SPECIES IMPACT STATEMENT

Old Cooma Road Realignment and Duplication Queanbeyan

Prepared for
Brown Consulting & Queanbeyan City Council

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Definitions

Activity	as defined in the *Environmental Planning & Assessment Act 1979* (EP&A Act).
BES	Bushfire and Environmental Services Pty Ltd.
DEC	Department of Environment and Conservation.
DECC	Department of Environment and Climate Change.
DECCW	Department of Environment, Climate Change and Water.
Development	as defined in the EP&A Act.
DEWHA	Department of Environment, Water, Heritage and the Arts.
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
EEC	Endangered Ecological Community.
ELA	Eco Logical Australia Pty Ltd.
EPBC Act	*Commonwealth Environmental Protection and Biodiversity Conservation* Act 1999.
EP&A Act	*Environmental Planning and Assessment* Act 1979.
LGA	Local Government Area
Locality	is the area within a 10 km radius of the site.
NV Act	NSW *Native Vegetation* Act 2003
QCC	Queanbeyan City Council
SIS	Species Impact Statement, as defined under the EP&A Act
Study area	is the subject site and any additional areas that have the potential to be significantly affected by the proposal, either directly or indirectly.
Subject site	means the area directly affected by the proposal.
Subject species	means those threatened species that are known or considered likely to occur in the study area.
The proposal	is the development, activity or action proposed as described in Section 1.3 of the report.
TSC Act	NSW *Threatened Species Conservation* Act 1995.

All other definitions are the same as those contained in the TSC Act.

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Executive Summary

This Species Impact Statement (SIS) was prepared by Eco Logical Australia Pty Ltd (ELA) for Brown Consulting Pty Ltd on behalf of Queanbeyan City Council (the client) to consider potential impacts on threatened species, populations and ecological communities associated with the proposed upgrading and realignment of Old Cooma Road between Karabar and Googong, south of Queanbeyan.

The purpose of this SIS is to evaluate the impacts of the proposal on threatened flora, fauna and ecological communities and to recommend measures to mitigate these impacts pursuant to the Threatened Species Conservation Act 1995 (TSC Act). The scope of the SIS was defined by the Director General's requirements (DGRs), issued by the Department of Conservation and Climate Change (DECC) (now Department of Environment, Climate Change and Water) on 20 December 2007. The DGRs listed the following as subject species or communities:

- White Box, Yellow Box, Blakely's Red Gum Woodland (Box-Gum Woodland);
- Button Wrinklewort;
- Silky Swainson Pea;
- Little Whip Snake;
- Golden Sun Moth;
- Pink-tailed Worm-lizard;
- Rosenberg's Goanna;
- Brown Treecreeper;
- Diamond Firetail;
- Hooded Robin;
- Speckled Warbler; and
- Eastern False Pipistrelle.

Further correspondence from the Department on 22 January 2010, in relation to the Commonwealth/NSW bilateral assessment process and EPBC Act considerations, listed the following as subject species and communities:

- Hoary Sunray; and
- Natural temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory.

Proposal & background

The proposed upgrades to Old Cooma Road affect an area approximately 4,800m in length from the intersection with the future Edwin Land Parkway to the intersection with Googong Dam Road, as shown in Figure 1. The proposal is planned in two stages, culminating in the realignment and duplication of the road to form a four lane, dual carriageway in approximately 2027. Stage 1 involves the construction of a new section of road to bypass a winding section of road adjacent to Cooma Road Quarry. Stage 2 of the proposal generally follows the existing road alignment, and

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duplicates the current two lane road to the north and south of Stage 1. Stage 1 of the proposal has been subject to previous flora and fauna investigations (BES 2007a), which identified that the removal of the State listed White Box, Yellow Box, Blakely's Red Gum Woodland (Box-Gum Woodland) endangered ecological community (EEC) would trigger the need for a Species Impact Statement. The Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) listed White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland) EEC and endangered Hoary Sunray *Leucochrysum albicans* were also recorded within the footprint of Stage 1, and a referral to the Commonwealth Minister for the Environment was recommended (BES 2007a).

Study area

The study area for this SIS incorporated a 100m buffer from the centre of the proposed alignment but also extended for up to 1,300m from the road in some intact habitats. Much of the 226 ha study area had been subject to a range of previous disturbances, particularly the subject site (development footprint), which was degraded by the existing road corridor and rural land uses. Land adjoining the subject site is predominantly rural and rural residential freehold land, although substantial areas in parts of the northern and southern sections are relatively intact Crown land. The areas of Crown land were found to possess substantial habitat connectivity and threatened fauna values.

Survey results

Additional targeted surveys for flora and fauna were undertaken between October 2008 and July 2009, in line with the DGRs requirements. Using the classifications of Fallding (2002), the study area was found to support three vegetation communities: Dry Forest; Box-Gum Woodland; and Woodland Grassland Mosaic. The Box-Gum Woodland community in the study area and subject site meets the definition of the Box-Gum Woodland EEC under both the TSC Act and EPBC Act.

No State listed threatened flora species were recorded within the study area, although further locations of the Commonwealth endangered flora species Hoary Sunray were recorded.

Targeted fauna surveys recorded two threatened woodland birds; the Speckled Warbler and Turquoise Parrot, both listed as vulnerable under the TSC Act. The study area was known to contain previous records of the threatened Brown Treecreeper and Rosenberg's Goanna, also listed as vulnerable under the TSC Act.

Impacts

The proposal will directly affect approximately 21.5 ha of land and result in the removal of approximately 17.2 ha of native vegetation, including 5.5 ha of Box-Gum Woodland as defined by the TSC Act and the EPBC Act.

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Vegetation to be removed includes approximately 6 ha of habitat for the Speckled Warbler Rosenberg's Goanna, Brown Treecreeper and Turquoise Parrot. The habitats to be affected include potentially important habitat components for threatened fauna such as 15 hollow-bearing trees and 20 termite mounds.

The upper reaches of two ephemeral creeks that drain to Barracks Creek in the northwest of the study area will be substantially modified by the proposal, although they are both currently disturbed to varying degrees.

Indirect impacts such as edge effects are limited in scope within the surrounding extensively cleared rural land, although they are more pronounced in areas of intact vegetation. Increased injury or mortality from an eventual increase in vehicle numbers and wider road corridor has the potential to adversely affect a range of fauna, including Rosenberg's Goanna.

Proposed mitigation measures

To compensate for the loss of Box-Gum Woodland and threatened species, an offset strategy will be negotiated by Queanbeyan City Council and DECCW. An offset plan is currently being prepared for a parcel of land to the west of the proposal containing 129 ha of Box-Gum Woodland (NGH Environmental 2010).

On site mitigation measures for fauna include the provision of fauna underpass structures in habitat corridors (particularly for Rosenberg's Goanna) and enhancement of habitat around these areas; lowering the road level at one or more corridor points to afford greater clearance for overflying birds; pre-clearance surveys and removal of affected animals; and selected reuse of tree hollows, logs and bush rock in adjacent habitats where appropriate.

Other on site mitigation measures include designing the proposal to minimise direct impacts to threatened biota where possible; rehabilitation of disturbed edges; stabilisation of exposed soils; erosion and sediment controls; temporary fencing of adjacent vegetation; and induction programs for construction personnel. Advisory signs for motorists and maintenance of the (70km/h) speed limit through the corridor north of Wickerslack Lane may help to mitigate impacts to larger fauna species crossing the road, including Rosenberg's Goanna. Mitigation measures will also involve long-term monitoring and management strategies where appropriate, particularly in adjacent habitats of high conservation value.

Conclusion

The loss of Box-Gum Woodland equates to approximately 0.2% of the community in the Queanbeyan Local Government Area and this loss will be offset by the protection and management of up to 129 ha of Box-Gum Woodland nearby. With the offset land, an assessment of significance has concluded that the impacts to Box-Gum Woodland are not significant. Assessments of significance for threatened

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fauna species have concluded that the impacts to the Speckled Warbler and Rosenberg's Goanna may be significant according to the definitions in those assessments.

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PREFACE

This Species Impact Statement has been prepared by Eco Logical Australia Pty Ltd in accordance with the requirements of Sections 109 and 110 of the NSW *Threatened Species Conservation Act 1995* and with regard to the requirements as notified by the Director General of the Department of Environment and Conservation in correspondence dated 20th December 2007 and 22 January 2010.

David Coombes
Senior Ecologist
Eco Logical Australia Pty. Ltd. ACN: 096 512 088

DECLARATION

I ..... of Queanbeyan City Council, being the applicant for the development consent for the upgrading and realignment of Old Cooma Road between Karabar and Googong Dam Road, have read and understood this species impact statement. I understand the implications of the recommendations made in the statement and accept that they may be placed as conditions of consent or concurrence for the proposal.

Name:
Position:

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1. INTRODUCTION

1.1 Project Description

This report provides an assessment of potential impacts to threatened species, populations and ecological communities associated with the upgrading and deviation of Old Cooma Road, between Karabar and Googong, south of Queanbeyan. This report has been prepared on behalf of Brown Consulting and Queanbeyan City Council (the client).

The purpose of this Species Impact Statement is:

- to identify the issues pertaining to threatened species, populations, ecological communities or their habitats, and provide appropriate amelioration for adverse impacts resulting from the action; and
- to assist the consent or approval authorities in the assessment of the proposal pursuant to the Environmental Planning and Assessment Act 1979 (EP&A Act).

A list of subject species to be considered, along with specific requirements for survey and assessment, have been provided in the Director General's requirements (DGRs) for a Species Impact Statement for the Proposed Old Cooma Road Realignment, issued to Queanbeyan City Council on 20 December 2007 (Appendix 1). Additional requiremets relating to the EPBC Act were issued to QCC on 22 January, 2010 (Appendix 1). Further requirements for the content of the Species Impact Statement are provided by Section 110 of the TSC Act.

Matters which have been limited or modified.
The DGRs have clarified Sections 110(2)(g) and 110(3)(d) of the TSC Act for this proposal by stating that the following matters (from Section 110 of the TSC Act) need only be addressed where relevant:

- All reference to threat abatement plans. There are no threat abatement plans relevant to the key threatening processes associated with the proposal.

- All reference to recovery plans. There are draft recovery plans relevant to the subject species listed in Tables 1 and 2 and the subject ecological community listed in Section 3.2 of the DGRs. However, if other entities should be deemed as subject species, populations or ecological communities by analysis in accordance with the DGRs, then any relevant recovery plans pertaining to these entities will need to be addressed in the SIS.

- All reference to key threatening processes. Only the following key threatening processes are relevant to this proposal:
  - Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands;
  - Bushrock removal;

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- Clearing of native vegetation;
- Invasion of native plant communities by exotic perennial grasses;
- Removal of dead wood and dead trees; and
- Loss of hollow-bearing trees.

