during the recent Cumberland Ecology survey. A total of 96 echolocation calls of the Yellow-bellied Sheathtail Bat at 17 sites were recorded for Autumn and Spring surveys conducted by Greg Richards and Associates (Resource Strategies 2005b). There are no records of this species in the DEC Wildlife Atlas with Mid Western Regional and Wellington LGAs. This number of records suggests there is a moderate-high abundance of Yellow-bellied Sheathtail Bat in the locality.

ii. Regional

There are a no records of the Yellow-bellied Sheathtail Bat from National Parks and Nature Reserves within the region. The moderate-high number of records from the locality suggests that this may be higher. These records suggest there may be a moderate abundance of Yellow-bellied Sheathtail Bat in the region.

iii. Populations

a. Distribution of local populations of threatened species recorded from the study area

This species recorded at 18 locations in the study area; however, it is assumed that they are from the same population due to the large range and mobility of this species.

b. Other populations within the region

There is possibly only one known population of Yellow-bellied Sheathtail Bat within the region.

c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term.

d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares.

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Highly mobile species such as bats are not likely to be restricted to movement corridors with continuous forest/woodland. Areas of habitat in the locality will remain proximate; therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region or study area*

This species would forage and roost in woodland/forest communities. See Section 4.5.2 and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture. As much of the woodland is regrowth and has been highly disturbed by grazing (and generally lack hollows) then the habitat to be cleared is not likely to be locally or regionally significant for the Yellow-bellied Sheath-tail Bat.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site.

Nesting boxes will be used in adjacent habitat areas and fauna rescue procedures used where necessary. 16 nest boxes are to be erected for this species (and other microchiropteran bats) near towers 56, 83-89, 91-100 and 174-176.

Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.17 Glossy Black Cockatoo (*Calyptorhynchus lathamī*)

7.17.1 Description

The Glossy Black Cockatoo is sparsely distributed along the east coast and immediately inland from western Victoria to Rockhampton in Queensland (Crome and Shields 1992). Isolated populations of the species inhabit King Island in Bass Strait and Kangaroo Island off the coast of South Australia (Schodde and Tidemann 1986).

7.17.2 Conservation status

i. Local

There are several records of this species in the locality. There are some large areas of habitat reserved in national parks where it has been recorded although most of the vegetation in the locality has experienced a high level of disturbance. Due to these clearing activities and relatively young age of regrowth there are only few hollows available for nesting for this species. Clearing would have also removed a large proportion of the feed trees (casuarinas). Even so, the Glossy Black Cockatoo is known to occur in the locality and is not at the edge of its distribution (NSW NPWS 1999d). The local conservation status of this species is unknown.

ii. Regional

Due to the extensive clearing of woodland areas in this region, the available habitat has been greatly reduced. This species occurs from western Victoria to Rockhampton (NSW NPWS 1999d) and is not at the edge of its distribution however it probably has low abundance in the region. The conservation status of the Glossy Black Cockatoo is unknown but it is unlikely this species is well represented in the region.

iii. Threatened Species Status

The Glossy Black Cockatoo (*Calyptorhynchus lathamī*) is listed as VULNERABLE on Schedule 2 of the TSC Act (NSW Scientific Committee 2004o). The species was listed because:

- Its population has been severely reduced;
- It is an ecological specialist (it depends on particular types of diet or habitat); and
- It has poor recovery potential (NSW Scientific Committee 2004o).

This species is listed as ENDANGERED under the EPBC Act.

iv. *Key threatening processes listed under the NSW TSC Act 1995;*

The Glossy Black Cockatoo is at threat from the following:

- Reduction of suitable habitat through clearing for agriculture or development;
- Loss of tree hollows;
- Too-frequent fire which reduces the abundance and recovery of she-oaks; and
- Illegal bird smuggling and egg collecting (NSW NPWS 1999d)

a. Contribution to threatening processes as a result of the proposal

- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site.
- Due to extensive clearing activities associated with cattle grazing there are a low number of hollowed trees remaining on the subject site. Most of the hollows that do remain are small, providing limited habitat for Glossy Black Cockatoo. The proposal will result in the removal of some of these hollowed trees.
- The proposal will not increase the risk of fire in the study area. In fact, the vegetation management and monitoring will ensure that the risk of high frequency fires will probably decrease
- There is no reason why the proposal would increase illegal bird smuggling and collecting. This is not a residential development or a development that would lead to an increase level of access to breeding areas by the public.

v. *Threat Abatement Plans*

None available

a. Relevance to proposal

Not applicable

vi. *Recovery Plans*

None available

a. Relevance to proposal

Not applicable

vii. *Habitat requirements*

The Glossy Black Cockatoo characteristically inhabits forests on sites with low soil-nutrients, reflecting the distribution of key *Allocasuarina* spp, predominantly Forest Oak (*Allocasuarina torulosa*) and Black She-oak (*Allocasuarina littoralis*) in eastern populations (NSW NPWS 1999d)The species requires large tree hollows for nesting (NSW NPWS 2002b).

7.17.3 Local and Regional Abundance

i. *Local*

Glossy Black Cockatoos were recorded in the recent fauna surveys by Cumberland Ecology at three different sites. Two pairs (although thought to be the same pair) were recorded in Autumn and Spring surveys conducted by Mount King Ecological Surveys (Resource Strategies 2005b). Up to 50 animals have been recorded in the DEC Wildlife Atlas with Mid Western Regional and Wellington LGAs. Seventeen records exist for this species from the Goulburn River National Park, although none exist for the Munghorn Gap Nature Reserve. Both parks are likely to provide some habitat for this species in the locality. These records suggest there is a moderate abundance of Glossy Black-Cockatoos in the locality.

ii. *Regional*

This region has been intensively cleared and the remaining woodland is highly fragmented. This has lead to a decline in bird populations. This disturbance to habitat means that it is unlikely that this species has a high abundance in the region.

iii. *Populations*

a. Distribution of local populations of threatened species recorded from the study area

At least three Glossy Black Cockatoos were recorded on the subject site. No information is available on the distribution of the population of which these animals are a part.

b. Other populations within the region

There are no DEC records of this species in any other national park in the region other than Munghorn Gap Nature Reserve.

c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant

areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term. Protection and enhancement of woodland fragments that occur outside the National Parks is also necessary to prevent continued loss of woodland birds (NSW NPWS 2003d).

d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares. The proposal will result in a further fragmentation of the woodland in this study area and as such it is possible that the woodland bird declines witnessed in this region will continue.

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Highly mobile species such as large birds are not likely to be restricted to movement corridors with continuous forest/woodland. Areas of habitat in the locality will remain proximate; therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

This species would forage and nest in woodland/forest communities. See Section 4.5.2 and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture. As much of the woodland is regrowth (containing few hollows) and has been highly disturbed by grazing then the habitat to be cleared is not likely to be locally or regionally significant for the Glossy Black Cockatoo.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site.

Nesting boxes will be used in adjacent habitat areas and fauna rescue procedures used where necessary. 16 nest boxes are to be erected for this species near towers 56, 83-89, 91-100 and 174-176.

Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.18 Brown Treecreeper (*Climacteris picumnus victoriae*)

7.18.1 Description

The range of the Brown Treecreeper extends from the Bunya Mountains in the north along the sub-coastal environments and the western slopes of the Great Dividing Range as far south as the Grampians in western Victoria (NSW Scientific Committee 2004e). It is sparsely scattered to the east of the Divide in drier areas such as the Cumberland Plain of Western Sydney, and in parts of the Hunter, Clarence, Richmond and Snowy River valleys.

The western boundary of the range of *Climacteris picumnus victoriae* runs approximately through Wagga Wagga, Temora, Forbes, Dubbo and Inverell and along this line the subspecies intergrades with the arid zone subspecies of Brown Treecreeper *Climacteris picumnus picumnus* (Schodde and Mason 1999).

It is sedentary and nests in tree hollows within permanent territories, breeding in pairs or communally in small groups (NSW Scientific Committee 2004e). The usual clutch size is 2-3 (Garnett and Crowley 2000).

7.18.2 1.1.2 Conservation status

i. Local

The Brown Treecreeper has not been recorded in the locality by DEC. Cumberland Ecology not detect this species but Mount King Ecological Surveys detected it in reasonable numbers. Mount King Ecological Surveys recorded 15 animals at eight sites. Small woodland birds are highly dependent on remnant, continuous areas of habitat in the locality. There is more habitat available in the study area than in other parts of the region but it is still unlikely that this species is adequately reserved in the locality.

ii. Regional

The Brown Treecreeper has been recorded in eleven national parks within the region in moderate abundance. The Brown Treecreeper may potentially utilise a high proportion of the habitat in the national parks in the region (approximately 97,00ha of habitat). Even so this only constitutes approximately 1% of the entire region. Like other woodland birds, this species has suffered from habitat clearance and fragmentation and it is unlikely that this species is adequately reserved in the region. In fact, it is likely that this species continues to decline in the region.

iii. *Threatened Species Status*

The Brown Treecreeper (eastern subspecies) is listed as VULNERABLE on Schedule 2 of the TSC Act (NSW Scientific Committee 2004e).

The species is not listed under the EPBC Act.

iv. *Key threatening processes listed under the NSW TSC Act 1995;*

The Brown Treecreeper is at threat from the following:

- Clearance and fragmentation of habitat including the removal of native vegetation and dead timber;
- Competition from aggressive honeyeater species;
- Increased nest predation as a consequence of habitat fragmentation; and
- Ecological consequences of high frequency fire.

a. Contribution to threatening processes as a result of the proposal

- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site. The proposal will result in the fragmentation of some areas of woodland on the subject site;
- The fragmentation associated with the proposal may increase the potential for competition from aggressive honeyeater species such as Noisy Miners or White-plumed Honeyeater and nest predation; and
- The proposed transmission line is not likely to increase fire frequency.

v. *Threat Abatement Plans*

No relevant Threat Abatement Plans exist for this species

a. Relevance to proposal

Not applicable

vi. *Recovery Plans*

- a. A Recovery Plan for this species has not been drafted or finalised.
- b. Relevance to proposal

Unknown

vii. *Habitat requirements*

The Brown Treecreeper occupies eucalypt woodlands, particularly open woodland lacking a dense understorey. It is insectivorous, eating ants, beetles and larvae, which it takes from the trunks of live and dead trees as well as from fallen branches and among leaf litter (Garnett and Crowley 2000).

7.18.3 Local and Regional Abundance

i. *Local*

Seven Brown Treecreepers were recorded at 4 sites during the current study by Cumberland Ecology. There were 22 sightings at more than 15 locations of this species recorded in the recent Spring and Autumn fauna surveys by Mount King Ecological Surveys (Resource Strategies 2005b). There are no DEC Wildlife Atlas records for the locality. 17 records exist for this species from the Munghorn Gap Nature Reserve and 25 records in Goulburn River National Park. Both Munghorn Gap Nature Reserve and Goulburn River National Park are likely to provide some habitat for this species in the locality. These records suggest there is a moderate-high abundance of Brown Treecreeper in the locality.

ii. *Regional*

Small woodland birds such as treecreepers are not expected to occur in very large numbers in the region due to the extensive clearing and fragmentation of habitat that has occurred throughout this area. In general, clearing activities have lead to a decline in many bird populations, especially smaller woodland species. The Brown Treecreeper has been detected in 10 national parks in the region although overall it is likely to be in low-moderate numbers.

iii. *Populations*

- a. Distribution of local populations of threatened species recorded from the study area

Not recorded

b. Other populations within the region

Brown Treecreepers have been recorded in 11 national parks in total. At least 246 records exist for the population at Ingalba Nature Reserve (4012ha). Due to the isolated nature of these areas of habitat this could represent several populations.

c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term. Large patches of national parks in the region comprise of approximately 95,700ha. There are other areas of conserved habitat in national parks but due to the small patch size of these areas it is unlikely to provide suitable habitat for this species.

d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares. The large patches that will be affected by the proposal may be significant in that grazing and clearing have resulted in many small remnant patches throughout the region, with larger patches less frequent. All remaining patches of woodland, especially the larger patches, are significant habitat for woodland birds which have experienced serious declines in this region due to removal and fragmentation of habitat (Reid 1999). However, larger patches of habitat are better represented in the locality than in the region and the subject site (approximately 10 patches < 3,300 ha) would be less significant than other areas of habitat in the locality such as that found in Goulburn River National Park (70,161 ha) and Munghorn Gap Nature Reserve (5,935ha).

iv. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

This species would forage and nest in woodland/forest communities. See Section 4.5.2 and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

v. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture.

The proposal will result in the severance of several patches of habitat for the transmission line. Most of these patches are small and would not provide significant habitat for these species. However, ten patches are larger and would provide some habitat for woodland birds such as the Brown Treecreeper. The fragmentation of these woodland areas is likely to reduce the quality of these areas for woodland birds and potentially lead to the further decline of this species in the locality.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site.

Nesting boxes will be used in adjacent habitat areas and fauna rescue procedures used where necessary. 16 nest boxes are to be erected for this species near towers 15, 164-165, 198 and 209.

Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.19 Painted Honeyeater (*Grantiella picta*)

7.19.1 Description

The Painted Honeyeater is sparsely distributed from south-eastern Australia to north-western Queensland and eastern Northern Territory. It frequents eucalypt forests and woodlands, particularly those with mistletoes. It may also be found in Acacia woodlands, paperbarks and casuarinas along watercourses (ACT Government 2005) (Ayers et al. 1996). (NSW NPWS 1997)

7.19.2 Conservation status

i. Local

The Painted Honey-eater has been recorded in the locality and within the Munghorn Gap Nature Reserve. Cumberland Ecology did not detect this species although recent surveys by Mount King Ecological Surveys recorded one individual. There is more habitat available in the study area than in other parts of the region but it is still unlikely that this species is adequately reserved in the locality.

ii. Regional

The Painted Honey-eater only occurs within the large national parks within the region (Weddin Mountains National Park, Munghorn Gap Nature Reserve and Ingalba Nature Reserve). There are only approximately 5 large national parks in the region that may provide suitable habitat for this species (approximately 18,300ha, 0.22% of the region). A high proportion of woodland birds have experienced serious declines in the region as a result of the extensive clearing for agriculture and habitat fragmentation. Like other woodland birds it is unlikely that this species is adequately reserved.

iii. Threatened Species Status

The Painted Honeyeater is listed as VULNERABLE on the schedules of the TSC Act (NSW Scientific Committee 2004v). The species was listed because:

- Its population and distribution has been significantly reduced
- It faces severe threatening processes
- It is an ecological specialist.

The species is not listed under the EPBC Act.

iv. Key threatening processes listed under the NSW TSC Act 1995;

The major threats for the Painted Honeyeater include:

- clearing and fragmentation of its habitat for farmland, and continued degradation of remnants by grazing.
- loss, without replacement, of ecologically mature trees which support most mistletoe
- fragmentation of habitat may also have resulted in the proliferation of larger, more aggressive honeyeaters.

- a. Contribution to threatening processes as a result of the proposal
 - Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site.
 - Due to extensive clearing activities associated with cattle grazing there are a low number of hollowed trees remaining on the subject site. Most of the hollows that do remain are small, providing limited habitat for Painted Honeyeater. The proposal will result in the removal of some of these hollowed trees.
 - The proposal will result in the fragmentation of some areas of woodland on the subject site.

v. *Threat Abatement Plans*

No relevant Threat Abatement Plans exist for this species

- a. Relevance to proposal

Not applicable

vi. *Recovery Plans*

- a. A Recovery Plan for this species has not been drafted or finalised.
- b. Relevance to proposal

Unknown

vii. *Habitat Requirements*

This birds migrates north-south for spring-summer breeding in NSW and wintering in northern Queensland and NT. Its diet is mainly mistletoe fruits and adequate woodland/forest cover and the availability of these fruits are the major habitats for this species (Pizzey and Knight 2003).