1.2 Background

Queanbeyan is the largest non-capital city in south-east NSW, and the fastest growing inland city in NSW. To the south of Queanbeyan, the proposed new township of Googong is anticipated to provide up to 5,550 new homes to accommodate 16,000 people over a 20-25 year period.

The upgrading and deviation of Old Cooma Road is considered important for the continued growth of the area, and essential for planned land releases at Googong, to the south of Queanbeyan. The proposed road upgrade is necessary to accommodate the substantially increased traffic levels resulting from the Googong land releases as this route forms a key component of the regional transport corridor.

The proposed new section of Old Cooma Road that bypasses the winding section at the Cooma Road Quarry entrance (Stage 1 of the current proposal) was previously investigated for flora and fauna values by Australian Botanical Surveys (2001) and Bushfire and Environmental Services (BES 2007a). The flora and fauna assessment undertaken by BES (2007a) concluded that the proposal may have a significant effect on the White Box, Yellow Box, Blakely's Red Gum Woodland endangered ecological community, listed under the TSC Act, and that Queanbeyan City Council should seek requirements for a Species Impact Statement from the Director General of the (then) NSW Department of Environment and Conservation. The proposal was also considered likely to substantially affect the EPBC Act listed critically endangered community White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland and endangered flora species Hoary Sunray *Leucochrysum albicans* and a recommendation was made to refer the proposal to the Commonwealth Minister for the Environment.

1.3 Description of Proposal

The proposal involves the widening and realignment of Old Cooma Road to upgrade to a four-lane, dual carriageway between the intersection with the proposed Edwin Land Parkway at Karabar, south to the intersection with Googong Dam Road at Googong (Figure 1). Construction works are proposed in two stages as below, with the second stage (duplication of the road) due for completion in approximately 2027.

Stage 1 involves the construction of a new two lane, single carriageway section of road to bypass the current winding section of road (containing the entrance to the Cooma Road Quarry), between the Tempe Crescent turnoff and the southern

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connection of Heights Road (also known as Talpa Road). The length of Stage 1 is approximately 1.1 km.

Stage 2 involves the duplication of the entire section of Old Cooma Road between the proposed Edwin Land Parkway intersection and Googong Dam Road, by adding a second two lane carriageway. Construction work is planned for approximately 2027.

The proposed construction works will include clearing of vegetation, excavating, filling and compaction of soils, importation of materials and vehicles, stockpiling of materials, and provision of drainage, lighting and services. Detailed design work for Stage 1 is currently underway.

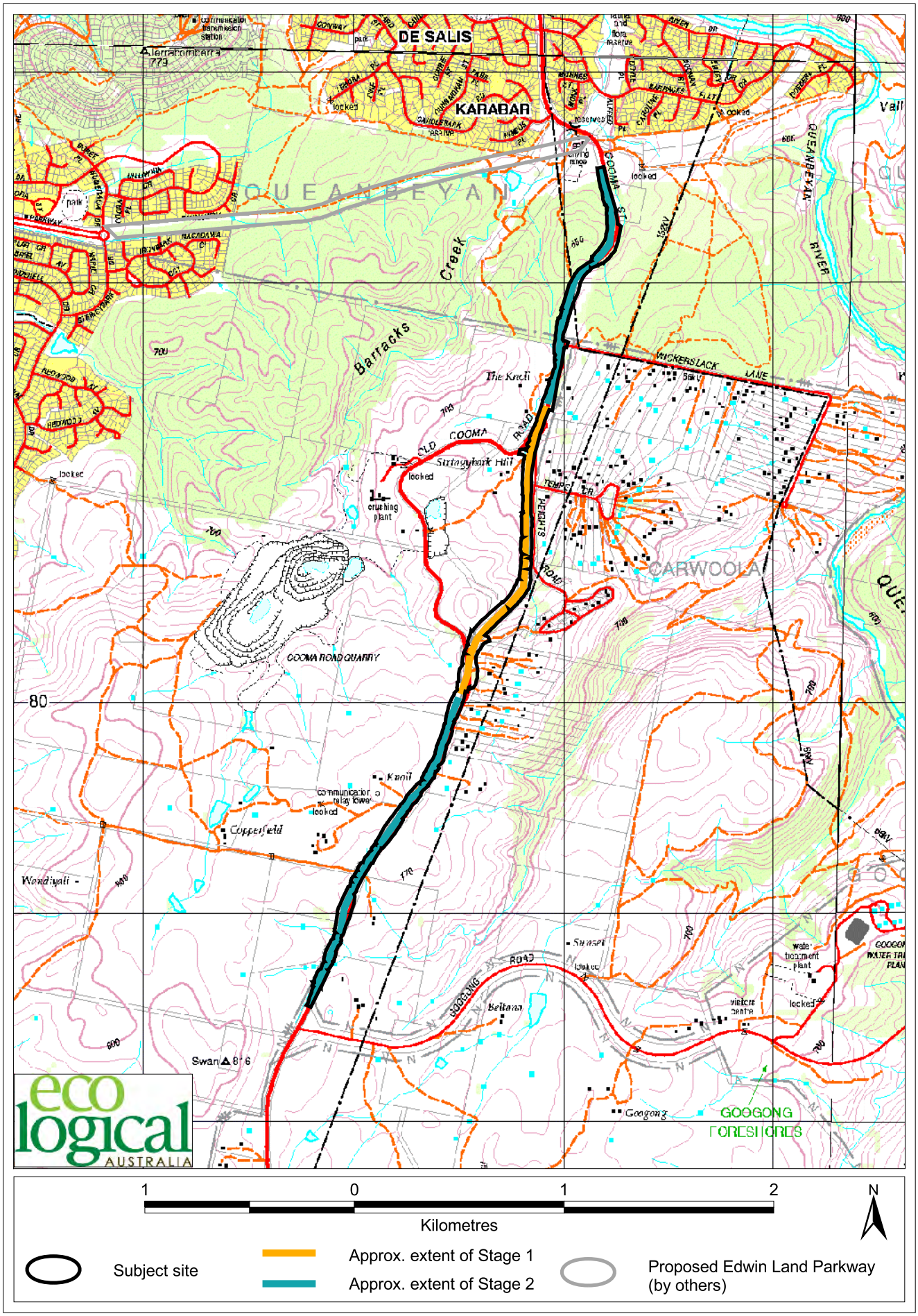
Sections of the existing 11KV overhead electricity line will need to be relocated during Stage 1. Part of the existing 66KV overhead line near Wickerslack Lane may also need to be relocated as part of Stage 2 works, to be assessed during the detailed design phase. Underground telecommunications cable and optical fibre lines will require relocation prior to Stage 1 construction and some gas mains near Wickerslack Lane, Tempe Crescent and Heights Road will require relocation during Stage 2. A new trunk services corridor will be constructed along the entire road length during Stage 1, with a shared trench containing gas and telecommunications services.

The total development footprint is approximately 21.5 ha, and ranges from 30 m to 90 m in width. A wider impact area at the northern end is due to the steeper topography and amount of fill required to construct the road. Approximately 4 ha of the development footprint (subject site) consists of existing road or other areas devoid of any vegetation. The proposal involves the removal of approximately 17.2 ha of native vegetation, including 5.5 ha of Box-Gum Woodland, which is listed as an endangered ecological community under NSW and federal legislation. Fauna habitat to be removed includes up to 8 ha of Dry Forest and Box-Gum Woodland that is known habitat for the Speckled Warbler, Turquoise Parrot, Brown Treecreeper and Rosenberg's Goanna The proposal will also remove potentially important resources for threatened species including 15 hollow-bearing trees and 20 terrestrial termite mounds.

The proposal will involve landscaping works, including stabilisation of disturbed areas with bands of native grasses to reduce erosion and screening with endemic tree species to mitigate the visual and aural impacts to adjacent residences. Upon completion of Stage 1, parts of the redundant Old Cooma Road will be rehabilitated.

The proposal includes on-site mitigation measures such as a fauna underpass (or culvert), maintenance of avian linkages and pre-clearing surveys. Off-site mitigation measures involve the development of an offset strategy to compensate for the removal of Box-Gum Woodland and other habitat. Up to 129 ha of Box-Gum Woodland will be protected within the offset site (see NGH Environmental 2010).

Figure 1: Proposed upgrading and realignment of Old Cooma Road



1.4 The Locality

The locality for the purposes of this assessment is land within 10km of the centre of the subject site. The locality encompasses the majority of Queanbeyan City Council area, but also extends into the ACT in the north-west, and into Palerang Council area to the south-east. This area incorporates Googong Dam on the Queanbeyan River, areas of rural, residential and commercial land and undeveloped bushland, including Mount Jerrabomberra Reserve, Cuumbeun Nature Reserve, Queanbeyan Nature Reserve, Stony Creek Nature Reserve and Wanna Wanna Nature Reserve. In the Queanbeyan City Council's portion of the locality, there is about 9290 ha of land zoned rural, 3160 ha zoned environmental protection, 1213 ha zoned residential, 866 ha zoned as National Parks, 386 ha zoned open space, 190 ha zoned business or industrial, 137 ha zoned special uses and 46 ha as other zones.

1.5 Definition of the Study Area

The study area encompasses an area of about 226 ha and includes the subject site (about 21.5 ha) and adjoining areas of suitable habitat on public and private land surrounding the subject site (Figure 2). The majority of the study area is zoned rural (about 20 ha) although a small proportion (about 4ha) towards the north-east is zoned environmental protection.

The study area incorporates a minimum area or buffer of approximately 100m from the centreline of the proposed road alignment, and extends to a distance of up to approximately 1,300m in areas of suitable fauna habitat.

1.6 Description of the Study Area

1.6.1 Vegetation

Most of the study area has been subject to considerable disturbances and removal of native vegetation resulting from the construction and use of the existing road, power easements and adjacent rural land-uses. Only the northern extent of the study area contains relatively undisturbed native vegetation on either side of Old Cooma Road.

Approximately 209 ha (79%) of the study area is covered by some form of native vegetation, although much of this has been modified by ongoing rural activities. The native vegetation of the study area, based upon regional vegetation mapping (Fallding, 2002) and ground-truthing undertaken in the course of this and previous studies (BES 2008), comprises about 128.7 ha of Box-Gum Woodland; about 75.2 ha of Dry Forest; and about 5 ha of Grassland-Woodland Mosaic. The remainder (17 ha) of the study area is comprised of non-native vegetation, buildings, dams and roads.