7.19.3 Local and Regional Abundance

i. *Local*

Painted Honeyeater was not recorded in the recent fauna surveys by Cumberland Ecology. One individual was recorded in Autumn and Spring surveys conducted by Mount King Ecological Surveys (Resource Strategies 2005b). There are nine DEC Wildlife Atlas

records for the locality. Eight records exist for this species from the Munghorn Gap Nature Reserve. Both Munghorn Gap Nature Reserve and Goulburn River National Park are likely to provide some habitat for this species in the locality. These records suggest there is a low abundance of Painted Honeyeater in the locality.

ii. Regional

Woodland birds such as honeyeaters are not expected to occur in large numbers in the region due to the extensive clearing and fragmentation of habitat that has occurred throughout this area. These activities have led to a decline in bird populations, especially smaller woodland species. The Painted Honeyeater has been detected in three national parks and is likely to be in low numbers in the region.

iii. Populations

- a. Distribution of local populations of threatened species recorded from the study area

Not recorded

- b. Other populations within the region
- c. The Painted Honeyeater is known to occur at three national parks in the region. Given the highly mobile nature of this bird that migrates across states seasonally it is unlikely that these occurrences are different populations.
- d. c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term. Large patches of national parks in the region comprise of approximately 95,700ha. There are other areas of conserved habitat in national parks but due to the small patch size of these areas it is unlikely to provide suitable habitat for this species.

- e. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares. The large patches that will be affected by the proposal may be significant in that grazing and clearing have resulted in many small remnant patches throughout the region, with larger patches less frequent. All remaining patches of woodland, especially the larger patches, are significant

habitat for woodland birds which have experienced serious declines in this region due to removal and fragmentation of habitat (Reid 1999). However, larger patches of habitat are better represented in the locality than in the region and the subject site (approximately 10 patches < 3,300 ha) would be less significant than other areas of habitat in the locality such as that found in Goulburn River National Park (70,161 ha) and Munghorn Gap Nature Reserve (5,935ha).

iv. Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Woodland birds are restricted to vegetated areas which provide shelter from predators by means of shrub cover. Therefore, depending on the width of the gap between these patches, connectivity for woodland birds would be poor as movement corridors. Where practical, the gaps between patches of woodland will be vegetated with native shrubs and grasses, which may increase connectivity for these species.

Where corridors are to be severed, native shrubs and grasses will be planted or retained beneath the transmission line where possible. This will maintain a vegetated movement/sheltered corridor within which woodland birds can travel to interconnected and proximate areas of habitat.

Woodland birds are likely to be restricted to movement corridors with continuous vegetation. The revegetation of narrow corridors between proximate patches of woodland will increase connectivity and act as movement corridors for this species. Therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

This species would forage and nest in woodland/forest communities. See Section 4.5.2. and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture.

The proposal will result in the severance of several patches of habitat for the transmission line. Most of these patches are small and would not provide significant habitat for these species. However, 10 patches are larger and would provide some habitat for woodland birds such as the Painted Honeyeater. The fragmentation of these woodland areas is likely to reduce the quality of these areas for woodland birds and potentially lead to the further decline of this species in the locality.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.20 Swift Parrot (*Lathamus discolor*)

7.20.1 Description

The Swift Parrot is distributed from Tasmania up to Queensland, where there have been recent records from the Gold Coast, Noosa, Toowoomba, Warwick and Lockyer Valley areas. The patterns of records in southern Queensland now suggests the species is a regular to that State, and means that the Swift Parrot probably undertakes the longest migration of a parrot anywhere in the world (Birds Australia 2004). The species has also been recorded inland near Griffith and Wyallda in mid west NSW and at Mount Lofty in South Australia (Pizzey and Knight 2003).

The Swift Parrot breeds only in Tasmania during September-December producing 3-5 white rounded eggs. Breeding is restricted to the southeast coast of Tasmania within the range of blue gum where it occupies an area less than 500 km². There is also a smaller breeding population in the north of the state between Launceston and Smithton. It then migrates to the mainland in March-June and returns to Tasmania August to October. It nests in tree hollows, 6-20 m high, with several pairs nearby (Pizzey and Knight 2003).

7.20.2 Conservation status

i. Local

The Swift Parrot has been recorded in the locality in low numbers. Cumberland Ecology and Mount King Ecological Surveys did not detect this species. There is more habitat available in the study area than in other parts of the region but it is still unlikely that this species is adequately reserved in the locality.

ii. Regional

The Swift Parrot occurs in three national parks within the region (Munghorn Gap National Park, Ingalba National park, and Livingston National Park). The size of these habitat patches used by this species in the region varies between 1,919ha and 5,935ha). The Swift Parrot bird breeds in Tasmania and would use woodland in the region for foraging. Although it could use a large proportion of these reserved areas as habitat this only constitutes approximately 1% of the entire region. Like other woodland birds, this species has suffered from habitat clearance and fragmentation and it is unlikely that habitat for this species is adequately reserved in the region.

iii. Threatened Species Status

The Swift Parrot is listed as ENDANGERED in Part 1 of Schedule 1 of the TSC Act (NSW Scientific Committee 2004b1). The species was listed because:

- The Swift Parrot breeds in Tasmania, where the breeding population has declined from in excess of 10,000 pairs to less than 1,000 pairs (Forshaw 1993), and (Garnett 1993, Brereton 1998) in New South Wales there are considerably fewer than this number; and
- The Swift Parrot is dependent on flowering resources across a wide range of habitat in its wintering grounds in New South Wales (Shields and Crome 1992). Continued loss of this resource through conversion of native woodlands and forests to other land uses associated with human development threatens the continued existence of this species in nature in New South Wales in the short term (2 – 5 years).

The Swift Parrot is also listed as vulnerable under Schedule 4 of the Tasmanian Threatened Species Protection Act 1995, Schedule 8 of the South Australian National Parks and Wildlife Act 1972, and listed as a threatened taxon under Schedule 2 of the Victoria Flora and Fauna Guarantee Act 1988.

The Swift Parrot is also listed as ENDANGERED under the EPBC Act.

iv. Key threatening processes listed under the NSW TSC Act 1995;

The Swift Parrot is at threat from the following:

- Clearing of habitat;
 - Land degradation that contributes to eucalypt dieback and reduces availability of food resources; and
 - Lack of regeneration and replacement food trees (NSW NPWS 2002b).
- a. Contribution to threatening processes as a result of the proposal
- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site.
 - A high proportion of the land in the study area has been affected by agricultural activities and grazing. It is unlikely the proposal will exacerbate the degradation caused by these activities because the subject site will be closely managed and subject to several protocols designed to minimise potential impacts.
 - Vegetation cleared for the proposal will not be allowed to regenerate. Some food trees for this species may be lost.

v. *Threat Abatement Plans*

No relevant Threat Abatement Plans are relevant to this species.

a. Relevance to proposal

Not applicable

vi. *Recovery Plans*

Not relevant

a. Relevance to proposal

Unknown

vii. *Habitat requirements*

The Swift Parrot requires hollows to breed in when this occurs in Tasmania in September and December. When this species migrates north it forages in forests, woodlands, plantations, Banksias, street trees (Pizzey and Knight 2003) especially in nectar-rich Box-Ironbark forests and woodlands (Birds Australia 2004). Swift Parrots feed extensively on nectar, lerp, and other items from eucalypt foliage during the non-breeding season (Swift Parrot Recovery Team 2000).

During the breeding season the diet of the Swift Parrot consists mainly of the nectar from the flowers of the Tasmanian Blue Gum. The flowers of the Black Gum/ Swamp Gum (*E. ovata*) are an important supplement to the Tasmanian Blue Gum. Post-breeding food resources are mainly nectar from summer and autumn flowering eucalypts, particularly stringybark, gum-topped stringybark, white gum, mountain gum and cabbage gum.

7.20.3 Local and Regional Abundance

i. *Local*

The Swift Parrot was not recorded in the recent fauna surveys by Cumberland Ecology or by Mount King Ecological Surveys (Resource Strategies 2005b). There are four DEC Wildlife Atlas records for the locality. No records exist for this species from the Munghorn Gap Nature Reserve and Goulburn River National Park although these areas should provide some habitat for this species in the locality. These records suggest there is a low abundance of Swift Parrot in the locality.

ii. *Regional*

Birds such as parrots are not expected to occur in large numbers in the region due to the extensive clearing and fragmentation of habitat that has occurred throughout this area. Even though the Swift Parrot does not rely on hollows in the region the area of foraging habitat available to support these species has decreased significantly as a result of these activities. The Swift Parrot has been detected in three national parks in the entire region and it is likely to be in low numbers.

iii. *Populations*

- a. Distribution of local populations of threatened species recorded from the study area

Not recorded

- b. Other populations within the region

Due to the highly mobile nature of this birds that migrates between Tasmania and Queensland there are unlikely to be separate populations within the region. The species has been recorded in three national parks in the region but these are unlikely to be separate populations.

- c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term.

- d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares.

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as “stepping stones” to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Woodland birds are restricted to vegetated areas which provide shelter from predators by means of shrub cover. Therefore, depending on the width of the gap between these patches, connectivity for woodland birds would be poor as movement corridors. Where practical, the gaps between patches of woodland will be vegetated with native shrubs and grasses, which may increase connectivity for these species.

Where corridors are to be severed, native shrubs and grasses will be planted or retained beneath the transmission line where possible. This will maintain a vegetated movement/sheltered corridor within which woodland birds can travel to interconnected and proximate areas of habitat.

Woodland birds are likely to be restricted to movement corridors with continuous vegetation. The revegetation of narrow corridors between proximate patches of woodland will increase connectivity and act as movement corridors for this species. Therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

This species would forage and nest in woodland/forest communities. See Section 4.5.2. and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture. As much of the woodland is regrowth and has been highly disturbed by grazing then the habitat to be cleared is not likely to be locally or regionally significant for the Swift Parrot.

The proposal will result in the severance of several patches of habitat for the transmission line. Most of these patches are small and would not provide significant habitat for these species. However, approximately ten patches are larger and would provide some habitat for woodland birds such as the Swift Parrot. The fragmentation of these woodland areas is likely to reduce the quality of these areas for woodland birds and potentially lead to the further decline of this species in the locality. The Swift Parrot may be relatively protected from the impacts of these local activities because of the large size of their home ranges and migratory behaviour.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.21 Square-tailed Kite (*Lophoictinia isura*)

7.21.1 Description

This is a raptorial bird that sails effortlessly, seldom flapping, harrier-like over woodland and forest canopy in search of nestling birds, which are its main food. It has a whitish, streaked down-pointed head, reddish brown wings, with large cream crescent at the base of long broadly barred “fingertips” on its wings (Pizzey and Knight 2003).

Square-tailed Kites are uncommon, yet widespread. They are sparsely distributed across NSW and Australia in areas with more than 500mm rainfall per year (NSW NPWS 2002b).

The Square-tailed Kite hunts by low slow quartering above woodlands and transect hunting both at low and high altitudes. The main prey especially when breeding are

nestling passerines, whilst non breeding prey includes birds, skinks, insects and small rabbits (Olsen et al. 1993, Olsen 1995). The Square-tailed Kite breeds from July to November, laying 2-3 dull white eggs, blotched lavender and red-brown. In a monogamous relationship solitary pairs mate once a year. The large, loose nest consists of sticks, 15-25 m up in leafy trees (Pizzey and Knight 2003). The incubation period of 36 days is followed by a fledgling period of eight to nine weeks. The young finally attain adult plumage at two years (Olsen et al. 1993, Olsen 1995).

7.21.2 Conservation status

i. Local

There are several records of this species in the locality. There are some large areas of habitat reserved in national parks where it has been recorded although most of the vegetation in the locality has experienced a high level of disturbance. Due to these clearing activities and relatively young age of regrowth there are only few hollows available for nesting for this species. Even so, the Square-tailed Kite is known to occur in the locality and is not at the edge of its distribution (NSW NPWS 1999f). The local conservation status of this species is unknown.

ii. Regional

Due to the extensive clearing of woodland areas in this region the available habitat has been greatly reduced. This species occurs from Western Australia, the top end, Queensland and NSW to Victoria (NSW NPWS 1999f) and is not at the edge of its distribution however it probably has low abundance in the region. The conservation status of the Square-tailed Kite is unknown but it is unlikely this species is well represented in the region.

iii. Threatened Species Status

The Square-tailed Kite is listed as VULNERABLE on Schedule 2 of the TSC Act (NSW Scientific Committee 2004y). The species was listed because:

- Its population has been reduced to a critical level;
- It faces severe threatening processes;
- It is an ecological specialist (it depends on particular types of diet or habitat); and
- It has poor recovery potential (NSW Scientific Committee 2004y).

This species is listed as MIGRATORY under the EPBC Act.

iv. *Key threatening processes listed under the NSW TSC Act 1995;*

The Square-tailed Kite is at threat from the following:

- Clearing of suitable forest and woodland habitat, particularly along rivers and in urban and semi-urban areas;
- Illegal collection of eggs;
- Illegal shooting; and
- Grazing, intensive forestry and too-frequent fire that affects woodland birds and other food resources (NSW NPWS 2002b).

a. Contribution to threatening processes as a result of the proposal

- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site.
- There would be no reason to expect that the proposal would lead to an increase in illegal collection of eggs and illegal shooting.
- The proposal will not increase the risk of fire in the study area. In fact, the vegetation management and monitoring will ensure that the risk of high frequency fires will probably decrease

v. *Threat Abatement Plans*

None available

a. Relevance to proposal

Not relevant

vi. *Recovery Plans*

None available

a. Relevance to proposal

Not applicable

Habitat Requirements

Square tailed Kites preferred habitat is woodlands, heathlands, tropical and sub-tropical rainforests, timbered water courses, hills and gorges (Pizzey and Knight 2003). It requires large loose sticks for nesting purposes within leafy trees.

7.21.3 Local and Regional Abundance

i. Local

Square-tailed Kites were not recorded in the recent fauna surveys by Cumberland Ecology. Four individuals were recorded in Autumn and Spring surveys conducted by Mount King Ecological Surveys (Resource Strategies 2005b). There are twelve DEC Wildlife Atlas records for the locality. Five records exist for this species from the Goulburn River National Park and the Munghorn Gap Nature Reserve. Both parks are likely to provide some habitat for this species in the locality. These records suggest there is a low abundance of Square-tailed Kites in the locality.

ii. Regional

Predators such as the Square-tailed Kite are not expected to occur in high numbers. Additionally, this region has been intensively cleared and the remaining woodland is highly fragmented. This has lead to a decline in bird populations. The Square-tailed Kite has been detected in three national parks and is likely to be in low numbers in the region.

iii. Populations

a. Distribution of local populations of threatened species recorded from the study area

Not recorded

b. Other populations within the region

The Square-tailed Kite has been detected in three national parks in the region; Munghorn Gap Nature Reserve, Goulburn River National park and Ilandra National park. Due to the proximity of some of these parks these would represent no more than two populations in the region.

c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term. Protection and

enhancement of woodland fragments that occur outside the National Parks is also necessary to prevent continued loss of woodland birds (NSW NPWS 2003d).

d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares. The proposal will result in a further fragmentation of the woodland in this study area and as such it is possible that the woodland bird declines witnessed in this region will continue.

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Woodland birds are restricted to vegetated areas which provide shelter from predators by means of shrub cover. Therefore, depending on the width of the gap between these patches, connectivity for woodland birds would be poor as movement corridors. Where practical, the gaps between patches of woodland will be vegetated with native shrubs and grasses, which may increase connectivity for these species.

Where corridors are to be severed, native shrubs and grasses will be planted or retained beneath the transmission line where possible. This will maintain a vegetated movement/sheltered corridor within which woodland birds can travel to interconnected and proximate areas of habitat.

Woodland birds are likely to be restricted to movement corridors with continuous vegetation. The revegetation of narrow corridors between proximate patches of woodland will increase connectivity and act as movement corridors for this species. Therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

This species would forage and nest in woodland/forest communities. See Section 4.5.2. and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture. As much of the woodland is regrowth (containing few hollows) and has been highly disturbed by grazing then the habitat to be cleared is not likely to be locally or regionally significant for the Square-tailed Kite.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.22 Hooded Robin (*Melanodryas cucullata*)

7.22.1 Description

The species feeds on the ground by pouncing on insects, and forages in areas with a mix of bare ground, ground cover and litter. It nests in an open cup of bark strip, rootlets and grass on stumps, cavities in broken trunks, stunted eucalypt, on or near dead wood (Pizzey and Knight 2003). The Hooded Robin lives in small family groups of pairs or trios. Home ranges are relatively large and averaged 18ha for birds on the New England Tableland.

7.22.2 1.1.2 Conservation status

i. Local

The Hooded Robin has been recorded in the locality in moderate numbers. Cumberland Ecology did not detect this species but Mount King Ecological Surveys detected it in reasonable numbers. Mount King Ecological Surveys recorded 15 animals at eight sites. Small woodland birds are highly dependent on remnant, continuous areas of habitat in the locality. There is more habitat available in the study area than in other parts of the region but it is still unlikely that this species is adequately reserved in the locality.

ii. Regional

The Hooded Robin occurs in nine national parks within the region. The Hooded Robin may potentially utilise a high proportion of the habitat in the national parks in the region (approximately 97,00ha of habitat). Even so this only constitutes approximately 1% of the entire region. Like other woodland birds, this species has suffered from habitat clearance and fragmentation and it is unlikely that this species is adequately reserved in the region. In fact, it is likely that this species continues to decline in the region.

iii. Threatened Species Status

The Hooded Robin is listed as VULNERABLE under Schedule 2 of the TSC Act (NSW Scientific Committee 2004q)

The species is not listed under the EPBC Act.

iv. Key threatening processes listed under the NSW TSC Act 1995;

The Hooded Robin is at threat from the following:

- Clearance and fragmentation of habitat including removal of dead timber.

- a. Contribution to threatening processes as a result of the proposal
 - Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site. The proposal will result in the fragmentation of some areas of woodland on the subject site.

v. *Threat Abatement Plans*

No relevant Threat Abatement Plans exist for this species

- a. Relevance to proposal

Not applicable

vi. *Recovery Plans*

- a. A Recovery Plan for this species has not been drafted or finalised.
- b. Relevance to proposal

Unknown

vii. *Habitat requirements*

The species appears unable to survive in remnants smaller than 100-200ha. It occurs in drier eucalypt forests, woodlands, scrubs especially where fallen logs occur as well as cleared paddocks with stumps/dead trees or regrowth (Pizzey and Knight 2003).

7.22.3 Local and Regional Abundance

i. *Local*

Hooded Robins were recorded in the recent fauna surveys by Mount King Ecological Surveys (Resource Strategies 2005b) (15 in total). There are no DEC Wildlife Atlas records for the locality. Five records exist for this species from the Munghorn Gap Nature Reserve and Goulburn River National Park. Both Munghorn Gap Nature Reserve and Goulburn River National Park are likely to provide some habitat for this species in the locality. These records suggest there is a low abundance of Hooded Robin in the locality.

ii. *Regional*

Small woodland birds such as robins are not expected to occur in large numbers in the region due to the extensive clearing and fragmentation of habitat that has occurred throughout this area. The Hooded Robin is especially sensitive to habitat fragmentation and has not been known to survive in patches less than 100-200ha. In general, clearing activities have led to a decline in many bird populations, especially smaller woodland species. The Hooded Robins has been detected in nine national parks in the region although overall it is likely to be in low numbers.

iii. *Populations*

- a. Distribution of local populations of threatened species recorded from the study area

Not recorded

- b. Other populations within the region
- c. Hooded Robins have been recorded in nine national parks in total. At least 57 records exist for the population at Ingalba Nature Reserve (4012ha). Due to the isolated nature of these areas of habitat this could represent several populations.
- d. c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term. Large patches of national parks in the region comprise of approximately 95,700ha. There are other areas of conserved habitat in national parks but due to the small patch size of these areas it is unlikely to provide suitable habitat for this species.

- e. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares. The large patches that will be affected by the proposal may be significant in that grazing and clearing have resulted in many small remnant patches throughout the region, with larger patches less frequent. All remaining patches of woodland, especially the larger patches, are significant habitat for woodland birds which have experienced serious declines in this region due to removal and fragmentation of habitat (Reid 1999). However, larger patches of habitat are better represented in the locality than in the region and the subject site (approximately 10 patches < 3,300 ha) would be less significant than other areas of habitat in the locality such

as that found in Goulburn River National Park (70,161 ha) and Munghorn Gap Nature Reserve (5,935ha).

iv. Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Woodland birds are restricted to vegetated areas which provide shelter from predators by means of shrub cover. Therefore, depending on the width of the gap between these patches, connectivity for woodland birds would be poor as movement corridors. Where practical, the gaps between patches of woodland will be vegetated with native shrubs and grasses, which may increase connectivity for these species.

Where corridors are to be severed, native shrubs and grasses will be planted or retained beneath the transmission line where possible. This will maintain a vegetated movement/sheltered corridor within which woodland birds can travel to interconnected and proximate areas of habitat.

Woodland birds are likely to be restricted to movement corridors with continuous vegetation. The revegetation of narrow corridors between proximate patches of woodland will increase connectivity and act as movement corridors for this species. Therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

This species would forage and nest in woodland/forest communities. See Section 4.5.2. and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture.

The proposal will result in the severance of several patches of habitat for the transmission line. Most of these patches are small and would not provide significant habitat for these species. However, ten patches are larger and would provide some habitat for woodland birds such as the Hooded Robin. The fragmentation of these woodland areas is likely to reduce the quality of these areas for woodland birds and potentially lead to the further decline of this species in the locality.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.23 Black-chinned Honeyeater (*Melithreptus gularis gularis*)

7.23.1 Description

This is a honeyeater with blue eye-crescent and large creamy nape band; blackish chin and centre of throat; underparts white, washed grey-buff; legs yellowish (Pizzey and Knight 2003).

The species occurs predominantly west of the Great Dividing Range in a narrow belt through NSW into southern QLD and south into South Australia and Victoria (Barrett et al. 2003).

The Black-chinned Honeyeater builds suspended nests in which two eggs are usually laid (Beruldsen 1980).

7.23.2 Conservation status

i. Local

The Black-chinned Honeyeater has been recorded in the locality in moderate numbers. Cumberland Ecology did not detect this species although recent surveys by Mount King Ecological Surveys recorded this species at two sites. There is more habitat available in the study area than in other parts of the region but it is still unlikely that this species is adequately reserved in the locality.

ii. Regional

The Black-chinned Honeyeater occurs in five national parks within the region (Livingstone National Park, Ingalba National park, Nest Hill Nature Reserve, Benambra National Park and Tabletop Nature Reserve). The size of these habitat patches used by this species in the region varies between 108ha and 4,012ha). The Black-chinned Honeyeater may potentially utilise a high proportion of the habitat in the national parks in the region (approximately 97,00ha of habitat). Even so this only constitutes approximately 1% of the entire region. Like other woodland birds, this species has suffered from habitat clearance and fragmentation and it is unlikely that this species is adequately reserved in the region.

iii. Threatened Species Status

The Black-chinned Honeyeater is listed as VULNERABLE on Schedule 2 of the TSC Act (NSW Scientific Committee 2004b).

The species is not listed under the EPBC Act.

iv. *Key threatening processes listed under the NSW TSC Act 1995;*

The Black-chinned Honeyeater is considered to be under threat from the following:

- Competition from aggressive honeyeater species such as Noisy Miners or White-plumed Honeyeater;
 - Increased nest predation from increasing populations of predators such as Pied Currawongs and Australian Ravens; and
 - Reduction in availability of habitat.
- a. Contribution to threatening processes as a result of the proposal
- The fragmentation associated with the proposal may increase the potential for competition from aggressive honeyeater species such as Noisy Miners or White-plumed Honeyeater.
 - The proposal may result in a minor increase in predators such as Pied Currawongs and Australian Ravens and this in turn may increase the risk of nest predation.
 - Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site.

v. *Threat Abatement Plans*

No relevant Threat Abatement Plans are relevant to this species.

a. Relevance to proposal

Not applicable

vi. *Recovery Plans*

Not relevant

a. Relevance to proposal

Unknown

vii. Habitat requirements

This species feeds on arthropods, nectar and lerp from eucalypt foliage and bark (NSW Scientific Committee 2004b).

The Black-chinned Honeyeater occupies dry eucalypt woodland with in an annual rainfall range of 400-700 mm, particularly in associations containing Box and Ironbark (NSW Scientific Committee 2004b). In the NSW north coast region this species is known to utilise drier coastal woodlands. The species also nests and forages in woodlands containing box-ironbark associations, River Red Gum, drier coastal woodlands of the Cumberland Plain, Western Sydney and in the Hunter, Richmond and Clarence Valleys. It feeds on arthropods, nectar and lerp from eucalypt foliage and bark (Blakers et al. 1984).

7.23.3 Local and Regional Abundance

i. Local

Black-chinned Honeyeater was not recorded in the recent fauna surveys by Cumberland Ecology. Three individuals from two sites were recorded in Autumn and Spring surveys conducted by Mount King Ecological Surveys (Resource Strategies 2005b). There are eighteen DEC Wildlife Atlas records for the locality. No records exist for this species from the Munghorn Gap Nature Reserve and Goulburn River National Park although these areas should provide some habitat for this species in the locality. These records suggest there is a low abundance of Painted Honeyeater in the locality.

ii. Regional

Woodland birds such as honeyeaters are not expected to occur in large numbers in the region due to the extensive clearing and fragmentation of habitat that has occurred throughout this area. These activities have lead to a decline in bird populations, especially smaller woodland species. The Black-chinned Honeyeater has been detected in five national parks although it is likely to be in low numbers in general throughout the region.

iii. Populations

- a. Distribution of local populations of threatened species recorded from the study area

Not recorded

- b. Other populations within the region

Black-chinned Honeyeater

c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term. Large patches of national parks in the region comprise of approximately 95,700ha. There are other areas of conserved habitat in national parks but due to the small patch size of these areas it is unlikely to provide suitable habitat for this species.

d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares. The large patches that will be affected by the proposal may be significant in that grazing and clearing have resulted in many small remnant patches throughout the region, with larger patches less frequent. All remaining patches of woodland, especially the larger patches, are significant habitat for woodland birds which have experienced serious declines in this region due to removal and fragmentation of habitat (Reid 1999). However, larger patches of habitat are better represented in the locality than in the region and the subject site (approximately 10 patches < 3,300 ha) would be less significant than other areas of habitat in the locality such as that found in Goulburn River National Park (70,161 ha) and Munghorn Gap Nature Reserve (5,935ha).

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring

between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Woodland birds are restricted to vegetated areas which provide shelter from predators by means of shrub cover. Therefore, depending on the width of the gap between these patches, connectivity for woodland birds would be poor as movement corridors. Where practical, the gaps between patches of woodland will be vegetated with native shrubs and grasses, which may increase connectivity for these species.

Where corridors are to be severed, native shrubs and grasses will be planted or retained beneath the transmission line where possible. This will maintain a vegetated movement/sheltered corridor within which woodland birds can travel to interconnected and proximate areas of habitat.

Woodland birds are likely to be restricted to movement corridors with continuous vegetation. The revegetation of narrow corridors between proximate patches of woodland will increase connectivity and act as movement corridors for this species. Therefore movement between large areas of habitat for this species will not be greatly impacted.

v. Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area

This species would forage and nest in woodland/forest communities. See Section 4.5.2. and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. Location, nature and extent of habitat removal or modification that would result from proposed action

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture.

The proposal will result in the severance of several patches of habitat for the transmission line. Most of these patches are small and would not provide significant habitat for these species. However, 10 patches are larger and would provide some habitat for woodland birds such as the Black-chinned Honeyeater. The fragmentation of these woodland areas is likely to reduce the quality of these areas for woodland birds and potentially lead to the further decline of this species in the locality.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.24 Turquoise Parrot (*Neophema pulchella*)

7.24.1 Description

The Turquoise Parrot is endemic to eastern Australia and ranges from south-eastern Queensland to Victoria. It feeds on seeds of grasses and shrubs and requires a reliable supply of drinking water. Turquoise Parrots inhabit gullies, rocky ridges and river flats of The Great Dividing Range (Higgins 1999). The species has also been recorded in savannah, riparian woodlands and farmland (Morris 1980; Quinn and Reid 1996.)

7.24.2 Conservation status

i. Local

The Turquoise Parrot has been recorded in the locality in moderate numbers. Cumberland Ecology did not detect this species but Mount King Ecological Surveys did record one individual of this species in the study area. There is more habitat available in the study area than in other parts of the region but it is still unlikely that this species is adequately reserved in the locality.

ii. Regional

The Turquoise Parrot occurs in eight national parks within the region. Although it could use a large proportion of these reserved areas as habitat this only constitutes approximately 1% of the entire region. Like other woodland birds, this species has suffered from habitat clearance and fragmentation and it is unlikely that habitat for this species is adequately reserved in the region.

iii. *Threatened Species Status*

The Turquoise Parrot is listed as VULNERABLE on Schedule 2 of the NSW TSC Act (1995 (NSW Scientific Committee 2004p).

The species is not listed under the EPBC Act.

iv. *Key threatening processes listed under the NSW TSC Act 1995;*

The Turquoise Parrot is at threat from the following:

- Loss of hollowed trees; and
 - Fragmentation of habitat through clearing, logging, grazing and fire.
- a. Contribution to threatening processes as a result of the proposal
- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site.
 - Due to extensive clearing activities associated with cattle grazing there are a low number of hollowed trees remaining on the subject site. Most of the hollows that do remain are small, providing limited habitat for parrots. The proposal will result in the removal of some of these hollowed trees.

v. *Threat Abatement Plans*

No relevant Threat Abatement Plans exist for this species

- a. Relevance to proposal

Not applicable

vi. *Recovery Plans*

- a. A Recovery Plan for this species has not been drafted or finalised.
- b. Relevance to proposal

Unknown

vii. *Habitat Requirements*

This species occurs in eucalypt woodland and open forests with a ground cover of grasses and low shrub understorey. Turquoise Parrots nest in hollows of small trees, dead eucalyptus, or in holes, or stumps.