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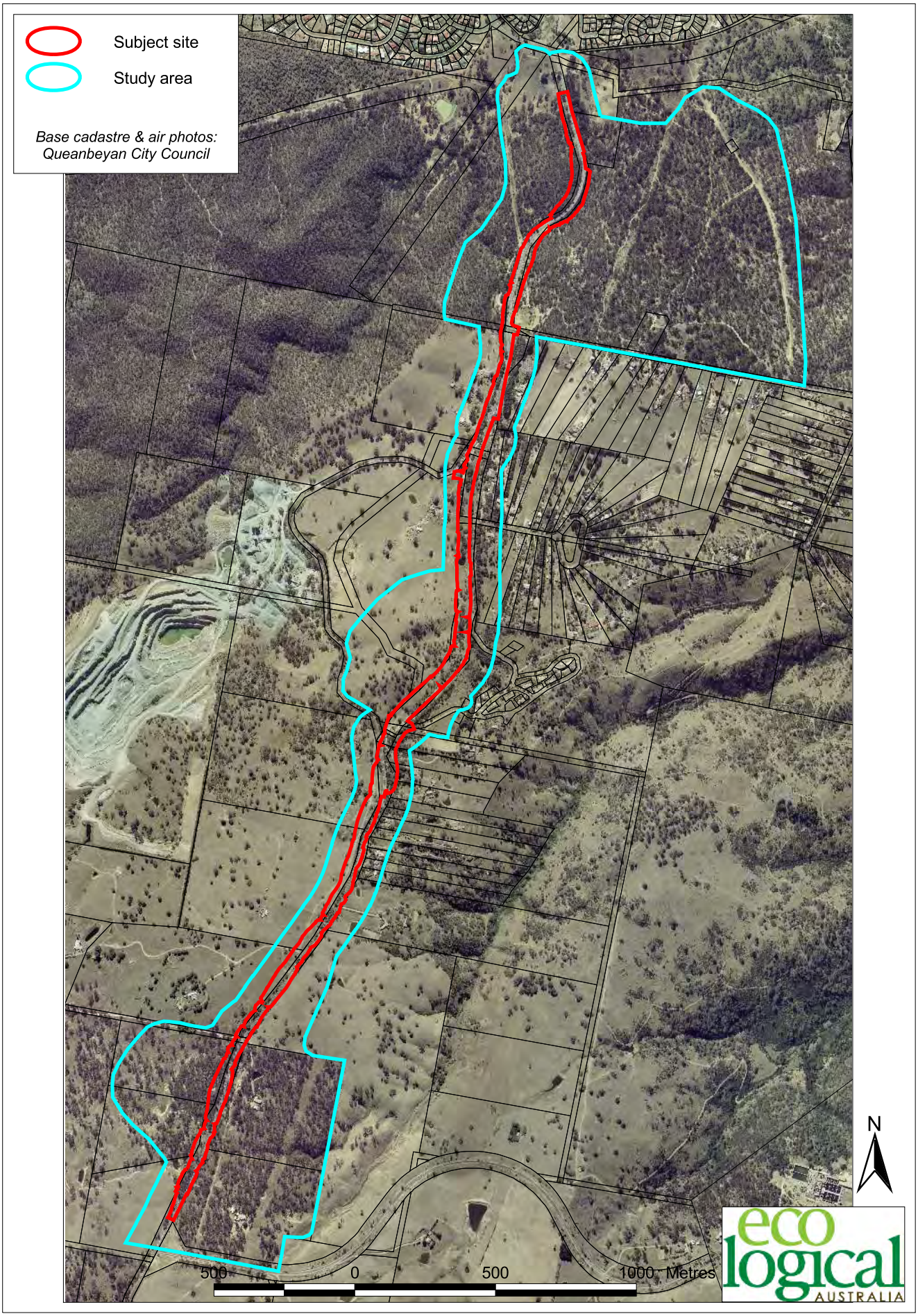
Figure 2: Location of study area and subject site



1.6.2 Fauna habitats

The northern parts of the study area include extensive areas of relatively intact Dry Forest and Box-Gum Woodland with steeply incised ephemeral drainage lines, hollow-bearing trees (potential habitat for woodland birds, microbats) and termite mounds (potential egg-laying sites for Rosenberg's Goanna). Similar forest and woodland habitats occur in the southern extremities of the study area, although this area is much smaller, largely isolated and more disturbed.

More disturbed examples of these habitats also occur in places through the predominantly privately owned land in the remainder of the study area. However these areas have generally been subject to long-term grazing and other agricultural practices and or have been developed for smaller rural-residential allotments. These disturbances have generally led to the severe degradation or removal of most fauna habitats.

The central section of the study includes an ephemeral drainage line and surface rock scatters on the steeper slopes of the proposed main deviation between the northern and southern extents of Heights Road. Gullies in this area are subject to extensive weed invasion and erosion in parts.

1.6.3 Land use, tenure and zoning

The predominant land uses in the study area are stock grazing, small lot rural residential land-use, the transport corridor along the existing Old Cooma Road, and some infrastructure such as water, electricity and telecommunication easements. Areas of vegetated Crown Land in the south-west and north-east of the study area, and vegetated freehold in the north-west, currently have no active land-use.

Zoning of lands within and surrounding the study area is presented in Figure 3. In the study area, 98 ha is zoned 1(a) Rural A, 29 ha 1(c) Rural C, 9.2 ha 1(d) Rural D, 6 ha 2(d) Residential D, 20.9 ha 2(d) SP Residential D Scenic Protection, 52 ha 7(a) Environmental Protection, 3.6 ha 7(b) Environmental Protection, and 1.4 ha 9(a) Proposed Roads. Approximately 74% of the study area is private tenure.

Access to land owned by the Ngambri Aboriginal Land Council in the north-west of the study area was only temporarily available, and thus surveys on this land were limited.

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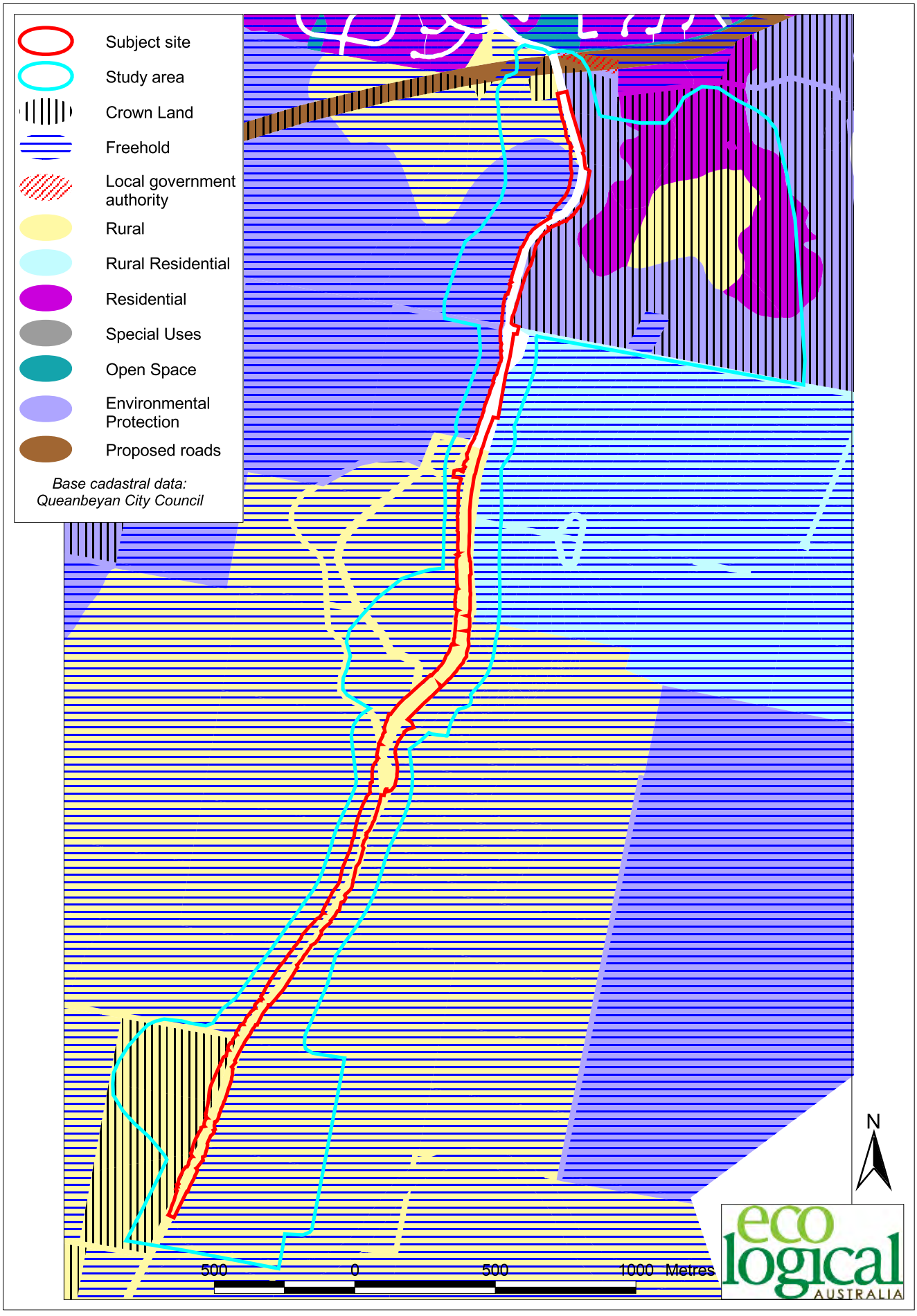
Figure 3: Land use and zoning in and around the study area



1.7 The Subject Site

The subject site (Figure 2) or proposed development footprint, is approximately 21.5 ha in size and extends for approximately 4.8 km from the future intersection with Edwin Land Parkway south of Karabar to the intersection with Googong Dam Road. Approximately 5.16 ha (24%) of the subject site is already cleared as part of the existing Old Cooma Road. The southern section of the subject site predominantly occurs within the existing Old Cooma Road easement, with minor realignments likely for road straightening in places. The northern portion of the site extends beyond the existing road easement into parts of freehold and Crown land to accommodate a wider footing necessitated by steeper terrain. The central section of the subject site follows the proposed road deviation to replace the winding section of Old Cooma Road in the vicinity of the Cooma Road Quarry. This part of the subject site occurs on the eastern side of Lot 120 DP 754881, is currently zoned rural and is owned by Queanbeyan City Council.

Most of the subject site has been extensively disturbed, although approximately 17.2 ha of native vegetation remains, including 10.4 ha of Dry Forest and 5.5 ha of the Box-Gum Woodland EEC.

Fauna habitats within the subject site include foraging and sheltering resources typical of disturbed woodland and native pasture habitats. Specific resources in the subject site include 15 hollow-bearing trees representing potential nesting and sheltering resources for birds and mammals, 20 termite mounds (potential nesting habitat for the Rosenberg's Monitor) and one small dam. Some scattered surface rocks (representing potential Pink-tailed Worm-lizard habitat) occur in the central portion of the subject site.

Most fauna habitats in the subject site are of lower quality than those in some surrounding areas due to their proximity to Old Cooma Road and associated disturbances. While this is not the case with the habitats in the central section of the subject site (Stage 1 – quarry bypass), these habitats are typical of those subject to long-term intensive rural land-use such as stock grazing, gully erosion and weed infestation.