7.24.3 Local and Regional Abundance

i. *Local*

A Turquoise Parrot was recorded in the recent fauna surveys by Mount King Ecological Surveys (Resource Strategies 2005b). There are 32 DEC Wildlife Atlas records for the locality. Fifteen records exist for this species from the Goulburn River National Park. Both Munghorn Gap Nature Reserve and Goulburn River National Park are likely to provide some habitat for this species in the locality. These records suggest there is a low abundance of Turquoise Parrot in the locality.

ii. *Regional*

Woodland birds are not expected to occur in large numbers in the region due to the extensive clearing and fragmentation of habitat that has occurred throughout this area. These activities have led to a decline in bird populations, especially smaller woodland species. The Turquoise Parrot has been detected in eight national parks in the region although overall it is likely to be in low numbers.

iii. *Populations*

- a. Distribution of local populations of threatened species recorded from the study area

Not recorded

- b. Other populations within the region

The Turquoise Parrot is known to occur in the Goulburn River National Park and in the study area. It is unknown if this population extends beyond the national parks.

- c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term. Large patches of national parks in the region comprise of approximately 95,700ha. There are other areas of

conserved habitat in national parks but due to the small patch size of these areas it is unlikely to provide suitable habitat for this species.

d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares. The large patches that will be affected by the proposal may be significant in that grazing and clearing have resulted in many small remnant patches throughout the region, with larger patches less frequent. All remaining patches of woodland, especially the larger patches, are significant habitat for woodland birds which have experienced serious declines in this region due to removal and fragmentation of habitat (Reid 1999). However, larger patches of habitat are better represented in the locality than in the region and the subject site (approximately 10 patches < 3,300 ha) would be less significant than other areas of habitat in the locality such as that found in Goulburn River National Park (70,161 ha) and Munghorn Gap Nature Reserve (5,935ha).

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Woodland birds are restricted to vegetated areas which provide shelter from predators by means of shrub cover. Therefore, depending on the width of the gap between these patches, connectivity for woodland birds would be poor as movement corridors. Where

practical, the gaps between patches of woodland will be vegetated with native shrubs and grasses, which may increase connectivity for these species.

Where corridors are to be severed, native shrubs and grasses will be planted or retained beneath the transmission line where possible. This will maintain a vegetated movement/sheltered corridor within which woodland birds can travel to interconnected and proximate areas of habitat.

Woodland birds are likely to be restricted to movement corridors with continuous vegetation. The revegetation of narrow corridors between proximate patches of woodland will increase connectivity and act as movement corridors for this species. Therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

This species would forage and nest in woodland/forest communities. See Section 4.5.2. and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. **Potential Impact**

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture.

The proposal will result in the severance of several patches of habitat for the transmission line. Most of these patches are small and would not provide significant habitat for these species. However, ten patches are larger and would provide some habitat for woodland birds such as the Turquoise Parrot. The fragmentation of these woodland areas is likely to reduce the quality of these areas for woodland birds and potentially lead to the further decline of this species in the locality.

b. **Ameliorative measures**

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species

then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.25 Barking Owl (*Ninox connivens*)

7.25.1 Description

The Barking Owl occurs across northern, eastern and south-western Australia, as well as East Indonesia and New Guinea. In NSW, it is distributed across coastal plains and foothills and the inland slopes and plains. It is sparse on the higher parts of the tablelands and rare or absent on the dense wet forests of the eastern fall of the Great Dividing Range (NSW NPWS 2003b).

The Barking Owl is a moderately large brown hawk-like owl with white spotted wings. It has prominent yellow eyes on a flat face, fully feather legs and large yellow feet (Hollands 1991, Higgins 1999).

The species occurs is moderately large and occurs in areas of woodland or mature open forest within tropical, temperate and semi-arid zones. The Barking Owl is generally nocturnal although more active during the daytime compared with other owl species.

7.25.2 Conservation status

i. Local

There is a total of 6 records of this species in the locality from the Atlas of NSW Wildlife (DEC (NSW) 2005a). Two individual Barking Owls were detected within Wellington LGA and 4 within Midwestern Regional LGA. During a recent survey, no species were recorded (Resource Strategies 2005b). There are some large areas of habitat reserved in national parks where it has been recorded although most of the vegetation in the locality has experienced a high level of disturbance. Due to these clearing activities and relatively young age of regrowth there are only few hollows available for nesting for this species.. The local conservation status of this species is unknown.

ii. Regional

Due to the extensive clearing of woodland areas in this region the available habitat has been greatly reduced. It has been recorded in one nature reserve, however also occurs in State Forests, although most occurrences are on privately owned land. The species is

regarded as locally uncommon or rare and is no longer found in areas where it had previously been recorded several decades ago (NSW NPWS 2003b). The conservation status of the Barking Owl is unknown.

iii. *Threatened Species Status*

The Barking Owl (*Ninox connivens*) is listed as VULNERABLE on Schedule 2 of the TSC Act (NSW Scientific Committee 2004t). The species was listed because:

- Its distribution and abundance has been reduced;
- Its population is suspected to be reduced;
- It faces moderate threatening processes;
- It has low reproduction rate; and
- It is positioned at the top of the food chain;

The species is not listed under the EPBC Act.

Key threatening processes listed under the NSW TSC Act 1995;

- Clearance of native vegetation;
- Removal of dead wood and dead trees;

Threats to this species include;

- Loss of mature hollow-bearing trees and changes to the structure of forests and woodland that lead to fewer such trees in the future;
- Clearing of habitat for grazing agriculture, forestry or other developments;
- Reduction in the number of prey through pesticide use.

a. Contribution to threatening processes as a result of the proposal

- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site;
- Due to extensive clearing activities associated with cattle grazing there are a low number of hollowed trees remaining on the subject site. Most of the hollows that do remain are small, providing limited habitat for Barking Owl. The proposal will result in the removal of some of these hollowed trees;
- No pesticides will be used for the proposed transmission line; and

- Vehicle numbers will not be increased by the proposed transmission line.

iv. *Threat Abatement Plans*

None are known

- a. Relevance to the proposal

Unknown

v. *Recovery Plans*

A draft recovery plan for the Barking Owl has been prepared by the National Parks division of DEC.

Objectives include;

- Increased understanding of the biology, ecology and management of the Barking Owl;
- Increase education and awareness of the involvement in the conservation of the Barking Owl in NSW;
- Undertake threat abatement and mitigation; and
- Provide organizational support.

The implementation of this recovery plan is the responsibility of NPWS over a period of 5 years.

- a. Relevance to proposal

Unknown

vi. *Habitat requirements*

Habitat is dominated by eucalypts, particularly red gum species. Roosting sites tend to be located in areas of dense foliage, breeding in the hollows of eucalypts and paperbarks near water courses and wetlands.

The Barking Owl is at the top of the food chain, taking mammals, birds and invertebrates, however exact requirements are not known in terms of prey, habitat floristics and structure (NSW NPWS 2003b).

7.25.3 Local and Regional Abundance

i. Local

Barking Owl was not recorded in the recent fauna surveys by Cumberland Ecology. No individuals were recorded in twelve survey sites in Autumn and Spring surveys conducted by Mount King Ecological Surveys (Resource Strategies 2005b). Six records of Powerful Owl occur in the DEC Wildlife Atlas with Mid Western Regional and Wellington LGAs. These records suggest there is a low abundance of Barking Owl in the locality.

ii. Regional

The regional abundance of the Barking Owl is unknown as there are no published estimates for NSW, however, the species occurs in some NPWS reserves and State Forests on the coastal plain and inland slopes and plains. Records exist for all the NSW bioregions, there have been 30 records of Barking Owl within Ingalba Nature Reserve in the region. The species has been recorded in several locations within the region although due to habitat fragmentation and clearance of hollow-bearing trees it is unlikely this species occurs in high numbers.

iii. Populations

- a. Distribution of local populations of threatened species recorded from the study area

Not recorded

- b. Other populations within the region

The records of Barking Owl from the region are likely to be from the same population as the range and distribution of this highly mobile species is very large.

- c. Long-term security of other habitats

The Ingalba Nature Reserve which occurs within the region provides records of Barking Owl. The reserve comprises 4,012 hectares; an area which is secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term.

- d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature

reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares.

iv. Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Woodland birds are restricted to vegetated areas which provide shelter from predators by means of shrub cover. Therefore, depending on the width of the gap between these patches, connectivity for woodland birds would be poor as movement corridors. Where practical, the gaps between patches of woodland will be vegetated with native shrubs and grasses, which may increase connectivity for these species.

Where corridors are to be severed, native shrubs and grasses will be planted or retained beneath the transmission line where possible. This will maintain a vegetated movement/sheltered corridor within which woodland birds can travel to interconnected and proximate areas of habitat.

Woodland birds are likely to be restricted to movement corridors with continuous vegetation. The revegetation of narrow corridors between proximate patches of woodland will increase connectivity and act as movement corridors for this species. Therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area.*

This species would forage and roost in woodland/forest communities. See Section 4.5.2. and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture. As much of the woodland is regrowth (containing few hollows) and has been highly disturbed by grazing then the habitat to be cleared is not likely to be locally or regionally significant for the Barking Owl.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.26 Powerful Owl (*Ninox strenua*)

7.26.1 Description

Powerful Owls are endemic to the forests of the south-eastern mainland Australia, mainly from the Great Dividing Range to the coasts. . It also occurs on the western slopes of the Great Dividing Range and in the drier box-ironbark forests and woodlands (Debus & Chafer 1994).

It is characterised by bright-yellow, large, forward-directed eyes and is the largest owl found in Australia, with an overall head-tail length of 60-65cm. A nocturnal hunter, the Powerful Owl preys mainly on arboreal or semi-arboreal marsupials. The species is mostly sedentary and lives alone or in pairs.

7.26.2 Conservation status

i. Local

No records exist for the Powerful Owl in Wellington LGA, although there are 32 records for the species within Midwestern Regional LGA from the Atlas of NSW Wildlife (DEC (NSW) 2005a). Most of the vegetation in the locality has experienced a high level of disturbance. Due to these clearing activities and relatively young age of regrowth there are only few hollows available for nesting for this species. The local conservation status of the species is unknown.

ii. Regional

Due to the extensive clearing of woodland areas in this region the available habitat has been greatly reduced. This species is sparsely distributed though extends occasionally to the western slopes indicating it is at the western fringe of its NSW distribution. The conservation status of the Powerful Owl is unknown.

iii. Threatened Species Status

The Powerful Owl (*Ninox strenua*) is listed as VULNERABLE on Schedule 2 of the TSC Act (NSW Scientific Committee 2004u).

The species is not listed under the EPBC Act.

iv. Key threatening processes listed under the NSW TSC Act 1995;

a. Key threatening processes listed under the NSW TSC Act 1995;

- Clearance of native vegetation;

- Removal of dead wood and dead trees;
- Consequences of high frequency fire regimes

Threats to this species include;

- Loss of mature hollow-bearing trees and changes to the structure of forests and woodland that lead to fewer such trees in the future;
- Clearing of habitat for grazing agriculture, forestry or other developments;
- Urbanisation and fragmentation (DEC (NSW) 2005a).

b. Contribution to threatening processes as a result of the proposal

- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site;
- Due to extensive clearing activities associated with cattle grazing there are a low number of hollowed trees remaining on the subject site. Most of the hollows that do remain are small, providing limited habitat for Powerful Owl. The proposal will result in the removal of some of these hollowed trees;
- No pesticides will be used for the proposed transmission line; and
- Vehicle numbers will not be increased by the proposed transmission line.

v. *Threat Abatement Plans*

None are known

a. Relevance to the proposal

Unknown

vi. *Recovery Plans*

A draft recovery plan for large forest owls is also being prepared by the National Parks division of DEC.

The main objectives of the plan are:

- To minimise further habitat fragmentation by encouraging protection and management of significant habitat. This will be achieved through the distribution of information packages to local councils and other public bodies to assist in the identification of suitable habitat for the Powerful Owl; encouraging Catchment

Management Boards to protect existing habitat and securing management of large areas of owl habitat and nesting sites on private land through the liaison with private landowners;

- Minimise impacts of development activities on large owls through the use of set guidelines to identify and mitigate potential impacts of the project;
- Assess the distribution and amount of high quality habitat for owl species across public and private lands to estimate numbers of the species which are not protected;
- Monitor trends in population parameters through the implementation of monitoring programs across various land tenures and disturbance histories.

a. Relevance to proposal

Unknown

vii. *Habitat Requirements*

The Powerful Owl occurs chiefly in taller, wetter eucalypt forests, but also uses drier eucalypt forest and woodland (Debus and Chafer 1994).

The birds roost by day in trees or tall shrubs, generally selecting those species with dense canopies such as Turpentines, she-oaks, and rainforests. Favoured roost trees tend to be in gullies rather than on ridges (Smith and Smith 2000). The Powerful Owl feeds chiefly on medium size arboreal mammals, and has a large territory (Davey 1993). It nests in hollows of mature eucalypts usually in or near well timbered gullies (Debus and Chafer 1994).

7.26.3 Local and Regional Abundance

i. *Local*

There are 32 records of this species in the locality from the Atlas of NSW Wildlife for the Midwestern Regional LGA. The Powerful Owl was not detected during the current study or in recent surveys of the study area (Resource Strategies 2005b). However, the species is at the western edge of its distribution (Debus and Chafer 1994).

ii. *Regional*

The regional abundance of the Powerful Owl is unknown. There are 8 records of the species within Munghorn Gap Nature Reserve in the region. The species has not been recorded in any other locations within the region, and due to habitat fragmentation and clearance of hollow-bearing trees it is unlikely this species occurs in high numbers.

iii. *Populations*

- a. Distribution of local populations of threatened species recorded from the study area

Not recorded

- b. Other populations within the region

No isolated populations of Powerful Owl occur within north east NSW, however, it is unknown if other populations occur.

- c. Long-term security of other habitats

The nature reserve in the region where the Powerful Owl occurs is Munghorn Gap, an area comprising 5,935 hectares. This area is secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term.

- d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares.

iv. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area.*

This species would forage and roost in woodland/forest communities. See Section 4.5.2. and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

v. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

- a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture. As much of the woodland is regrowth (containing few

hollows) and has been highly disturbed by grazing then the habitat to be cleared is not likely to be locally or regionally significant for the Powerful Owl.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Nesting boxes may be used in suitable adjacent habitat and fauna rescue procedures may be implemented where necessary. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.27 Masked Owl (*Tyto novaehollandiae*)

7.27.1 Description

The Masked Owl is a large, robust owl with distinctive black-bordered facial disc. They have a paler chest, legs and face with a darker back and wings and can vary from shades of white/cream through to dark brown, and the male is paler.

Masked Owls are sparsely distributed in coastal regions of Australia. In NSW they are recorded sporadically in the north-east along the coast and tablelands (NSW NPWS 2002b). The Masked Owl's range is restricted to no more than 300 kilometres from the coast (Lindsey 1992). The Masked Owl's distribution inland coincides with the western distribution of the River Red Gum (Gilmore and Parnaby 1994).

7.27.2 Conservation status

i. Local

There are no records of this species in the locality from the Atlas of NSW Wildlife (DEC (NSW) 2005a). One individual Masked Owl was detected in the study area during a recent survey (Resource Strategies 2005b). There are some large areas of habitat reserved in national parks where it has been recorded although most of the vegetation in the locality has experienced a high level of disturbance. Due to these clearing activities and relatively young age of regrowth there are only few hollows available for nesting for this species.

Even so, the Masked Owl is known to occur in the locality and is not at the edge of its distribution (^{NSW NPWS 1999g}). The local conservation status of this species is unknown.

ii. Regional

Due to the extensive clearing of woodland areas in this region the available habitat has been greatly reduced. This species sparsely distributed through much of Australia, though most numerous in coastal and near-coastal regions (NSW NPWS 1999g) and is not at the edge of its distribution however it probably has low abundance in the region. The conservation status of the Masked Owl is unknown.

iii. Threatened Species Status

- The Masked Owl (*Tyto novaehollandiae*) is listed as VULNERABLE on Schedule 2 of the TSC Act (NSW Scientific Committee 2004t).

The species is not listed under the EPBC Act.

iv. Key threatening processes listed under the NSW TSC Act 1995;

- Clearance of native vegetation;
- Removal of dead wood and dead trees;

Threats to this species include;

- Loss of mature hollow-bearing trees and changes to the structure of forests and woodland that lead to fewer such trees in the future;
- Clearing of habitat for grazing agriculture, forestry or other developments;
- Reduction in the number of prey through pesticide use; and
- Being hit by vehicles (NSW NPWS 2002b).

a. Contribution to threatening processes as a result of the proposal

- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site;
- Due to extensive clearing activities associated with cattle grazing there are a low number of hollowed trees remaining on the subject site. Most of the hollows that do remain are small, providing limited habitat for Masked Owl. The proposal will result in the removal of some of these hollowed trees;

- No pesticides will be used for the proposed transmission line; and
- Vehicle numbers will not be increased by the proposed transmission line.

v. *Threat Abatement Plans*

None are known

a. Relevance to the proposal

Unknown

vi. *Recovery Plans*

A draft recovery plan for large forest owl is also being prepared by the National Parks division of DEC

The main objectives of the plan are;

- To minimise further habitat fragmentation by encouraging protection and management of significant habitat. This will be achieved through the distribution of information packages to local councils and other public bodies to assist in the identification of suitable habitat for the Powerful Owl; encouraging Catchment Management Boards to protect existing habitat and securing management of large areas of owl habitat and nesting sites on private land through the liaison with private landowners;
- Minimise impacts of development activities on large owls through the use of set guidelines to identify and mitigate potential impacts of the project;
- Assess the distribution and amount of high quality habitat for owl species across public and private lands to estimate numbers of the species which are not protected; and
- Monitor trends in population parameters through the implementation of monitoring programs across various land tenures and disturbance histories.

a. Relevance to proposal

Unknown

vii. *Habitat requirements*

The Masked Owl lives in eucalypt forest/woodland, densely vegetated gullies and tall old growth trees or caves from sea level to 1100m. The species is also, though rarely, found in warm temperate to tropical rainforests; and occasionally in mangroves, Melaleuca swamps or streamside vegetation in woodlands.

This species is an opportunistic carnivore that preys on a broad range of arboreal and terrestrial mammals. It usually hunts close to the ground in fairly open habitats (Blakers et al. 1984). Masked Owls are forest owls but often hunt along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats.

The Masked Owl is known to nest in large hollow-bearing trees. Masked Owls are known to roost and breed in a range of habitats including moist eucalypt forested gullies, dry open forest and occasionally caves (NSW NPWS 2002b). It mates for life and maintains permanent territories. The male prepares the nest cavity in a tree hollow after which the female incubates 2-3 eggs usually hatching within 35 days and the young fledge at 75-80 days. They have large home ranges of 500 to 1000 hectares per pair, covering forested and partly open country.

7.27.3 Local and Regional Abundance

i. Local

Masked Owl was not recorded in the recent fauna surveys by Cumberland Ecology. Only one individual was recorded in twelve survey sites in Autumn and Spring surveys conducted by Mount King Ecological Surveys (Resource Strategies 2005b). Two records of Masked Owl occur in the DEC Wildlife Atlas with Mid Western Regional and Wellington LGAs. These records suggest there is a low abundance of Masked Owl in the locality.

ii. Regional

The regional abundance of the Masked Owl is unknown. There have been 2 records of Masked Owl within Goulburn River Nature Reserve in the region. The species has been recorded in several locations within the region although due to habitat fragmentation and clearance of hollow-bearing trees it is unlikely this species occurs in high numbers.

iii. Populations

a. Distribution of local populations of threatened species recorded from the study area

Not recorded

b. Other populations within the region

One population of Masked Owl is likely to occur in the region, however, it is unknown if other populations occur.

c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term.

d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares.

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Woodland birds are restricted to vegetated areas which provide shelter from predators by means of shrub cover. Therefore, depending on the width of the gap between these patches, connectivity for woodland birds would be poor as movement corridors. Where practical, the gaps between patches of woodland will be vegetated with native shrubs and grasses, which may increase connectivity for these species.

Where corridors are to be severed, native shrubs and grasses will be planted or retained beneath the transmission line where possible. This will maintain a vegetated movement/sheltered corridor within which woodland birds can travel to interconnected and proximate areas of habitat.

Woodland birds are likely to be restricted to movement corridors with continuous vegetation. The revegetation of narrow corridors between proximate patches of woodland will increase connectivity and act as movement corridors for this species. Therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area.*

This species would forage and roost in woodland/forest communities. See Section 4.5.2. and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture. As much of the woodland is regrowth (containing few hollows) and has been highly disturbed by grazing then the habitat to be cleared is not likely to be locally or regionally significant for the Masked Owl.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.28 Grey-crowned Babbler (*Pomatostomus temporalis temporalis*)

7.28.1 Description

As its name suggests this is a grey-crowned babbler – a passerine bird. Above, dark brownish grey; rump and tail, black, broadly tipped white. The wing is dark brownish grey, with concealed pale cinnamon-brown patch visible in flight.

The Grey-crowned Babbler is extinct in South Australia and the ACT. It is endangered in Victoria and is declining in NSW and south-east Queensland although it is common and widespread over the remainder of its range in Queensland (Garnett and Crowley 2000).

The breeding season of the Grey-crowned Babbler runs from June to December, with one to six eggs laid once or twice a year. The Grey-crowned Babbler breeds co-operatively in sedentary family groups of 2-13 birds, with the eggs being buried in the thick lining when the sitting bird leaves. The nest is a large, conspicuous untidy dome shaped with a spout-like entrance. There are two types that are constructed; one for nesting and a number of others for communal night roosting. Sticks and twigs with grass, soft bark, plant down, fur or feathers are used as a thick lining for the nest, which are often located in small saplings and trees from three to fifteen metres from the ground.

7.28.2 Conservation status

i. Local

The Grey-crowned Babbler has been recorded in the locality in low numbers. Neither Cumberland Ecology nor Mount King Ecological Surveys detected this species in recent surveys in the study area. Small woodland birds are highly dependent on remnant, continuous areas of habitat in the locality. There is more habitat available in the study area than in other parts of the region but it is still unlikely that this species is adequately reserved in the locality.

ii. Regional

The Grey-crowned Babbler occurs in four national parks within the region. The Grey-crowned Babbler may potentially utilise a high proportion of the habitat in the national parks in the region (approximately 97,00ha of habitat). Even so this only constitutes approximately 1% of the entire region. Like other woodland birds, this species has suffered from habitat clearance and fragmentation and it is unlikely that this species is adequately reserved in the region. In fact, it is likely that this species continues to decline in the region.

iii. *Threatened Species Status*

The Grey-crowned Babbler is listed as VULNERABLE on Schedule 2 of the TSC Act (NSW Scientific Committee 2004p).

The species is not listed under the EPBC Act.

iv. *Key threatening processes listed under the NSW TSC Act 1995;*

- Clearance of native vegetation

The Grey-crowned Babbler is at threat from the following:

- Fragmentation, which leads to smaller groups size, reduced breeding success, less effective immigration; and
- Emigration and stochastic events that affect small populations.

Once lost from a fragment, natural recolonisation by the species is unlikely (Garnett and Crowley 2000).

a. Contribution to threatening processes as a result of the proposal

- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site. The proposal will result in the fragmentation of some areas of woodland on the subject site.

v. *Threat Abatement Plans*

No relevant Threat Abatement Plans exist for this species

a. Relevance to proposal

Not applicable

vi. *Recovery Plans*

a. A Recovery Plan for this species has not been drafted or finalised.

b. Relevance to proposal

Unknown

vii. *Habitat requirements*

Grey-crowned Babblers occupy open forest and woodlands dominated by mature eucalypts, with regenerating trees, tall shrubs (*Acacia*), and an intact ground cover of grass and forbs. They occasionally stray into urban areas and rarely in coastal areas. The species spends much of the time on or near the ground, in communal groups feeding.

Grey-crowned Babblers are insectivorous and forage in leaf litter and on bark of trees, feeding on invertebrates taken from the ground or the trunks and foliage of the vegetation. They live in extended family parties, which are essential for both the co-operative feeding of young, and predator avoidance (Garnett and Crowley 2000).

7.28.3 Local and Regional Abundance

i. *Local*

Grey-crowned Babblers were not recorded in the recent fauna surveys by Cumberland Ecology and Mount King Ecological Surveys (Resource Strategies 2005b). There are seven DEC Wildlife Atlas records for the locality. Three records exist for this species from the Munghorn Gap Nature Reserve. Both Munghorn Gap Nature Reserve and Goulburn River National Park are likely to provide some habitat for this species in the locality. These records suggest there is a low abundance of Grey-crowned Babblers in the locality.

ii. *Regional*

Small woodland birds such as babblers are not expected to occur in large numbers in the region due to the extensive clearing and fragmentation of habitat that has occurred throughout this area. These activities have lead to a decline in bird populations, especially smaller woodland species. The Grey-crowned Babbler has been detected in four national parks in the region and overall it is likely to be in low numbers.

iii. *Populations*

a. Distribution of local populations of threatened species recorded from the study area

Not recorded

b. Other populations within the region

Grey-crowned Babblers have been recorded in four national parks in total (Weddin Mountains National Park, Ingalba Nature Reserve, Munghorn Gap Nature Reserve and Goulburn River National Park). At least 100 records exist for the population at Ingalba Nature Reserve (4012ha). Due to the isolated nature of these areas of habitat this could represent several populations.

c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term. Large patches of national parks in the region comprise of approximately 95,700ha. There are other areas of conserved habitat in national parks but due to the small patch size of these areas it is unlikely to provide suitable habitat for this species.

d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares. The large patches that will be affected by the proposal may be significant in that grazing and clearing have resulted in many small remnant patches throughout the region, with larger patches less frequent. All remaining patches of woodland, especially the larger patches, are significant habitat for woodland birds which have experienced serious declines in this region due to removal and fragmentation of habitat (Reid 1999). However, larger patches of habitat are better represented in the locality than in the region and the subject site (approximately 10 patches < 3,300 ha) would be less significant than other areas of habitat in the locality such as that found in Goulburn River National Park (70,161 ha) and Munghorn Gap Nature Reserve (5,935ha).

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement

corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as “stepping stones” to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Woodland birds are restricted to vegetated areas which provide shelter from predators by means of shrub cover. Therefore, depending on the width of the gap between these patches, connectivity for woodland birds would be poor as movement corridors. Where practical, the gaps between patches of woodland will be vegetated with native shrubs and grasses, which may increase connectivity for these species.

Where corridors are to be severed, native shrubs and grasses will be planted or retained beneath the transmission line where possible. This will maintain a vegetated movement/sheltered corridor within which woodland birds can travel to interconnected and proximate areas of habitat.

Woodland birds are likely to be restricted to movement corridors with continuous vegetation. The revegetation of narrow corridors between proximate patches of woodland will increase connectivity and act as movement corridors for this species. Therefore movement between large areas of habitat for this species will not be greatly impacted.

vi. Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area

This species would forage and nest in woodland/forest communities. See Section 4.5.2. and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. Location, nature and extent of habitat removal or modification that would result from proposed action

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km

easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture.

The proposal will result in the severance of several patches of habitat for the transmission line. Most of these patches are small and would not provide significant habitat for these species. However, 10 patches are larger and would provide some habitat for woodland birds such as the Grey-crowned Babbler. The fragmentation of these woodland areas is likely to reduce the quality of these areas for woodland birds and potentially lead to the further decline of this species in the locality.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.29 Speckled Warbler (*Pyrrholaemus sagittatus*)

7.29.1 Description

This is a small passerine bird – a streaked ground warbler with white face and white speckled crown. The species is distributed from south-eastern QLD, through central NSW to Victoria and it is more frequently encountered in inland than coastal areas (Barrett et al. 2003).

In NSW the Speckled Warbler occupies eucalypt and cypress woodlands on the slopes of the Great Dividing Range and with an extension of range into the cypress woodlands of the northern Riverina. Populations of the species also occur in the drier coastal areas (NSW Scientific Committee 2004x). The warblers build domed nests on the ground and usually lay 3-4 eggs (Beruldsen 1980, Tzaros 1996).

7.29.2 Conservation status

i. Local

The Speckled Warbler has been recorded in the locality in moderate numbers. Cumberland Ecology and Mount King Ecological Surveys both detected this species in reasonable numbers. Cumberland Ecology recorded 16 individuals at 5 towers. Mount King Ecological Surveys recorded two individuals. Small woodland birds are highly dependent on remnant, continuous areas of habitat in the locality. There is more habitat available in the study area than in other parts of the region but it is still unlikely that this species is adequately reserved in the locality.

ii. Regional

The Speckled Warbler occurs in eight national parks within the region. The Speckled Warbler may potentially utilise a high proportion of the habitat in the national parks in the region (approximately 97,00ha of habitat). Even so this only constitutes approximately 1% of the entire region. Like other woodland birds, this species has suffered from habitat clearance and fragmentation and it is unlikely that this species is adequately reserved in the region. In fact, it is likely that this species continues to decline in the region.

iii. Threatened Species Status

The Speckled Warbler is listed as VULNERABLE on Schedule 2 of the TSC Act (NSW Scientific Committee 2004x).

The species is not listed under the EPBC Act.

iv. Key threatening processes listed under the NSW TSC Act 1995;

The Speckled Warbler is at threat from clearance and fragmentation of habitat including removal of dead timber.

a. Contribution to threatening processes as a result of the proposal

- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site. The proposal will result in the fragmentation of some areas of woodland on the subject site.

v. Threat Abatement Plans

No relevant Threat Abatement Plans exist for this species

- a. Relevance to proposal

Not applicable

vi. *Recovery Plans*

- a. A Recovery Plan for this species has not been drafted or finalised.

- b. Relevance to proposal

Unknown

vii. *Habitat requirements*

The Speckled Warbler forages on the ground and in the understorey for arthropods and seeds (NSW Scientific Committee 2004x). This species is sedentary, living in pairs or trios and nests on the ground in grass tussocks, dense litter and fallen branches (NSW Scientific Committee 2004x).

7.29.3 Local and Regional Abundance

i. *Local*

Speckled Warblers were recorded in the recent fauna surveys by Cumberland Ecology and Mount King Ecological Surveys (Resource Strategies 2005b) (18 in total). There are 34 DEC Wildlife Atlas records for the locality. Twelve records exist for this species from the Munghorn Gap Nature Reserve. Both Munghorn Gap Nature Reserve and Goulburn River National Park are likely to provide some habitat for this species in the locality. These records suggest there is a moderate abundance of Speckled Warblers in the locality.

ii. *Regional*

Small woodland birds such as warblers are not expected to occur in large numbers in the region due to the extensive clearing and fragmentation of habitat that has occurred throughout this area. These activities have lead to a decline in bird populations, especially smaller woodland species. The Speckled Warbler has been detected in eight national parks in the region although they would be restricted to these patches of habitat and would be in relatively low numbers.

iii. *Populations*

- a. Distribution of local populations of threatened species recorded from the study area

A population of Speckled Warblers was detected at the subject site by Cumberland Ecology (16 sightings at 5 towers). Mount King Ecological Surveys also recorded two individuals. This species is also known to occur in the surrounding Munghorn Gap Nature Reserve and Goulburn River National Park. It is likely that this is one population but further information on the distribution of this population is unavailable.