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2. Initial Assessment

2.1 Identifying Subject Species and Communities

The Director Generals Requirements (DGRs) for the Species Impact Statement for Old Cooma Road, and subsequent modifications (Appendix 1), lists a number of subject species and ecological communities to be considered in the assessment process.

The DGRs listed two endangered ecological communities and twelve threatened species as 'subject species':

- White Box, Yellow Box, Blakely's Red Gum Woodland (Box-Gum Woodland);
- Natural Temperate Grassland of the Southern Tablelands of NSW and the ACT;
- Hoary Sunray *Leucochrysum albicans* var. *tricolor;*
- Button Wrinklewort *Rutidosis leptorrhynchoides*;
- Silky Swainson Pea *Swainsona sericea*;
- Little Whip Snake *Suta flagellum;*
- Golden Sun Moth *Synemon plana;*
- Pink-tailed Worm-lizard *Aprasia parapulchella;*
- Rosenberg's Goanna *Varanus rosenbergi;*
- Brown Treecreeper *Climacteris picumnus;*
- Diamond Firetail *Stagonopleura guttata;*
- Hooded Robin *Melanodryas cucullata;*
- Speckled Warbler *Pyrrholaemus sagittatus*; and
- Eastern False Pipistrelle *Falsistrellus tasmaniensis.*

A further four threatened fauna species were listed in the DGRs for consideration as 'subject species':

- Striped Legless Lizard *Delma impar;*
- Gang-gang Cockatoo *Callocephalon fimbriatum;*
- Koala *Phascolarctos cinereus;* and
- Eastern Bent-wing Bat *Miniopterus schreibersii oceanensis.*

Most of the above species are listed as vulnerable of the schedules of the TSC Act, with exceptions being the Golden Sun Moth and Button Wrinklewort, which are listed as endangered under the TSC Act and the Hoary Sunray, which is listed as endangered only under the EPBC Act.

Further analysis of threatened species or communities likely to occur in the area was undertaken as described below.

A description of each of the subject species and communities is provided in Appendix 5.

Database Searches

A preliminary list of threatened flora and fauna species, populations and ecological communities known to occur or with potential to occur in the locality was prepared by searching the DECCW Atlas of NSW Wildlife and Bionet (including records from the Australian Museum, NSW State Forests and Royal Botanic Gardens) for records of species listed under the TSC Act, and the DEWHA Protected Matters Search Tool for threatened species and Matters of National Environmental Significance listed under the EPBC Act. Any other records of threatened species in the locality from other sources were added to this list.

Data searches were most recently undertaken on 18 May 2010, and covered a ten kilometre radius from a point in approximately the centre of the subject site (Appendix 2). These lists were filtered to identify threatened species known from, or considered likely to occur within, or utilise, the subject site. The filtering process was based upon available specific habitat information in the scientific literature as well as the results of flora, fauna and habitat surveys in the study area, other flora and fauna studies and other records of threatened species, populations or endangered ecological communities in the locality.

Species that were not recorded during field survey and are considered unlikely to occur within, or to utilise, the subject site have been excluded from further consideration.

Literature Review

Available literature regarding the threatened species, populations and communities considered likely to occur in the locality was reviewed. This review included standard references (e.g. Strahan 1995, Cogger 2000, Menkhorst and Knight 1998, Pizzey & Knight 1997, and Harden 1990-2002) plus current online resources including PlantNet (2009), and threatened species profiles and other information available from the DECCW and DEWHA websites.

Previous Studies in the Locality

Previous flora and fauna studies in the locality were reviewed as part of the initial assessment to locate records of threatened species and communities and areas of suitable habitat for threatened species or communities. These studies included the following.

Australian Botanical Surveys. 2001. Flora and fauna habitat survey along the proposed Cooma Road realignment. Report prepared for National Environmental Consulting Services.

Biosis Research. 2003a. Draft: Natural Heritage of "The Poplars" Queanbeyan, NSW. Unpublished report for Queanbeyan City Council.

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Other sources of information included Wildcare Queanbeyan fauna records from Old Cooma Road between Karabar and Googong Dam Road from 1 January 2008 to 31 May 2009.

The review of previous flora and fauna studies and records in the locality has indicated that the following threatened species or communities have been recorded in the study area:

- Box-Gum Woodland; Rosenberg's Goanna; and Brown Treecreeper (BES 2007a; Butler 2007; Thompson & Mullins 2004; Wildcare Queanbeyan records).

In addition, the review of previous records and studies indicated that the following threatened species could potentially occur in the study area given the habitats present:

- Golden Sun Moth; Little Whip Snake; Pink-tailed Worm-Lizard; Diamond Firetail; Flame Robin, Gang-gang Cockatoo; Hooded Robin; Scarlet Robin, Speckled Warbler; Varied Sittella, Eastern False Pipistrelle; Eastern Bentwing Bat; Greater Long-eared Bat; Button Wrinklewort; and Silky Swainson Pea (BES 2007a, 2008, 2009; ELA 2010; GHD 2009; NGH 2010; Thompson & Mullins 2004).

Methods

2.2 Survey Requirements

The minimum survey requirements for subject species have been given in the DGR's (Appendix 1).

2.3 Flora Survey Methods

2.3.1 Description of Survey Techniques and Survey Sites - Flora

A detailed botanical survey was conducted across parts of the study area and surrounds in November 2006 in conjunction with the flora and fauna assessment of Stage 1 (quarry bypass) undertaken by BES (2007a). A summary of these surveys appears in Table 1.

The Random Meander technique documented by Cropper (1993) was used across the study area and surrounds, to document the flora species present, including those of conservation significance, and the location and extent of vegetation communities. Several vegetation survey sheets were completed for the vegetation communities that occur within the study area. The vegetation was surveyed at all levels present: the canopy (trees), middle canopy (trees), understorey (shrubs), and groundcover plants (plants less then one metre in height). An abundance score was assigned to each species recorded. Dominant species and the projected foliage cover of each stratum were recorded at locations that typified the vegetation communities present in the study area. A general description of the vegetation was then prepared based on structural characteristics and dominant canopy species in accordance with Walker and Hopkins (1990) and Specht (1970). These techniques were used to classify and name the vegetation communities in the study area and immediate surrounds.

The vegetation communities identified in the study area were compared with the Final Determinations of the NSW Scientific Committee and the listing advice of the Commonwealth Threatened Species Scientific Committee to ascertain whether the communities comprised listed threatened ecological communities.

Specific searches for plant species of conservation significance known from the locality were also conducted by BES in November 2006 using the Random Meander method targeting areas of potential or suitable habitat. This technique was used to target the Yass Daisy *Ammobium craspedioides*, Hoary Sunray *Leucochrysum albicans* var. *tricolor*, Button Wrinklewort *Rutidosis leptorrhynchoides*, Small Purple-pea *Swainsona recta*, Silky Swainson-pea *Swainsona sericea*, and Austral Toadflax *Thesium australe*.

Butler (2007) conducted additional surveys in the study area during July 2007 to determine the presence of the Commonwealth endangered community White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

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Additional vegetation and flora surveys was undertaken in the study area and adjacent lands by BES in spring and early summer 2007 as part of the Queanbeyan Biodiversity Study (BES 2008).

Further detailed vegetation mapping and targeted flora surveys were undertaken across the study area by ELA in November 2008, December 2008 and February 2009 (Table 2 and Figure 4).

Vegetation and Box-Gum Woodland Surveys

A combination of the Random Meander technique (Cropper 1993) and 400 m^2 quadrats was used across the study area, to document the flora species present, including those of conservation significance, and the location and extent of vegetation communities, including Box – Gum Woodland.

Nine quadrats were completed in addition to those completed during the previous assessments. The vegetation was surveyed at all levels present: the canopy (trees), middle canopy (trees), understorey (shrubs), and groundcover plants (plants less then one metre in height). An abundance score was assigned to each species recorded. Dominant species and the projected foliage cover of each stratum were recorded at locations that typified the vegetation community present. A general description of the vegetation was then prepared based on structural characteristics and dominant canopy species in accordance with Walker and Hopkins (1990) and Specht (1970). These techniques were used to classify and name the vegetation communities in the study area and immediate surrounds.

Targeted Searches

Specific searches for the Button Wrinklewort *Rutidosis leptorrhynchoides*, and Silky Swainson-pea *Swainsona sericea* were undertaken in November and December 2008. The federally listed Hoary Sunray *Leucochrysum albicans* var. *tricolor* was also recorded during these surveys.

These surveys were undertaken after inspection of local reference sites where the species were confirmed to be in flower. Conditions in the lead up to and during the survey period where conducive to good flowering seasons for each species.

Surveys where conducted by a team of two to three people walking parallel transects approximately 10 m apart. Targeted searches for the species were also undertaken separately during the vegetation and Box-Gum Woodland surveys, using the Random Meander technique (Cropper 1993).

Figure 4a: Flora and fauna surveys in northern portion of the study area

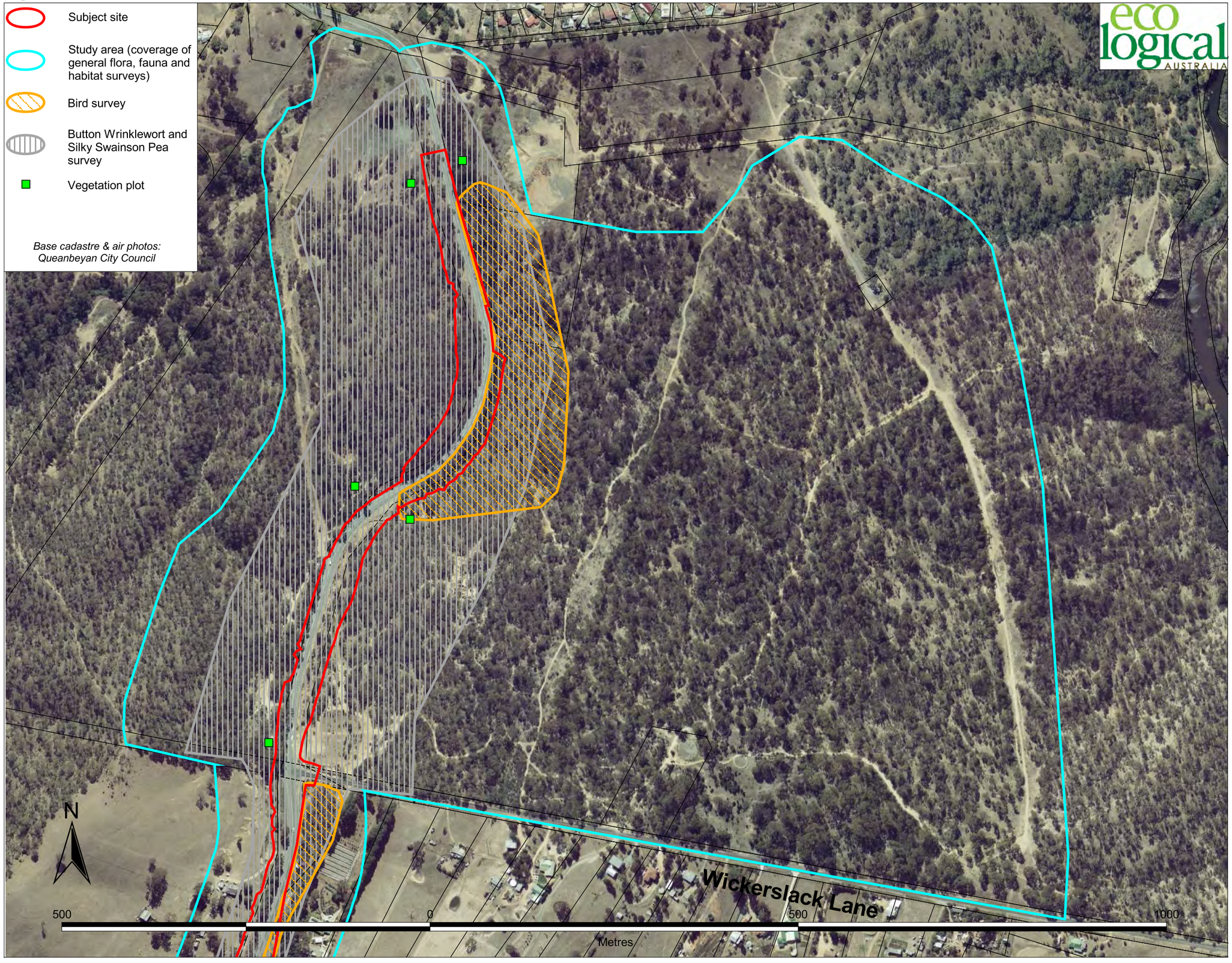

Figure 4b: Flora and fauna surveys in central portion of the study area

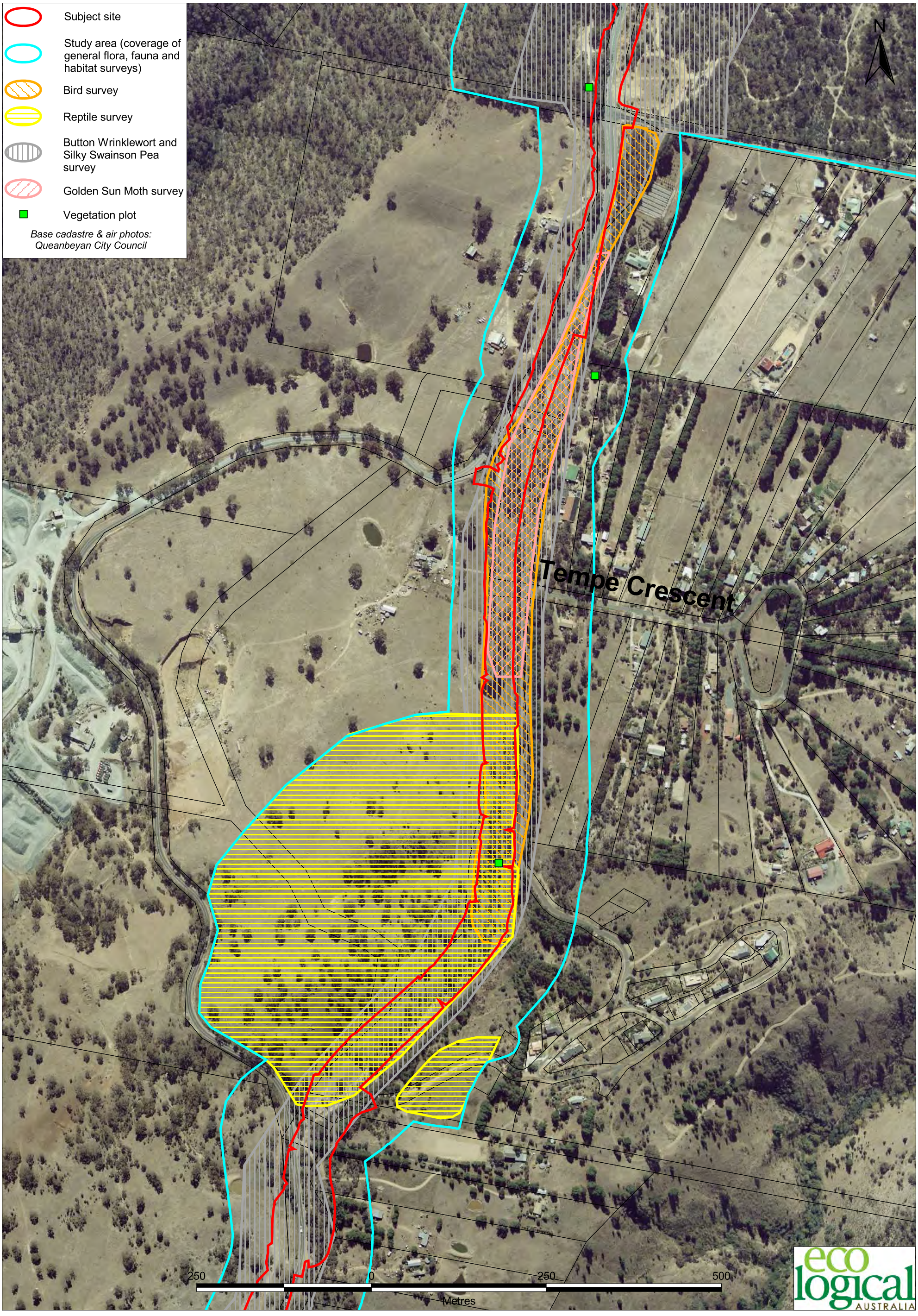

Figure 4c: Flora and fauna surveys in southern portion of the study area

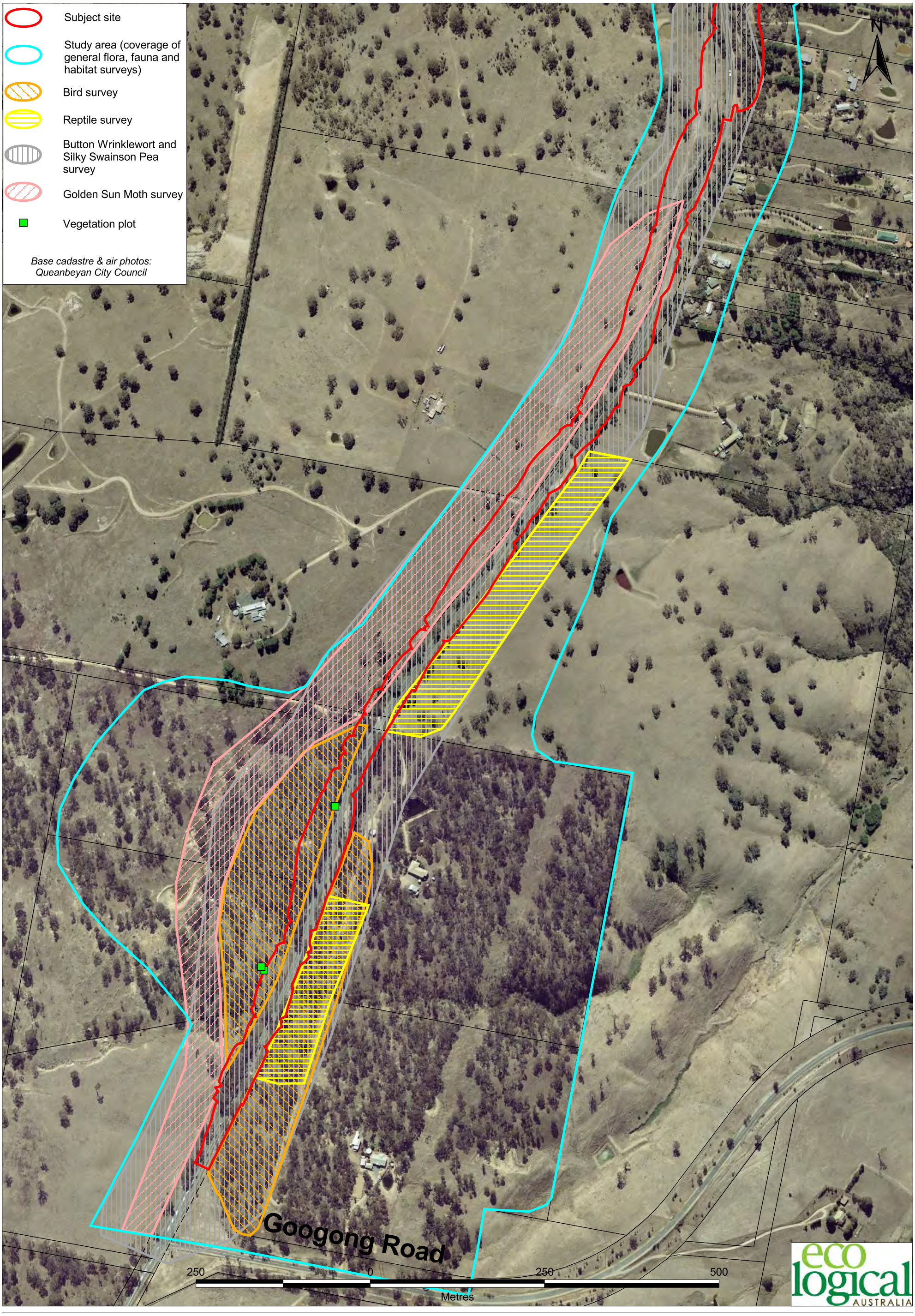

Table 1: Previous flora survey effort for Stage 1 (BES 2007a)

DATE	METHOD	EFFORT	TARGET SPECIES
1 November 2006	Random meander	8 person-hours	All flora species, including *Ammobium craspedioides, Leucochrysum albicans var. tricolor, Rutidosis leptorrhynchoides, Swainsona recta, Swainsona sericea* and *Thesium australe*.
	Vegetation plots	3 person-hours	All flora species
3 July 2007	Vegetation plots	undefined	EPBC BGW
9 July 2007	Vegetation plots	undefined	EPBC BGW

Table 2: Flora survey effort employed within the current study area

DATE	METHOD	EFFORT	TARGET SPECIES
5 November 2008	Random meander	3 person-hours	All flora species
	Vegetation plots	2 person-hours	Vegetation communities including BGW
6 November 2008	Random meander	2 person-hours	All flora species
	Vegetation plots	2 person-hours	Vegetation communities including BGW
	10m transect searches	18 person-hours	*Swainsona sericea*
7 November 2008	Vegetation plots	1 person-hours	Vegetation communities including BGW
	10m transect searches	8 person-hours	*Swainsona sericea*
8 December 2008	10m transect searches	9 person-hours	*Rutidosis leptorrhynchoides*
9 December 2008	10m transect searches	18 person-hours	*Rutidosis leptorrhynchoides*
20 February 2009	Vegetation plots	2 person-hours	EPBC BGW

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2.4 2.3 Fauna Survey Methods

Fauna surveys targeting reptiles, birds and the Golden Sun Moth as well as general habitat surveys were undertaken by ELA during October, November and December 2008 (Table 3 and Figure 4). Additional habitat surveys were undertaken in March and June 2009 (Table 3 and Figure 4).