- b. Other populations within the region

Speckled Warblers have been recorded in eight national parks in total. At least 112 records exist for the national parks in the region. Due to the isolated nature of these areas of habitat this could represent several populations.

- c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term. Large patches of national parks in the region comprise of approximately 95,700ha. There are other areas of conserved habitat in national parks but due to the small patch size of these areas it is unlikely to provide suitable habitat for this species.

- d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares. The large patches that will be affected by the proposal may be significant in that grazing and clearing have resulted in many small remnant patches throughout the region, with larger patches less frequent. All remaining patches of woodland, especially the larger patches, are significant habitat for woodland birds which have experienced serious declines in this region due to removal and fragmentation of habitat (Reid 1999). However, larger patches of habitat are better represented in the locality than in the region and the subject site (approximately 10 patches < 3,300 ha) would be less significant than other areas of habitat in the locality such as that found in Goulburn River National Park (70,161 ha) and Munghorn Gap Nature Reserve (5,935ha).

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as “stepping stones” to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Woodland birds are restricted to vegetated areas which provide shelter from predators by means of shrub cover. Therefore, depending on the width of the gap between these patches, connectivity for woodland birds would be poor as movement corridors. Where practical, the gaps between patches of woodland will be vegetated with native shrubs and grasses, which may increase connectivity for these species.

Where corridors are to be severed, native shrubs and grasses will be planted or retained beneath the transmission line where possible. This will maintain a vegetated movement/sheltered corridor within which woodland birds can travel to interconnected and proximate areas of habitat.

Woodland birds are likely to be restricted to movement corridors with continuous vegetation. The revegetation of narrow corridors between proximate patches of woodland will increase connectivity and act as movement corridors for this species. Therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

This species would forage and nest in woodland/forest communities. See Section 4.5.2. and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. *Potential Impact*

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture.

The proposal will result in the severance of several patches of habitat for the transmission line. Most of these patches are small and would not provide significant habitat for these species. However, ten patches are larger and would provide some habitat for woodland birds such as the Speckled Warbler. The fragmentation of these woodland areas is likely to reduce the quality of these areas for woodland birds and potentially lead to the further decline of this species in the locality.

b. *Ameliorative measures*

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.30 Diamond Firetail (Stagnopletra guttata)

7.30.1 Description

The Diamond Firetail is distributed through central and eastern NSW, extending north into southern and central Queensland and south through Victoria to the Eyre Peninsula, South Australia. The Diamond Firetail is a brightly coloured finch that occupies eucalypt woodlands, forests and mallee where there is a grassy understorey. Firetails build bottle-shaped nests in trees and bushes, and forage on the ground, largely for grass seeds and other plant material, but also for insects (Blakers *et al.* 1984, Read 1994).

7.30.2 1.1.2 Conservation status

i. Local

The Diamond Firetail has been recorded in the locality in moderate numbers. Cumberland Ecology and Mount King Ecological Surveys both detected this species in reasonable numbers. Cumberland Ecology recorded 2 individuals at 2 towers. Mount King Ecological Surveys recorded over 70 animals at 15 sites. Small woodland birds are highly dependent on remnant, continuous areas of habitat in the locality. There is more habitat available in the study area than in other parts of the region but it is still unlikely that this species is adequately reserved in the locality.

ii. Regional

The Diamond Firetail occurs in six national parks within the region. The Diamond Firetail may potentially utilise a high proportion of the habitat in the national parks in the region (approximately 97,00ha of habitat). Even so this only constitutes approximately 1% of the entire region. Like other woodland birds, this species has suffered from habitat clearance and fragmentation and it is unlikely that this species is adequately reserved in the region. In fact, it is likely that this species continues to decline in the region.

iii. Threatened Species Status

The Diamond Firetail is listed as VULNERABLE under Schedule 2 of the TSC Act. (NSW Scientific Committee).

The species is not listed under the EPBC Act.

iv. Key threatening processes listed under the NSW TSC Act 1995;

- Clearance of native vegetation

The Diamond Firetail is at threat from the following:

- Clearance and fragmentation of habitat;
- An increase abundance of predators such as Pied Currawongs and Australian Ravens may increase nest predation in fragmented woodland remnants (Major et al. 1996); and
- Overgrazing of the grass understorey.

a. Contribution to threatening processes as a result of the proposal

- Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland.

The proposal will involve the clearance of some of the woodland that occurs on the subject site. The proposal will result in the fragmentation of some areas of woodland on the subject site.

- The proposal may result in a minor increase in predators such as Pied Currawongs and Australian Ravens and this in turn may increase the risk of nest predation.
- The proposal will not lead to an increase in grazing of the understorey.

v. *Threat Abatement Plans*

No relevant Threat Abatement Plans exist for this species

a. *Relevance to proposal*

Not applicable

vi. *Recovery Plans*

A Recovery Plan for this species has not been drafted or finalised.

a. *Relevance to proposal*

Unknown

vii. *Habitat requirements*

This small woodland bird requires relatively undisturbed woodland/forest with a thick understorey within open eucalypt forests/woodlands, river red gums, mallee, buloke, cypress pine and acacia shrubs. It nests in eucalypt, citrus or mistletoe clumps (Pizzey and Knight 2003).

7.30.3 Local and Regional Abundance

i. *Local*

Diamond Firetails were recorded in the recent fauna surveys by Cumberland Ecology and Mount King Ecological Surveys (Resource Strategies 2005b) (76 in total). There are 27 DEC Wildlife Atlas records for the locality. Eight records exist for this species from the Munghorn Gap Nature Reserve. Both Munghorn Gap Nature Reserve and Goulburn River National Park are likely to provide some habitat for this species in the locality. These records suggest there is a moderate abundance of Diamond Firetails in the locality.

ii. *Regional*

Small woodland birds such as firetails are not expected to occur in large numbers in the region due to the extensive clearing and fragmentation of habitat that has occurred throughout this area. These activities have led to a decline in bird populations, especially smaller woodland species. The Diamond Firetail has been detected in six national parks in the region although overall it is likely to be in low numbers.

iii. *Populations*

a. Distribution of local populations of threatened species recorded from the study area

The Diamond Firetail is known to occur in the Munghorn Gap Nature Reserve and Goulburn River National Park. These may be two separate populations but it is more likely they form part of one population that also occurs on the subject site. It is unknown if this population extends beyond the national parks.

b. Other populations within the region

Diamond Firetails have been recorded in six national parks in total (Benambra National Park, Ingalba Nature Reserve, Ulandra Nature Reserve, Table Top Nature Reserve, Munghorn Gap Nature Reserve and Goulburn River National Park). At least 50 records exist for the population at Ingalba Nature Reserve (4012ha). Due to the isolated nature of these areas of habitat this could represent several populations.

c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term. Large patches of national parks in the region comprise of approximately 95,700ha. There are other areas of conserved habitat in national parks but due to the small patch size of these areas it is unlikely to provide suitable habitat for this species.

d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares. The large patches that will be affected by the proposal may be significant in that grazing and clearing have resulted in many small remnant patches throughout the region, with larger patches less frequent. All remaining patches of woodland, especially the larger patches, are significant habitat for woodland birds which have experienced serious declines in this region due to

removal and fragmentation of habitat (Reid 1999). However, larger patches of habitat are better represented in the locality than in the region and the subject site (approximately 10 patches < 3,300 ha) would be less significant than other areas of habitat in the locality such as that found in Goulburn River National Park (70,161 ha) and Munghorn Gap Nature Reserve (5,935ha).

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as “stepping stones” to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Woodland birds are restricted to vegetated areas which provide shelter from predators by means of shrub cover. Therefore, depending on the width of the gap between these patches, connectivity for woodland birds would be poor as movement corridors. Where practical, the gaps between patches of woodland will be vegetated with native shrubs and grasses, which may increase connectivity for these species.

Where corridors are to be severed, native shrubs and grasses will be planted or retained beneath the transmission line where possible. This will maintain a vegetated movement/sheltered corridor within which woodland birds can travel to interconnected and proximate areas of habitat.

Woodland birds are likely to be restricted to movement corridors with continuous vegetation. The revegetation of narrow corridors between proximate patches of woodland will increase connectivity and act as movement corridors for this species. Therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

This species would forage and nest in woodland/forest communities. See Section 4.5.2. and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture.

The proposal will result in the severance of several patches of habitat for the transmission line. Most of these patches are small and would not provide significant habitat for these species. However, ten patches are larger and would provide some habitat for woodland birds such as the Diamond Firetail. The fragmentation of these woodland areas is likely to reduce the quality of these areas for woodland birds and potentially lead to the further decline of this species in the locality.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.31 Regent Honeyeater (*Xanthomyza phrygia*)

7.31.1 Description

The Regent Honeyeater was once common in the woodlands of eastern Australia, particularly along the inland slopes of the Great Dividing Range. It once occurred as far west as Adelaide, and Kangaroo Island but has now disappeared from South Australia and western Victoria (NSW Scientific Committee 2004v). It also historically occurred within Dalby in Queensland and from the coast to the western slopes of the Great Dividing Range as far inland as Narrabri, Parkes and Warrumbungle National Park in NSW (Peters 1979).

The species distribution is now extremely patchy, with the population having declined to less than 1500 individuals (NSW NPWS 1997). There are now only a small number of known breeding sites in NSW, the most important of which are: Warrumbungles NP, Pilliga NR, Barraba district, central coast around Gosford, Hunter Valley, and Capertee Valley (NSW NPWS 1996, Ayers et al. 1996, NSW NPWS 1997).

The Regent Honeyeater is known from open forests and temperate eucalypt woodlands, particularly in blossoming eucalypts and mistletoe (Pizzey and Knight 2003). Most records of the species are from box-ironbark eucalypt associations, and wet lowland coastal forests dominated by Swamp Mahogany, Spotted Gum and Riverine Casuarina woodlands (NSW NPWS 1997). Portions of the study area habitats could therefore represent potential habitat for the species. Remnant stands of timber, roadside reserves, traveling stock routes and street trees also provide important habitat at certain times (Ayers et al. 1996).

7.31.2 Conservation status

i. Local

The Regent Honeyeater has been recorded in the locality in moderate numbers. Neither Cumberland Ecology nor Mount King Ecological Surveys detected this species in the study area. Small woodland birds are highly dependent on remnant, continuous areas of habitat in the locality. There is more habitat available in the study area than in other parts of the region but it is still unlikely that this species is adequately reserved in the locality.

ii. Regional

The Regent Honeyeater occurs in three national parks within the region. The Regent Honeyeater may potentially utilise a high proportion of the habitat in the national parks in the region (approximately 97,00ha of habitat). Even so this only constitutes approximately 1% of the entire region. Like other woodland birds, this species has suffered from habitat clearance and fragmentation and it is unlikely that this species is adequately reserved in the region. In fact, it is likely that this species continues to decline in the region.

iii. *Threatened Species Status*

The Regent Honeyeater is listed as ENDANGERED in Part 1 of Schedule 1 of the TSC Act (NSW Scientific Committee 2004v).

The Regent Honeyeater is also listed as ENDANGERED under the EPBC Act.

iv. *Key threatening processes listed under the NSW TSC Act 1995;*

The Regent Honeyeater is at threat from the following:

- Clearing, degradation and fragmentation of habitat, in particular logging of larger, mature trees that provide reliable nectar and nesting sites (NSW NPWS 2002b).
- a. Contribution to threatening processes as a result of the proposal
 - Most of the affected area has already been cleared from past grazing activities and most of the vegetation that would be affected by the proposal is grassland. The proposal will involve the clearance of some of the woodland that occurs on the subject site.
 - Due to extensive clearing activities associated with cattle grazing there are a low number of hollowed trees remaining on the subject site. Most of the hollows that do remain are small, providing limited habitat for Regent Honeyeater. The proposal will result in the removal of some of these hollowed trees.

v. *Threat Abatement Plans*

No relevant Threat Abatement Plans exist for this species

a. Relevance to proposal

Not applicable

vi. *Recovery Plans*

Not relevant

a. Relevance to proposal

Unknown

vii. *Habitat requirement*

Regent Honeyeaters feed on nectar and insects within box-ironbark eucalypt forests. When not breeding, birds roam widely in search of these unpredictable food sources (

NSW NPWS 1997). The most frequent nectar sources are 3 species of eucalypt; Red Ironbark, White Box and Yellow Box (Webster and Menkhorst 1992).

Nests are frequently located in Red Ironbark and Red River Gum but may also be in other Eucalypts, mistletoe clumps and Casuarinas. During the breeding season which occurs between July and November, 1-3 eggs are laid and incubated for a period of 12-15 days. Fledgling success may be dependent on the abundance of nectar from eucalypt flowers, predation and nests being damaged or blown down (Webster and Menkhorst 1992).

7.31.3 Local and Regional Abundance

i. Local

Regent Honeyeater were not recorded in the recent fauna surveys by Cumberland Ecology and Mount King Ecological Surveys (Resource Strategies 2005b). There are 100 DEC Wildlife Atlas records for the locality. Forty-six records exist for this species from the Munghorn Gap Nature Reserve. Both Munghorn Gap Nature Reserve and Goulburn River National Park are likely to provide some habitat for this species in the locality. These records suggest there is a moderate abundance of Regent Honeyeaters in the locality.

ii. Regional

Small woodland birds such as babblers are not expected to occur in large numbers in the region due to the extensive clearing and fragmentation of habitat that has occurred throughout this area. These activities have lead to a decline in bird populations, especially smaller woodland species. The Regent Honeyeater has been detected in three national parks in the region and overall it is likely to be in low numbers.

iii. Populations

a. Distribution of local populations of threatened species recorded from the study area

Not recorded.

b. Other populations within the region

Regent Honeyeaters have been recorded in three national parks in total (Ingalba Nature Reserve, Munghorn Gap Nature Reserve and Goulburn River National Park). The greatest number of records exists for Munghorn Gap Nature Reserve. The birds in the Munghorn Gap Nature Reserve and Goulburn River National Park are likely to be one population due to their proximity.

c. Long-term security of other habitats

Two nature reserves occur within the locality and comprise of nearly 80,000 ha; the Goulburn River National Park and the Munghorn Gap Nature Reserve. These areas are

secured in the long-term under management of the DEC and would contain significant areas of habitat for this species. A few other State Forest in the locality such as Cope State Forest and Curryall State Forest would contain areas of woodland although the security of these areas cannot be guaranteed in the long-term. Large patches of national parks in the region comprise of approximately 95,700ha. There are other areas of conserved habitat in national parks but due to the small patch size of these areas it is unlikely to provide suitable habitat for this species.

d. Significance of subject site in local context

The area of habitat for this species that will be lost as a result of the proposal is not significant compared to the large areas contained within local national parks and nature reserves. These areas are in the order of tens of thousands of hectares whereas the area to be removed by the proposal is less than one hundred hectares. The large patches that will be affected by the proposal may be significant in that grazing and clearing have resulted in many small remnant patches throughout the region, with larger patches less frequent. All remaining patches of woodland, especially the larger patches, are significant habitat for woodland birds which have experienced serious declines in this region due to removal and fragmentation of habitat (Reid 1999). However, larger patches of habitat are better represented in the locality than in the region and the subject site (approximately 10 patches < 3,300 ha) would be less significant than other areas of habitat in the locality such as that found in Goulburn River National Park (70,161 ha) and Munghorn Gap Nature Reserve (5,935ha).

iv. *Impact of the proposal on movement corridors (hectares cleared, corridor and other indirect impacts)*

Corridors are limited in the locality due to clearance of native vegetation for agricultural purposes. A corridor exists between the two large parks/reserves in the locality; Goulburn River National Park and the Munghorn Gap Nature Reserve, east of the south-eastern end of the proposed transmission line. The proposed transmission line will not sever this movement corridor.