Habitat and targeted fauna surveys were also conducted around Stage 1 of the study area by BES (2007a) on 24 and 25 November 2006 and 17 January 2007 (Table 4).

Habitat surveys

Surveys to identify and record particular habitat features of the study area and surrounding areas were undertaken at various times within the survey period from November 2008 to June 2009. Habitat surveys were also undertaken as part of Stage 1 studies by BES (2007a) in November 2006. During both of these surveys, all notable fauna habitat features were described, particularly those features of relevance for threatened species, including hollow-bearing trees, termite mounds, surface rocks, native grass groundcover and other vegetative shelter and foraging habitats. The locations of all hollow-bearing trees and termite mounds in the study area were captured by GPS to enable mapping.

Targeted reptile surveys

Reptile surveys targeting the Pink-tailed Worm Lizard and Little Whip Snake, and to a lesser extent the Striped Legless Lizard and Grassland Earless Dragon, were undertaken within habitats of better quality within the study area on 16 and 17 October 2008 for 24.08 person hours. Surveys entailed active searches under rocks, logs, branches and debris for reptiles or evidence of reptiles (e.g. sloughed skins of the Pink-tailed Worm-lizard). Surveys were conducted during conditions suitable for detecting the Pink-tailed Worm-lizard, as temperatures were under 25 ^{0}C (11-22 ^{0}C) and the area had received 14mm of rainfall 2 days before the survey (Googong weather station).

Areas with and adjacent to Stage 1 of the proposal were also surveyed for reptiles, particularly the Pink-tailed Worm-lizard, by BES (2007a) on 24 November 2006 and 17 January 2007. These surveys involved the rolling of over 1,000 rocks and logs and 16 person-hours.

Targeted bird surveys

Bird surveys were undertaken in four areas of better (more intact) habitat within and adjacent to the subject site on 16 October 2008, and these surveys were repeated on 7 November and 17 December 2008. Bird surveys were undertaken by two experienced surveyors using aural and visual detection of species, aided by

binoculars. At each survey site, an area of up to approximately 5 ha was actively searched for between 30 minutes and 1 hour (average 48 minutes per site). Surveys were undertaken early in the morning wherever possible, and were not undertaken during windy or rainy weather.

General bird surveys were also undertaken within the Stage 1 section of the proposal by BES (2007a) in November 2006.

Targeted Golden Sun Moth surveys

Open grassy habitats with a high proportion of Wallaby Grass (predominantly in the south west of the study area) were surveyed for the Golden Sun Moth during the known flying season in December 2008 for seven person hours. Hand netting was used to capture any moths for identification. Conditions were predominantly warm and sunny with little or no wind, so suitable for the species to be active. Surveys were undertaken between mid morning and mid afternoon. Previous surveys of smaller patches of woodland with a high proportion of Wallaby Grass groundcover near the central section of the subject site (Stage 1) were undertaken by BES (2007a) on 24 November 2006, using the same methods during appropriate (warm, sunny and still) conditions.

Opportunistic surveys

Opportunistic observations of fauna activity, indirect evidence of fauna activity and fauna habitats were conducted throughout the survey period. Opportunistic observations of threatened species or species not detected by previous surveys were recorded. The locations of any threatened species were mapped via GPS recording.

Limitations

The range of fauna surveys used in this assessment, together with survey timing and weather conditions, are consistent with the minimum requirements of the DGRs. The techniques used in this investigation are considered adequate to gather the data necessary to assess the impacts of the proposal on the target fauna species and their habitats.

Extensive surveys involving trapping and other methods were not considered necessary given the habitats present and the types or threatened fauna likely to occur in the study area. Cage trapping surveys were not undertaken given the knowledge that target species such as the Rosenberg's Goanna already occurs in some parts of the study area, and the unlikely occurrence of other threatened species that could be detected via cage trapping surveys. Nocturnal surveys were not undertaken for similar reasons, given that apart from several threatened microchiropteran bats that are assumed to occasionally occur on the site, the study area provides marginal habitat for other nocturnal threatened species.

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Fauna and habitat survey effort

The fauna and habitat survey effort employed over the study area is given below in Table 3. Previous fauna and habitat surveys undertaken by BES (2007a) within Stage 1 of the study area appear in Table 4.

Table 3: Fauna and habitat survey effort

DATE	METHOD	EFFORT	TARGET SPECIES
Reptiles			
16 October 2008	Active reptile search	13.68 person-hours	All reptile species, particularly
17 October 2008	Active reptile search	10.5 person-hours	Pink-tailed Worm Lizard, Little Whip Snake, Striped Legless Lizard
Birds			
16 October 2008	Active search	1.6 person-hours	All bird species, particularly Brown Treecreeper, Diamond Firetail, Hooded Robin, Speckled Warbler
17 October 2008	Active search	2 person-hours	
7 November 2008	Active search	2.5 person-hours	
17 December 2008	Active search	2.75 person-hours	
Sun Moth			
8 December 2008	Sweep netting	2 person-hours	Golden Sun Moth
9 December 2008	Sweep netting	5 person-hours	
Habitat			
7 November 2008	Active search	8 person-hours	All habitat features, including hollow-bearing trees & termite mounds.
17 December 2008	Active search	9 person-hours	
18 March 2009	Active search	4 person-hours	

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DATE	METHOD	EFFORT	TARGET SPECIES
2 June 2009	Active search	10 person-hours	

Table 4: Previous fauna and habitat survey effort employed for Stage 1 (BES 2007a)

DATE	METHOD	EFFORT	TARGET SPECIES
24 November 2006	Diurnal fauna and habitats	2 person-hours	All species
	Targeted searches	2 person-hours	Golden Sun Moth
	Targeted searches	6 person-hours	Pink-tailed Worm Lizard, Little Whip Snake
25 November 2006	Diurnal fauna and habitats	1.5 person-hours	All species
17 January 2007	Targeted searches	10 person-hours	Pink-tailed Worm Lizard, Little Whip Snake

Survey Conditions

Weather conditions during targeted fauna surveys (Table 5) were considered appropriate for detecting target species and fauna in general. In particular, the DGRs required reptile surveys for the Pink-tailed Worm-lizard to be undertaken between mid August and end of October with temperatures below 25 ^{0}C, preferably after rain. The DGRs also required bird surveys to avoid high wind or rainy conditions. Golden Sun Moth surveys were undertaken in warm sunny conditions during the known flying season.

Table 5: Targeted fauna survey conditions

DATE	TARGETED SURVEY	TEMPERATURE	WIND	CLOUD	RAIN
16 October 2008	Bird	5 ^{0}C – 13 ^{0}C	0	0/8	0
	Reptile	14 ^{0}C – 20 ^{0}C	0	0/8	0
17 October 2008	Bird	11 ^{0}C – 18 ^{0}C	1	4/8	0
	Reptile	11 ^{0}C – 22 ^{0}C	1	6/8	0

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DATE	TARGETED SURVEY	TEMPERATURE	WIND	CLOUD	RAIN
7 November 2008	Bird	16^0C – 16^0C	0	8/8	0
8 December 2008	Sun Moth	25^0C–29 ^{0}C	0-1	2/8	0
9 December 2008	Sun Moth	23 ^{0}C – 30 ^{0}C	0-1	2/8	0
17 December 2008	Bird	17^0C – 20^0 C	1	8/8	0

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3. Survey Results

3.1.1 Data audit of flora and fauna values

The database search for TSC Act and EPBC Act threatened species, populations and communities identified the following species known from or with the potential to occur within the locality (note that fish species were excluded from this search due to the lack of potential habitat in the study area):

- nine threatened flora species;
- 32 threatened fauna species;
- 11 non-threatened species listed as Migratory Species under the EPBC Act (although eight of these species potentially occur in or utilise the study area, none of these species are considered likely to use the study area regularly or to breed in the study area and are not considered further in this SIS); and
- two endangered ecological communities.

These species, populations and ecological communities are listed in Appendix 2, together with additional threatened species known from the locality. Of this list, the species (and communities) known to occur in, or with the potential to utilise habitats in the study area (based on field-based survey and habitat assessment), are highlighted in Appendix 2 and presented below in Tables 5, 6 and 7. Species and communities known from the study area appear in bold.

Table 5: Threatened flora known, 'likely' or with 'potential' to occur in study area.

SCIENTIFIC NAME	COMMON NAME	TSC Act	EPBC Act
Rutidosis leptorrhynchoides	Button Wrinklewort	E	
Swainsona sericea	Silky Swainson Pea	V	
Leucochrysum albicans* var. *tricolor	**Hoary Sunray**	**-**	**E**

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Table 6: Threatened fauna known, 'likely' or with 'potential' to occur in study area.

SCIENTIFIC NAME	COMMON NAME	TSC Act	EPBC Act
Birds			
Callocephalon fimbriatum	Gang-gang Cockatoo	V	
Climacteris picumnus victoriae	**Brown Treecreeper**	**V**	
Daphoenositta chrysoptera	Varied Sittella	V	
Lathamus discolor	Swift Parrot	E	E M
Melanodryas cucullata cucullata	Hooded Robin	V	
Neophema pulchella	**Turquoise Parrot**	**V**	
Petroica boodang	Scarlet Robin	V	
Petroica phoenicea	Flame Robin	V	
Pyrrholaemus sagittatus	**Speckled Warbler**	**V**	
Stagonopleura guttata	Diamond Firetail	V	
Xanthomyza phrygia	Regent Honeyeater	CE	E M
Mammals			
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	
Nyctophilus timoriensis	Greater Long-eared Bat	V	V
Reptiles			
Aprasia parapulchella	Pink-tailed Worm-lizard	V	V
Suta flagellum	Little Whip Snake	V	
Varanus rosenbergi	**Rosenberg's Goanna**	**V**	
Invertebrates			
Synemon plana	Golden Sun Moth	E	CE

Table 7: Endangered Ecological Communities known to occur in study area.

EEC NAME	TSC Act	EPBC Act
White Box, Yellow Box, Blakely's Red Gum Woodland (Box-Gum Woodland)	**E**	
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland)		**CE**

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3.1.2 Results – Flora and Vegetation

3.1.2.1 Flora Species

A total of 193 plant species were recorded during the surveys undertaken for this assessment (Appendix 3). Of these, 136 were native species and 57 (42%) were introduced species.