Two major secondary corridors exist between these large conservation areas; these can be described as the eastern corridor and the central corridor. These broad movement corridors are made up of patches of vegetation which are proximate to large patches in State Forests or private land and connecting larger areas of habitat. These patches act as "stepping stones" to proximate habitat in the locality and region forming broad scale movement corridors in a general north-south direction. The proposed transmission line will pass between and through some of these patches, further severing connections.

The eastern corridor is the largest/widest movement corridor which is made up of large patches which will be intersected by the proposed Transmission line, generally occurring between tower numbers 15 and 91. A narrower central corridor exists between tower numbers 162 and 176 further to the west along the proposed transmission line, which will be intersected. Approximately 42 hectares of woodland in the eastern corridor and 7.8 hectares in the central corridor will be impacted by the Transmission line.

Woodland birds are restricted to vegetated areas which provide shelter from predators by means of shrub cover. Therefore, depending on the width of the gap between these patches, connectivity for woodland birds would be poor as movement corridors. Where practical, the gaps between patches of woodland will be vegetated with native shrubs and grasses, which may increase connectivity for these species.

Where corridors are to be severed, native shrubs and grasses will be planted or retained beneath the transmission line where possible. This will maintain a vegetated movement/sheltered corridor within which woodland birds can travel to interconnected and proximate areas of habitat.

Woodland birds are likely to be restricted to movement corridors with continuous vegetation. The revegetation of narrow corridors between proximate patches of woodland will increase connectivity and act as movement corridors for this species. Therefore movement between large areas of habitat for this species will not be greatly impacted.

v. *Description of type, location, size and condition of the habitat and details of distribution and condition of similar habitats in the region and study area*

This species would forage and nest in woodland/forest communities. See Section 4.5.2. and Section 4.5.3 for further details. All woodland in the study area is considered to be potential habitat, as mapped in Figures 6a-6o in Volume 3 of the EIS.

vi. *Location, nature and extent of habitat removal or modification that would result from proposed action*

The proposed transmission line will result in the clearance of foraging and potential roosting habitat within areas of woodland/forest. See Section 1.3.1 for further details.

a. Potential Impact

The potential impact of this proposal will arise from the removal and fragmentation of habitat. Less than one hundred hectares of woodland will be removed along the 117km easement. The large majority of the areas potentially affected by the proposal have already been cleared for agriculture.

The proposal will result in the severance of several patches of habitat for the transmission line. Most of these patches are small and would not provide significant habitat for these species. However, ten patches are larger and would provide some habitat for woodland birds such as the Regent Honeyeater. The fragmentation of these woodland areas is likely to reduce the quality of these areas for woodland birds and potentially lead to the further decline of this species in the locality.

b. Ameliorative measures

The proposed route for the transmission line has been selected specifically because of the low conservation and habitat value of the vegetation it affects compared to several other options (NSW NPWS 2003d). In order to minimise the impact of the proposal each site

will be inspected before construction for potential threatened species habitat. Where potential habitat is identified and further surveys verify the presence of threatened species then construction will not proceed without a Threatened Species Assessment or consideration of an alternative site. Flora and Fauna Management Protocols (comprising Fauna Protection Protocol, Hollow-bearing Tree Management Protocol, Protection of Habitat Protocol and Replanting and Rehabilitation Management Protocol) have been developed to further minimise the impact upon areas disturbed by the proposal. These protocols are provided in the EIS under the PEMP.

7.32 Dollarbird (*Eurystomus orientalis*)

This species is listed as a migratory species (overfly marine species) under the EPBC Act. The EPBC Act Administrative Guidelines on Significance identify that:

An action has, will have, or is likely to have a significant impact on a migratory species if it does, will, or is likely to:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species, or
- result in invasive species that is harmful to the migratory species becoming established* in an area of important habitat of the migratory species, or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.

The Dollarbird occupies various and wide-ranging habitats. These include the edges of rainforest, forest, woodland, watercourses, wetlands, country, farmlands and treed outer suburbs (Pizzey and Knight 2003). It is a summer breeding migrant from Papua New Guinea and Indonesia to coastal and eastern Australia. Its range extends past the Victorian border and west past the Kimberley coast in Western Australia. This species is highly unlikely to rely substantially on the habitats to be affected by the proposal. In fact, this species prefers sitting in high locations, such as on dead trees, and is highly likely to take advantage of the high viewing points provided by the towers and transmission lines.

It is considered unlikely that important habitat for this species would be substantially modified as a result of the proposal. Similarly, invasive species are not likely to be substantially encouraged by the proposal, nor is this species life cycle likely to be affected. As such, for this species, the proposal is unlikely to warrant further concern or specific ameliorative measures.

7.33 Rainbow Bee-eater (*Merops ornatus*)

This species is listed as a migratory species (overfly marine species) under the EPBC Act. The EPBC Act Administrative Guidelines on Significance identify that:

An action has, will have, or is likely to have a significant impact on a migratory species if it does, will, or is likely to:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species, or
- result in invasive species that is harmful to the migratory species becoming established* in an area of important habitat of the migratory species, or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.

The Rainbow Bee-eater occupies various and wide-ranging habitats. These include open woodlands with sandy loamy soil, sandridges, sandpits, riverbanks, road cuttings, beaches, dunes, cliffs, mangroves, rainforest, woodlands and golf courses (Pizzey and Knight 2003). It breeds October – February in sandy burrows or bank cuttings. It is a summer breeding migrant from Papua New Guinea, Northern Australia and Indonesia to coastal and eastern Australia. Its range covers nearly the entire Australian continent. This species is highly unlikely to rely substantially on the habitats to be affected by the proposal.

It is considered unlikely that important habitat for this species would be substantially modified as a result of the proposal. Similarly, invasive species are not likely to be substantially encouraged by the proposal, nor is this species life cycle likely to be affected. As such, for this species, the proposal is unlikely to warrant further concern or specific ameliorative measures.

Chapter 8

Impact Assessment for Endangered Ecological Communities

8.1 Impact of the Proposed transmission line

This chapter provides profiles on the endangered ecological communities that summarise the impacts the proposed transmission line would have upon them. It covers Sections 109 and 110 of the TSC Act.

A record of all TSC listed endangered ecological communities found in the locality is provided within this chapter. Each profile contains the following information in order to comply with the Sections 109 and 110 of the TSC Act:

i. Description

TSC (Section 110(3)(a)) - a general description of the ecological community present in the area that is the subject of the action and in any area that is likely to be affected by the action

ii. Conservation Status

TSC (Section 110(2)(b)) - for each ecological community present, details of its local, regional and State-wide conservation status, the key threatening processes generally affecting it, its habitat requirements and any recovery plan or any threat abatement plan applying to it,

iii. Impact Assessment: Assessment of Impacts to Habitat

TSC (Section 110(3)(c)) - a full description of the type, location, size and condition of the habitat of the ecological community and details of the distribution and condition of similar habitats in the region.

8.2 Impacts upon Endangered Ecological Communities

The following community profiles are provided for all endangered ecological communities occurring or potentially occurring within the study area for the Wollar to Wellington 330kV Transmission Line Project.

- Fuzzy Box Woodland; and
- White Box - Yellow Box – Blakely's Red Gum Woodland.

They have been based on Sections 109 and 110 of the TSC Act: (see 8.1 above)

8.3 Fuzzy Box Woodland

8.3.1 Description

i. Community Description

Fuzzy Box Woodland on alluvial soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South bioregions is a woodland or open forest usually dominated by Fuzzy Box *Eucalyptus conica*, growing alongside Inland Grey Box *Eucalyptus microcarpa*, Yellow Box *Eucalyptus melliodora* or Kurrajong *Brachychiton populneus*. Buloke *Allocasuarina luehmannii* is common in places.

Shrubs are generally sparse and include *Acacia deanei*, *Dodonaea viscosa*, *Geijera parviflora*, *Acacia implexa*, *Senna artemisioides* sens. lat., *Myoporum montanum* and *Cassinia aculeata*. Small shrubs include *Maireana microphylla* and *Sclerolaena muricata*.

Weeds may be very common at some sites. They include the forb species *Plantago lanceolata*, *Verbena bonariensis* and *Marrubium vulgare* and the grass species *Bromus diandrus*, *Vulpia myuros*, *Lolium perenne*, *Paspalum dilatatum* and *Hyparrhenia hirta*.

ii. Occurrence in the study area

Fuzzy Box Woodland is known to occur in two locations within the study area. This is associated with Wilpinjong Creek and near the Sandy Hollow-Maryvale Railway at the eastern extremity of the Transmission line route. The example of Fuzzy Box Woodland is highly disturbed and consists of mainly a small number of remnant trees. The understorey is not representative of the natural structure of this community. Heavy grazing in the area has led to low species diversity and the creek zone, particularly on the moist southern side has been completely invaded by weeds. Refer to Figures 6a to 6o in Volume 3 for the location of this community.

8.3.2 Conservation Status

i. Local

Within the study area the total species list of the community is large, but many species are present in only a few sites or in very low abundance. This community is not widely distributed in the study area. Mapping of vegetation type in the locality has not been undertaken. The local conservation status of this EEC is therefore unknown.

ii. Regional

Fuzzy Box Woodland is not widely conserved in NSW. The community is poorly conserved within the nature conservation system, but is found within Weddin Mountains National Park. This is particularly important for this community as it is not conserved anywhere else in NSW (NSW Scientific Committee 2004m). Mapping of vegetation type in the region has not been undertaken. The regional conservation status of this EEC is therefore unknown.

iii. State-wide

Fuzzy Box has been listed as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 1 of the Act. Listing of endangered ecological communities is provided for by Part 2 of the Act (NSW Scientific Committee 2004m).

iv. Key Threatening Processes

- Clearance of Native Vegetation
- Invasion of native plant communities by exotic perennial grasses.

v. Threat Abatement Plans

Not relevant.

vi. Recovery Plans

There is currently no Recovery Plan for this EEC listed by the National Parks division of the DEC.

8.3.3 Impact Assessment: Assessment of Impacts to Habitat

i. Description of Habitat Values & Disturbance History

Fuzzy Box Woodland on alluvial soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South bioregions occurs on brown loam or clay, alluvial or colluvial soils on prior streams and abandoned channels or slight depressions on the undulating plains or flats of the western slopes of the Great Dividing Range. This community often occurs upslope from River Red Gum communities, just above frequently inundated areas on the floodplain. It also occurs on colluvial soils on lower slopes and on valley flats.

Less than 5% of Fuzzy Box Woodland on alluvial soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South bioregions is estimated to remain compared to pre-European times due to past clearing (NSW Scientific Committee 2004m, Phillips and Callaghan 1996). While broadscale clearing has now largely ceased in these areas, clearing of isolated paddock trees and further clearing of remnants remain threats.

ii. Extent of Habitat Removal and Conservation by Proposal

Fuzzy Box Woodland was recorded in the proximity of two of the proposed tower locations, 40 and 28.2, within the subject site. Both tower locations occur in cleared areas close to a riparian zone, where the woodland occurs. The proposed transmission line will result in the clearance or modification of less than 0.3 hectares of Fuzzy Box Woodland. Areas of this community may be conserved in the study area and within the Transmission line easement where understorey vegetation may be retained.

iii. Other Indirect Impacts

Edge-effects from clearance in the easement.

8.4 White Box Yellow Box Blakely's Red Gum Woodland

8.4.1 Description

i. Community Description

White Box Yellow Box Blakely's Red Gum Woodland includes those woodlands where the characteristic tree species include one or more of the following species in varying proportions and combinations - *Eucalyptus albens* (White Box), *Eucalyptus melliodora* (Yellow Box) or *Eucalyptus blakelyi* (Blakely's Red Gum). Grass and herbaceous species generally characterise the ground layer. Shrubs are generally sparse or absent, though they may be locally common.

Box –Gum Woodlands occur on the western slopes of NSW from Victoria to Queensland.

Where past clearing and tinning have occurred, the canopy may be absent. In areas where grazing and other disturbance has occurred, the understorey species composition may have changed, as some of the native species seem to be intolerant to grazing (NSW Scientific Committee 2004c1).

ii. Occurrence in the study area

This broad community classification includes a number of communities which have been identified as occurring in the study area. These communities include:

- Yellow Box – Blakely's Red Gum;
- Yellow Box – White Box;
- White Box – Inland Grey Box;
- White Box;
- White Box – Red Gum;
- White Box – Red Stringybark; and
- Blakely's Red Gum.

These vegetation communities are generally described as being part of the "Yellow Box league". Details of these communities are provided in Chapter 4. Refer to Figures 6a to 6o in Volume 3 for the location of this community.

8.4.2 Conservation Status

i. Local

This EEC occurs as 7 communities making up a League, which are widely distributed in the study area. Mapping of vegetation type in the locality has not been undertaken. The local conservation status of this EEC is therefore unknown.

ii. Regional

The community is poorly represented in conservation reserves. There are small occurrences of White Box Yellow Box Blakely's Red Gum Woodland in Goobang National Park and Goulburn River National Park in the region.

The regional conservation status is unknown.

iii. State-wide

White Box Yellow Box Blakely's Red Gum Woodland as an ENDANGERED ECOLOGICAL COMMUNITY on Part 3 of Schedule 1 of the TSC Act (NSW Scientific Committee 2004c1).

The vegetation communities in the study area, listed above, which are part of this EEC listing under the TSC Act are grouped into two communities (as shown in Table 4.1) listed under the EPBC Act 1995:

Grassy White Box Woodlands is nominated to be added as and Endangered Ecological Community to Schedule 2 of the Endangered Species Protection Act 1992 (ESP Act); and (Lunney et al. 1989, DEH 2005a).

Yellow Box/Red Gum Grassy Woodland is a nominated ecological community for listing under the EPBC Act (DEH 2005b).

These communities are described in Chapter 4

iv. Key Threatening Processes

- Clearance of Native Vegetation

Threats to this community include:

- Feral predators within the woodland.

v. *Threat Abatement Plans*

Not relevant.

vi. *Recovery Plans*

There is currently no Recovery Plan for this EEC listed by the National Parks division of the DEC.

8.4.3 Impact Assessment: Assessment of Impacts to Habitat

i. *Description of Habitat Values & Disturbance History*

White Box Yellow Box Blakely's Red Gum Woodland is found on relatively fertile soils on the tablelands and western slopes of NSW and generally occurs between the 400 and 800 mm isohyets extending from the western slopes, at an altitude of c. 170m to c. 1200 m, on the northern tablelands (NSW Scientific Committee 2004c1)

Sites where the Yellow Box League was recorded all had introduced species recorded in the ground layer but across a wide range of densities. Ten out of the sixteen sites of this league had 10% or less weed species in the ground layer and the other sites varied from 30-80%. The presence of weeds in the ground cover at these sites reflects the pastoral use of the study area.