3.1.2.2 Threatened Flora Species and Habitat

The study area provides known habitat for the Hoary Sunray *Leucochrysum albicans* var. *tricolor*, potential habitat for the Button Wrinklewort *Rutidosis leptorrhynchoides* and Silky Swainson Pea *Swainsona sericea*, all which have been identified as subject species in the DGRs.

Hoary Sunray *Leucochrysum albicans* var. *tricolor* **EPBC Act Status** - Endangered

An estimated 2,500 Hoary Sunray individuals occur throughout and adjacent to the development footprint, predominantly along the disturbed road verges (Figure 6a, 6b, 6c). A concentration of at least 1,700 individuals (BES 2007a) occurs in the central parts of the development footprint, associated with Stage 1. At least several hundred more individuals are scattered through the northern and southern sections of the development footprint (Stage 2). The species also occurs in numerous locations within the study area beyond the development footprint, although the number of individuals has not been estimated.

Beyond the study area, the Hoary Sunray appears to be relatively abundant at a number of locations elsewhere in the locality, and has been recorded in numerous locations within 1 km of the study area by BES, ELA and GHD during surveys in recent years (BES 2007 a & b, BES 2008a & b, BES 2009, GHD 2009, ELA 2009), including along the proposed Edwin Lane Parkway. The species is also known from a number of other locations within Queanbeyan LGA.

Button Wrinklewort *Rutidosis leptorrhynchoides* **TSC Act Status** - Endangered

The Button Wrinklewort is known from Goulburn, the Canberra-Queanbeyan areas, Michelago and Victoria. Regionally, it is known to occur at several sites to the west of Mount Jerrabomberra, including a population of around 1500 plants in Queanbeyan Nature Reserve, where is occurs primarily in association with Box-Gum Woodland. A population of around 700 plants is also known from "The Poplars", where the species occurs in semi-natural grassland. Several individuals also occur in a small reserve in Jerrabomberra Estate. There are no records of the species east of Mount Jerrabomberra.

The Button Wrinklewort tends to occupy areas where there is relatively less competition from herbaceous species (either due to the shallow nature of the soils, or at some sites due to the competitive effect of woodland trees). It exhibits an ability to colonise disturbed areas (e.g. vehicle tracks, bulldozer scrapings and areas of soil erosion), however it is susceptible to grazing and is now known only from un-grazed or lightly grazed sites.

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The ungrazed or lightly grazed Box-Gum Woodland within the study area provides a small amount of potential habitat for the Button Wrinklewort. However the species, which is conspicuous when in flower, was not detected within the study area despite targeted surveys using grids during the flowering period (the species was known to be flowering at Queanbeyan Nature Reserve). It was also not detected within the study area despite targeted surveys of the vast majority of the potential habitat within the study area in 2006. As stated above, there are no records of the species east of Mount Jerrabomberra, so there are no records in close proximity to the study area.

Silky Swainson-pea *Swainsona sericea* **TSC Act Status** - Vulnerable

In NSW the Silky Swainson-pea is known from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. In the region it is associated with less disturbed grassy woodlands and native grasslands and is relatively widespread. It is known from a number of sites within the Queanbeyan LGA including native grassland in the Jerrabomberra Creek area at Fernleigh Park Estate and south towards Old Cooma Road, from a paddock to the east of Tralee Station, at Googong in a grassland area beneath a canopy of Yellow Box, on the south-western slopes of Beatty Hill and in the Royalla Crown Lands. Further potential habitat occurs at Tralee Station, in association with Kangaroo Grass grassland in the central-west of the property. The species has also been recorded at more than ten other locations south along the Monaro Highway near Williamsdale, Michelago, Bredbo and Cooma.

The ungrazed or lightly grazed Box-Gum Woodland within the study area provides a small amount of potential habitat for the Silky Swainson-pea. However the species, which, whilst small, is conspicuous when in flower given the purple flowers, was not detected within the study area despite targeted surveys using grids during the flowering period. It was also not detected within the study area despite targeted surveys of the vast majority of the potential habitat within the study area in 2006.

Whilst the study area provides some potential habitat for the Button Wrinklewort and Silky Swainson Pea, the failure to detect these species despite targeted survey in suitable habitats during two flowering seasons (2006 and 2008) suggests that it is highly unlikely that either species occurs within the study area.

Under these circumstances it is highly unlikely that either the Button Wrinklewort and Silky Swainson Pea will be affected by the proposal and as such no further consideration will be given in this report to the impacts of the proposal on the Button Wrinklewort or Silky Swainson Pea.

3.1.2.3 Vegetation

The vegetation communities within the study area have been typed with reference to the classifications of Gellie (2006), Fallding (2002) and Keith (2006). Using the classifications of Gellie (2005), the study area supports three vegetation communities Tablelands Dry Shrub/Tussock Grass Forest, Tableland Dry Grassy Woodland and South Eastern Tablelands Dry Shrub/Grass/Herb Forest. These communities equate to the Dry Forest, Box-Gum Woodland and Woodland Grassland Mosaic communities of Fallding (2002), as shown in Figure 5. The communities also correspond with the

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Figure 5a: Vegetation in northern portion of the study area (ELA 2009, BES 2008 & Falding 2002)

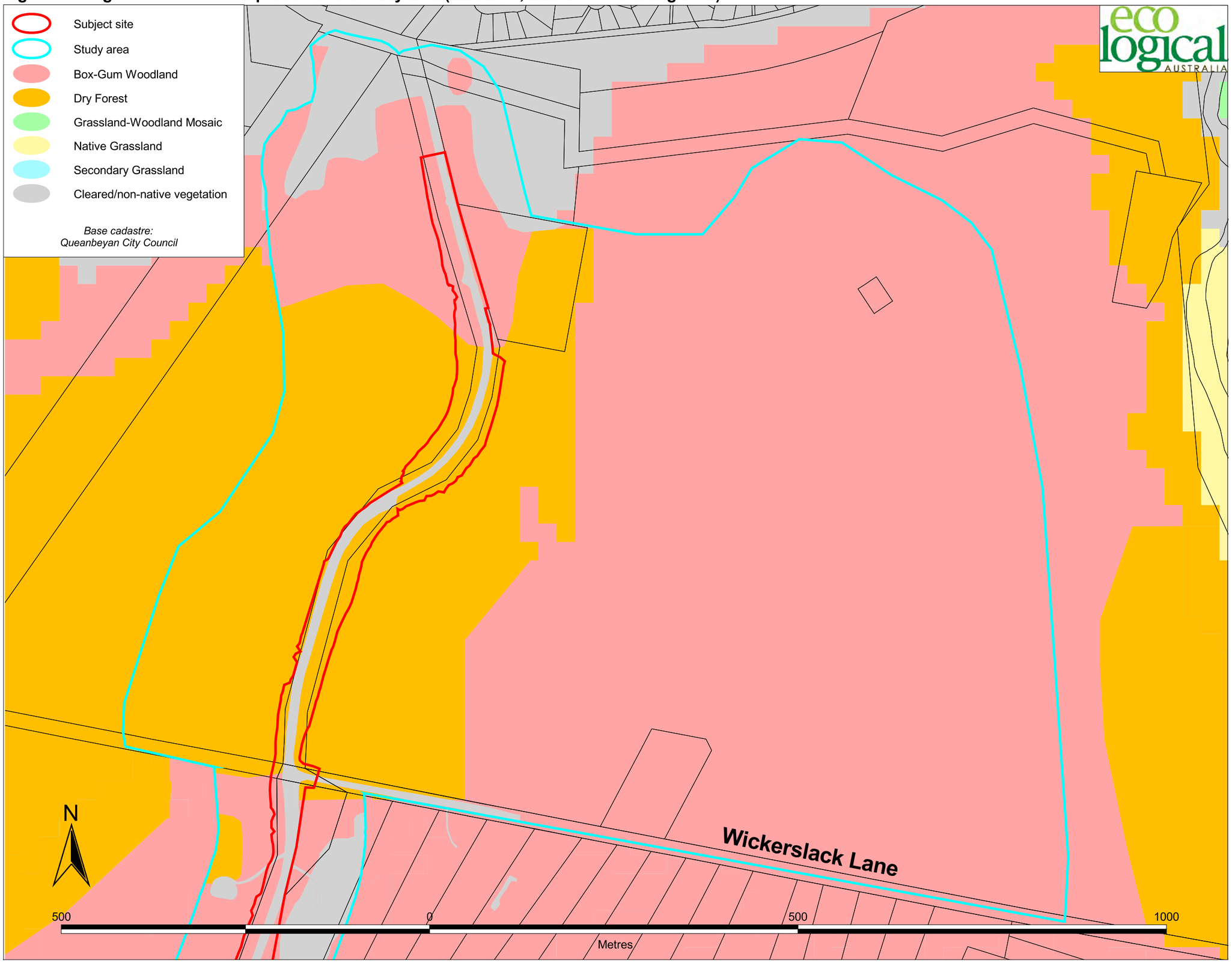

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Figure 5b: Vegetation in central portion of the study area (ELA 2009, BES 2008 & Falding 2002)