All communities have experienced grazing and many have been cleared or partially cleared in the past.

ii. *Extent of Habitat Removal and Conservation by Proposal*

Communities of the Yellow box league occur at many locations along the proposed Transmission line. A total of approximately 56.8 hectares of White Box Yellow Box Blakely's Red Gum Woodland will be removed or modified. Areas of this community may be conserved in the study area and within the Transmission line easement where understorey vegetation may be retained.

iii. *Other Indirect Impacts*

Edge-effects from clearance in the easement.

Chapter 9

Amelioration

9.1 Mitigation Measures and Long-term Management Strategies

TSC Act (Section (2)(h)) - A description of any feasible alternatives to the action that are likely to be of lesser effect and the reasons justifying the carrying out of the action in the manner proposed, having regard to the biophysical, economic and social considerations and the principles of ecologically sustainable development

DGR 3.1 - In discussing alternatives to the proposal, and the measures proposed to mitigate the effect of the proposal, consideration shall be given to developing long term management strategies to protect areas within the study area which are of particular importance for the subject species. This may include proposals to restore or improve habitat.

9.1.1 Previous Alignment Option Investigation

Full investigations of feasible alternatives to the proposed transmission line have been conducted by TransGrid and contractors since 1999. Volume 1 Chapter 3 provides a background to the planning process undertaken and presents the alternatives considered, including alternative power sources and routes for the transmission line.

A Corridor Selection Report (ERM 2003) identified feasible corridor routes for the transmission line. The preferred alignment was chosen based on having the least negative impact on environmental and social values. Specifically, the preferred alignment was identified as having the least impact upon remnant patches of native vegetation and habitats.

A summary of mitigation measures can be found in Volume 1 Table 8.1.

A Preliminary Environmental Management Plan (PEMP) has been prepared and forms part of the EIS.

9.1.2 Tower Location Impact Investigation

Following the selection of the alignment resulting in the least impact, further analysis was undertaken by TransGrid to determine the amount of clearing of forested areas actually required as a result of the proposal. Although it could, at first glance, be expected that all patches through which the transmission line runs would be totally cleared and / or substantially altered, this is not the case.

TransGrid looked specifically at the topographical relationship of the tower locations when compared to the patch locations. In simple terms, not all of the remnant vegetation underneath the powerlines needs to be cleared or altered, as the lines will clear the top of the tree canopy in various locations. These locations primarily consist of valleys or depressions where towers are located on rises, crests or hills.

TransGrid determined that the actual area of clearing was 97.5ha. This compares to the initial impact area calculated by GIS analysis of 130.1ha. In summary, although it was assumed during the initial alignment option investigation that an area roughly equivalent to the 130.1ha figure would be impacted, this has been reduced by an estimated 25% (32.6ha) as a result of the TransGrid additional tower location impact investigation.

9.1.3 Fauna Rescue and Pre-clearance Surveys

During the construction phase, when trees and other vegetation will be cleared, native fauna rehabilitation and protection will be considered. The aim of this protocol is to provide for the protection and humane removal of any native fauna disturbed by the clearance operation.

The majority of trees in the study area are regrowth and lack tree hollows. For this reason, it is not anticipated that much wildlife will be disturbed by the minimal clearance operation. Animals such as birds are expected to move away from the areas to be cleared and are not expected to need human assistance to move to safe areas. However, there is still some potential for a variety of less mobile native fauna to be impacted by the clearance and to need to be moved to safe areas.

Provisions will be made to protect such immobile native fauna by the following means:

- All persons working on the transmission line construction will be briefed about the possible fauna present at the time of construction, and what procedures should be undertaken in the event of an animal being injured or disturbed;
- A qualified animal rescue person will be on call at all times during clearing;
- Immediately prior to clearing a brief pre-clearance survey will be made for immobile animals that could be killed or injured by the felling of trees. The inspection will be made by a suitably qualified person;
- If any such animals are detected within trees, the trees will not be cleared until the animals have moved from the trees of their own volition;

- Animals disturbed or dislodged during the clearance but not injured will be assisted to move to vegetation close by that is identified for retention; and
- If animals are inadvertently injured during the vegetation clearance the wildlife carer will be responsible for taking appropriate steps to humanely treat the animal.

9.1.4 Nest Box Erection

Nest boxes will be utilised to compensate for the loss of either:

- Trees with hollows that require removal as a result of tower construction / transmission line location; or
- Trees with potential to form hollows within the easement location.

The nest boxes will be of various sizes and contain various sized openings. Such design features provide habitat for a various range of threatened and non-threatened fauna. However, selection of nest boxes will be aimed at providing compensatory habitat for the following threatened fauna known or considered likely to occur within the subject site and / or study area:

- Squirrel Glider (*Petaurus norfolcensis*);
- Bats including Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Eastern Freetail-bat (*Mormopterus norfolkensis*), Greater Long-eared Bat (*Nyctophilus timoriensis*) and Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*);
- Brown Treecreeper (*Climacteris picumnus victoriae*); and
- Other threatened avifauna including Glossy Black Cockatoo (*Calyptorhynchus lathami*), Turquoise Parrot (*Neophema pulchella*), Barking Owl (*Ninox connivens*), Masked Owl (*Tyto novaehollandiae*) and Powerful Owl (*Ninox strenua*).

Although various types of nest boxes are proposed to be used, the most important nest boxes will be for the Brown Treecreeper, Glossy Black Cockatoo and threatened bats, which are definitely known to occur along the transmission line. Squirrel Gliders have also been targeted despite not being recorded by Cumberland Ecology, as they are known to occur in the locality (Resource Strategies 2005b).

Nest boxes are to be placed within the study area in the largest woodland patches. Such patches would be likely to provide more security for species that would potentially inhabit the nest boxes. This is particularly so for species such as the Brown Treecreeper, which is known to prefer large contiguous patches as its habitat.

9.1.5 Regional Conservation Measures

At locations to be determined, TransGrid will provide compensatory habitat for the subject species determined to be affected by the proposal on a like for like basis via tree planting and rehabilitation. This will benefit not only the subject species determined to be affected, but also a wide range of other common native species. This will result in an area of approximately 97.5 ha of native vegetation being regenerated in the locality. Such rehabilitation could extend upon existing patches, increasing patch sizes, and in some instances improve connectivity in the locality.

9.1.6 Site-specific Conservation Measures

At two locations along the transmission line certain threatened species have been recorded, for which the terrestrial environment is very important. These species were:

- *Goodenia macbarronii*; and
- Stripe-faced Dunnart.

Goodenia macbarronii was found at Tower 91. For this species, the tower location was moved so as to avoid clearing known habitat of this species. In addition, it is proposed to have a reduced level of understorey management near Tower 91 to maintain north-south connectivity between the areas of habitat for this species. The understorey will be allowed to grow such that shrubs can grow to provide shelter in this location (i.e. slashing will not occur).

The Stripe-faced Dunnart was recorded near Tower 207. In this area, a reduced level of understorey management will occur similarly to that which will happen for *Goodenia macbarronii*. This will allow for increased shelter to protect this species from predators (such as foxes and owls) when moving across the transmission line between patches of habitat.

9.2 On-going Monitoring Programs

TSC Act (Section (2)(i)) - a full description and justification of the measures proposed to mitigate any adverse effect of the action on the species and populations, including a compilation (in a single section of the statement) of those measures.

DGR 3.2 - Any proposed on-going monitoring of the effectiveness of the mitigation measures shall be provided.

The potential impacts on flora and fauna values include;

- The clearing of approximately 97.5 ha of vegetation; and

- Potential impacts on some native fauna, particularly woodland birds, arising from habitat removal.

The removal of the vegetation will further reduce the biological resources within the NSS bioregion, however the loss of vegetation in the subject area will be fully compensated by rehabilitation of degraded land and improving faunal corridors by linking of remnant vegetation in TransGrid's state-wide sustainability and habitat compensation package. This package includes the rehabilitation of 380 ha of degraded land and the planting of 100,000 trees per year (equivalent of 142ha/annum), some of which will be dedicated in the locality of the transmission line in the NSS bioregion. On-going monitoring of such rehabilitation works occurs on a regular basis.

Chapter 10

Additional Information

10.1 List of Additional Approvals

TSC Act (Section 110(2)(j)) - A list of any approvals that must be obtained under any other Act or law before the action may be lawfully carried out, including details of the conditions of any existing approvals that are relevant to the species or population.

DGR 4.1 - In providing a list of other approvals the following shall be included;

- *any consent required under Part 4 of the Environmental Planning and Assessment Act 1979 including the name of the consent authority and when it is proposed to make the development application; or*
- *any approvals required under Part 5 of the Environmental Planning and Assessment Act 1979 including the name of the determining authority(ies), the basis for the approval and when these approvals are proposed to be obtained.*

10.1.1 Approval Required under EPBC Act

A Referral has already been completed and sent to DEH for assessment. The Referral states that the proposal will be a controlled action. Further documentation will be required to be supplied to DEH as part of the assessment process under the EPBC Act.

At the time that the Referral was prepared, a number of threatened species and communities listed under the EPBC Act as well as the TSC Act were located within the study area or considered to have potential habitat of note. In summary, these consisted of:

- White Box Grassy Woodland (endangered);
- *Goodenia macbarronii* (vulnerable) ;
- Regent Honeyeater (endangered);
- Swift Parrot (endangered);
- Rainbow Bee Eater (migratory – overfly marine area); and
- Dollarbird (migratory – overfly marine area).

It is however recognised that following this SIS preparation and submission, additional species with potential habitat may need to be included. Such information is to be assessed via the next step in the assessment process (likely to be Preliminary Documentation).

10.1.2 Other Approvals

Other approvals are required for the proposal. These have been outlined separately in the accompanying Volume 1 of the EIS. Please refer to Volume 1 for additional information in this regard.

Chapter 11

Conclusion

The construction and operation of the proposed 330kV Transmission Line from Wollar to Wellington will necessitate some clearing of native vegetation and other fauna habitats such as rocky outcrops that form habitat for threatened flora and fauna. The proposed 117 km transmission line has a 60 metre wide easement and totals 724 hectares (ha), of which 600 ha is cleared land and 115 ha retains some form of woodland. Of the woodland that occurs, approximately two thirds consists of dense woodland and one third consists of open woodland with wide spaces between the trees.

Clearance of some areas of Yellow Box – Blakely's Red Gum Woodland (including EPBC Grassy White Box Woodland and EPBC Yellow Box/Red Gum Grassy Woodland) will occur, as indicated in the Table S.1 below. Although some areas are required to be cleared, overall it can be seen from the data in this table that the vast majority of occurrence of these EECs within the study area will not be cleared.

Table 11.1 SUMMARY OF IMPACTS TO ENDANGERED ECOLOGICAL COMMUNITIES (EECS)

EPBC Act EEC	TSC Act EEC	Community Name	Mapped Vegetation in Study Area	Vegetation in Subject Site	No. of Towers Impacted	Area cleared (ha)
YRG	WYG	Yellow Box - Blakely's Red Gum (community 6)	463.8	20.6	12	15.4
YRG	WYG	Yellow Box - White Box (community 7)	178.6	10.9	9	8.2
YRG	WYG	Blakely's Red Gum (community 11)	24.7	2.8	1	2.1
GW	WYG	White Box - Inland Grey Box (community 8)	1037.3	17.6	6	13.2
GW	WYG	White Box (community 9)	689.7	23.4	8	17.5
GW	WYG	White Box - Red Stringybark (community 10)	14.3	0.5	2	0.4
	FB	Fuzzy Box Woodland (community 13)	11.7	0.5	2	0.3

Key: EPBC Act EECs: YRG = Yellow Box/Red Gum Grassy Woodland, GW = Grassy White Box Woodlands.
TSC Act EECs: WYG = White Box Yellow Box Blakely's Red Gum Woodland, FB = Fuzzy Box Woodland

The proposed transmission line route will also result in impacts to variety of threatened species and the key impacts are as follows:

- Protection of Narrow Goodenia (*Goodenia macbarronii*) in area of identified occurrence;
- Removal of open forest and woodland habitat that for a variety of threatened vertebrate fauna determined to be affected by this SIS including Squirrel Glider, Koala, Large-eared Pied Bat, Eastern False Pipistrelle, Eastern Bentwing-Bat, Little Bentwing-bat, Eastern Freetail-bat, Greater Long-eared Bat, Yellow-bellied Sheath-tail Bat, Glossy Black-cockatoo, Brown Treecreeper, Painted Honeyeater, Swift Parrot, Square-tailed Kite, Hooded Robin, Black-chinned Honeyeater, Turquoise Parrot, Barking Owl, Powerful Owl, Masked Owl, Grey-crowned Babbler, Speckled Warbler, Diamond Firetail and Regent Honeyeater.

As a result of the clearing other indirect impacts are possible and these have been assessed in the SIS / EIS. Such key potential impacts include:

- Fragmentation of larger patches of habitat into smaller patches of habitat;
- Edge effects;
- Weed invasion;
- Feral animal incursion (cats, foxes, rabbits, etc)
- Bush rock removal;
- Infection of native parrots by *Psittacine circoviral* disease;
- Infection of native plants by *Phytophthora cinnamomi*;
- Introduction of Fire ants;
- Erosion from and/or sedimentation into existing habitats;
- Alteration to the natural flow regimes of rivers, streams and floodplains;
- Removal of dead wood and dead trees;
- Competition from feral honeybees; and
- Alteration of the fire regime.

A range of mitigation measures has been developed to address the predicted impacts to native flora and fauna and to provide for no net loss of biodiversity as a result of the project. Firstly, the route has been chosen to avoid the majority of woodland in the study

area. This has occurred via a detailed constraints analysis and community consultation process. Secondly, in many locations the position of a tower site has been chosen on environmental merit over visual and social merit. TransGrid determined that the actual area of clearing was 97.5ha as a result of fine tuning some tower locations. This compares to the initial impact area calculated by GIS analysis of 130.1ha. In summary, although it was assumed during the initial alignment option investigation that an area roughly equivalent to the 130.1ha figure would be impacted, this has been reduced by an estimated 25% (32.6ha) as a result of the TransGrid additional tower location impact investigation.

Other proposed mitigation measures that will be implemented along the easement include fauna rescue and pre-clearance surveys, erection of species-specific nest boxes, and reduction in the level of disturbance underneath the transmission line in areas where the threatened species *Goodenia macbarronii* and Stripe-faced Dunnart were recorded.

In addition to the mitigation measures proposed along the easement, TransGrid will provide compensatory habitat for the subject species determined to be affected by the proposal on a "like for like" basis via financial support for tree planting and rehabilitation schemes, particularly those that provide for White Box – Yellow Box – Blakely's Red Gum Woodland. This will benefit not only the subject species determined to be affected, but also a wide range of other common native species. This will result in an area of approximately 97.5 ha of native vegetation being regenerated in the locality. Such rehabilitation could extend upon existing patches, increasing patch sizes, and in some instances improve connectivity in the locality.

The proposed transmission line will clear approximately 97.5 hectares of woodland and related habitats within the proposed 60 metre wide Transmission Line easement and associated auxiliary infrastructure. In comparison, the combined area (including grassland) to be impacted by the proposed 330kV Transmission Line development is approximately 724 hectares.

The proposed transmission line will result in clearance of habitat of threatened fauna species and endangered ecological communities that are listed on both the NSW TSC Act and the Commonwealth EPBC Act. However, woodland habitat will remain extensive within the locality and the proposed mitigation measures have been formulated to provide for no net loss of such habitats from the locality in the long term.

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