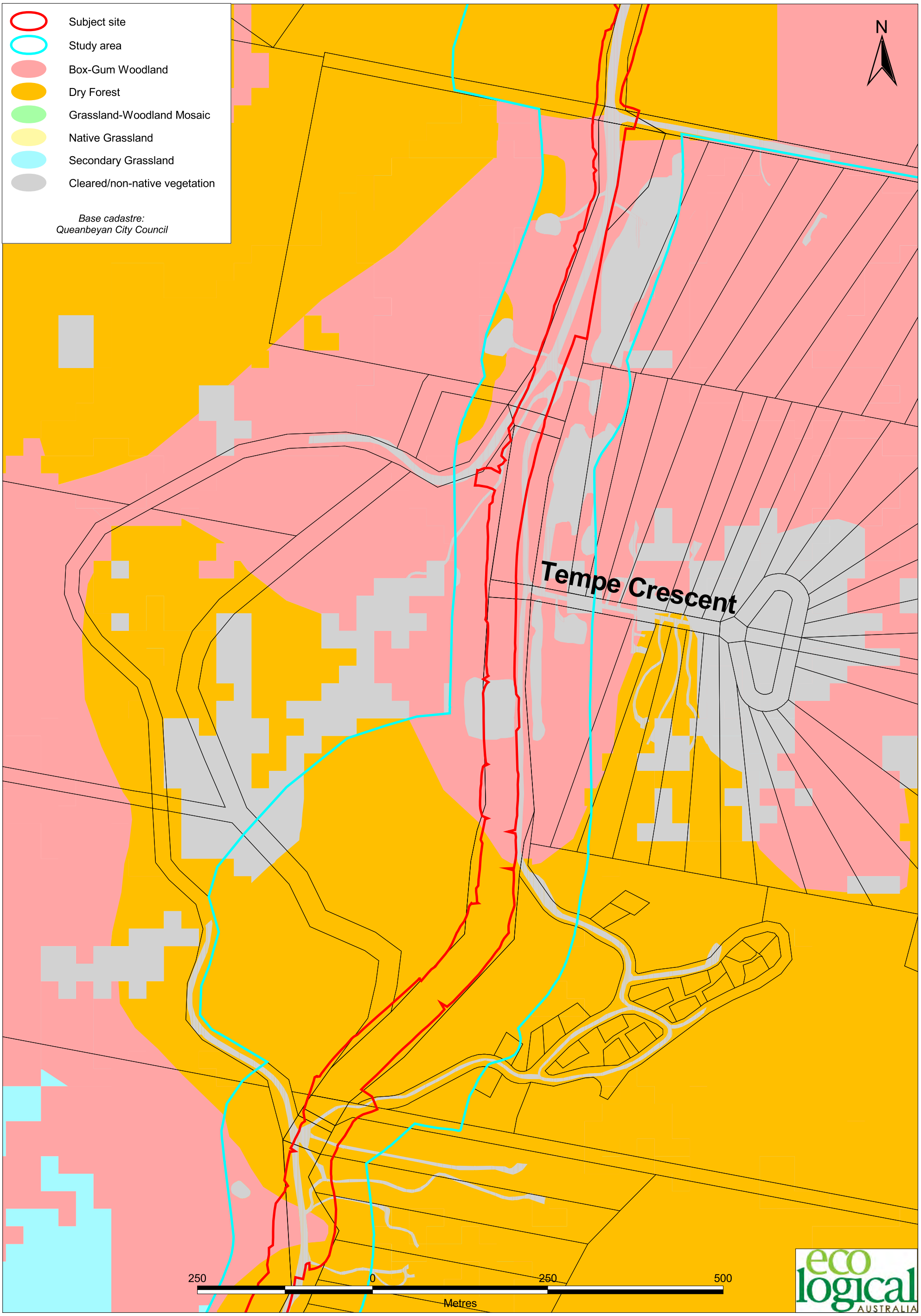
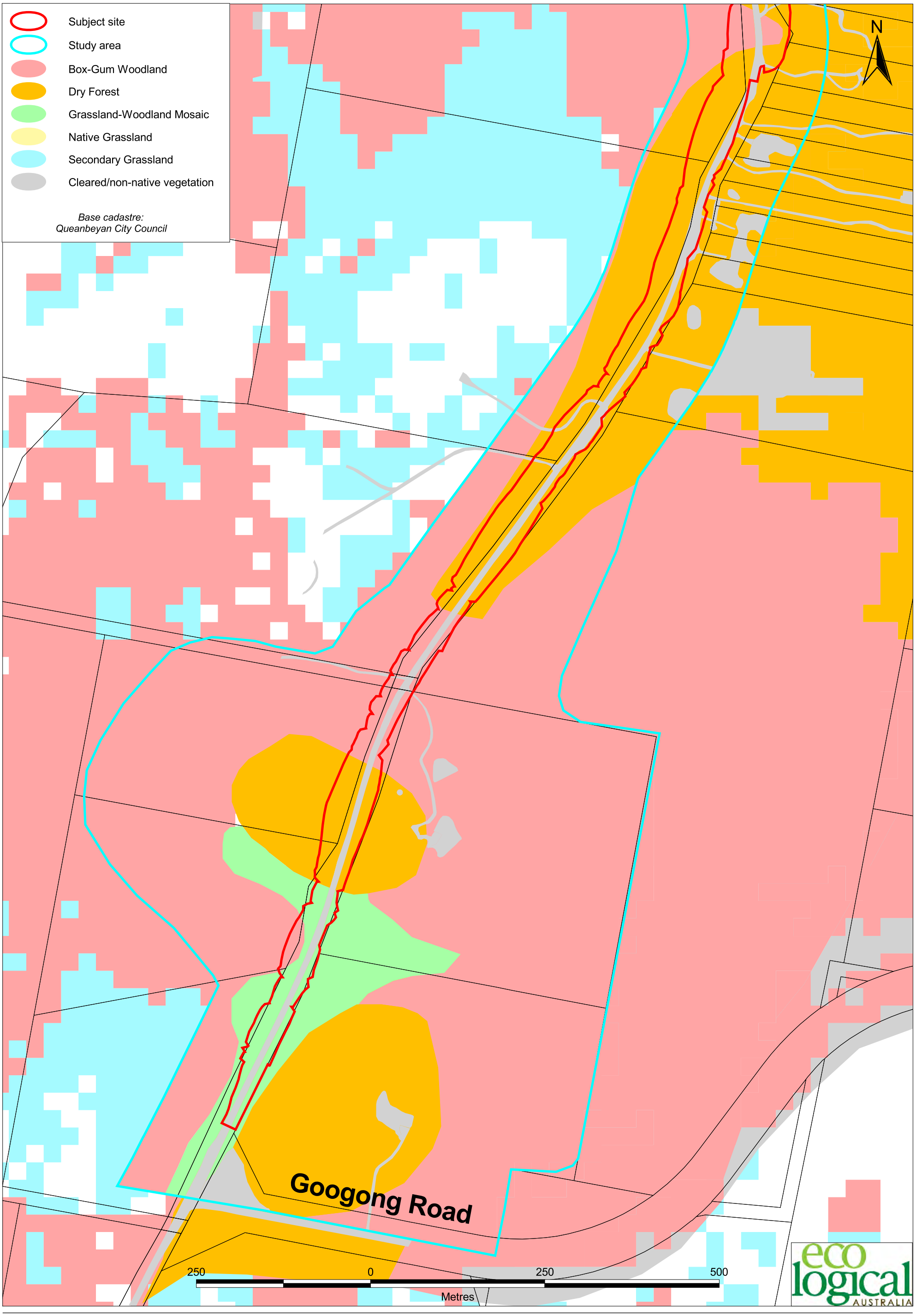


Figure 5c: Vegetation in southern portion of the study area (ELA 2009, BES 2008 & Falding 2002)



Southern Tableland Dry Sclerophyll Forests and Southern Tableland Grassy Woodlands of Keith (2006).

Tablelands Dry Shrub/Tussock Grass Forest (Dry Forest)
This community occurs across the central, southern and northern parts of the study area and is generally present north of Wickerslack Lane, the southern parts of the Heffernan's property to Lot 1 DP 513432 and in two distinct patches south to Googong Road as shown in Figure 5.

In a few areas, the community is ecotonal, as it includes some elements of the Tableland Dry Grassy Woodland communities that occur in surrounding areas, such as the presence of occasional individuals of Yellow Box *Eucalyptus melliodora.* It also includes shrub and groundcover species in places that are associated with the widespread Tablelands Dry Shrub-Tussock Grass Forest and South-east Tablelands Dry Shrub/Tussock Grass Forest of Gellie (2005).

In the southern parts of the Heffernan's property the community is heavily disturbed as a result of grazing and the extensive gully and sheet erosion that occurs in this area. These parts of the community include large infestations of Blackberry *Rubus fruiticosus* complex, Burgan *Kunzea ericoides* and many individuals of Radiata Pine *Pinus radiata*. The recovery potential of the community in this area has been substantially compromised as a result of the extensive disturbances to the substrate. Similar, yet less extensive modifications also occur in the far northern extremities of the community within the study area, on the eastern side of Old Cooma Road, where there is gully erosion.

The canopy is typically dominated by Red Box *Eucalyptus polyanthemos*, Red Stringybark *Eucalyptus macrorrhyncha,* Inland Scribbly Gum *Eucalyptus rossii* and less commonly Bundy *Eucalyptus goniocalyx* and Mealy Bundy *Eucalyptus nortonii* with occasional individuals of Apple Box *Eucalyptus bridgesiana* and Yellow Box in places, to a height of 8-12 m and Projective Foliage Cover (PFC) of approximately 10-30%. There is a sparse mid-canopy in places dominated by Cherry Ballart *Exocarpus cupressiformis,* Black Wattle *Acacia mearnsii* and Red-stemmed Wattle *Acacia rubida* to a height of 5 m and PFC of 5-10%.

The understorey includes species such as Mountain Hickory *Acacia penninervis,* Burgan, Grey Guinea-flower *Hibbertia obtusifolia,* Daphne Heath *Brachyloma daphnoides*, Urn-heath *Melichrus urceolatus*, *Daviesia mimosoides*, *Daviesia acicularis, Monotoca scoparia, Dillwynia sericea,* Early Wattle *Acacia genistifolia,* Pink Five-corners *Styphelia triflora*, Shiny Cassinia *Cassinia longifolia*, Native Indigo *Indigofera australis,* Blackthorn *Bursaria spinosa* and in a few locations Silver Wattle *Acacia dealbata*, *Grevillea juniperina,* Dusty Miller *Spyridium parvifolium* and Black Cypress Pine *Callitris endlicheri* to a height of approximately 1-3 m and PFC of generally less than 10%.

The groundcover is dominated by *Pultenaea procumbens*, Silvertop Wallaby Grass *Joycea pallida*, Speargrass *Austrostipa scabra* subsp. *falcata*, *Austrodanthonia racemosa*, Many-flowered Mat-rush *Lomandra multiflora* subsp. *multiflora,* Wattle Mat-rush *Lomandra filiformis,* Snow Grass *Poa sieberiana* and in places Hoary Sunray. The groundcover also includes a range of other native and exotic species including

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Mulga Fern *Cheilanthes sieberi*, Blue Flax-Lily *Dianella revoluta*, Poverty Raspwort *Gonocarpus tetragynus, Phalaris* sp.*, Plantago lanceolata,* Quaking Grass *Briza maxima,* Wild Oats *Avena fatua*, Red Leg *Bothriochloa macra,* Common Everlasting *Chrysocephalum apiculatum*, Scaly Buttons *Leptorhynchos squamatus*, Fuzzweed *Vittadinia cuneata*, Spiny-headed Mat-rush *Lomandra longifolia,* Forest Goodenia *Goodenia hederacea*, Twining Pea *Hardenbergia violacea*, *Poranthera microphylla*, Bluebells *Wahlenbergia* spp., Digger's Speedwell *Derwentia perfoliata,* Urn-heath *Melichrus urceolatus* and Climbing Saltbush *Einadia nutans,* to a height of approximately 1 m and PFC of approximately 10-20%.

Tableland Dry Grassy Woodland (Box-Gum Woodland)
This vegetation community occurs as shown in Figure 5:

- in the northern extremities of the study area in association with the lower-slopes to Barracks Creek;
- on the Heffernan's property in association with the lower parts of the drainage line that traverses the property, and to the north in the existing Old Cooma Road reserve; and
- south of Lot 1 DP 513432 to Googong Road.

The community is generally heavily disturbed as a result of historic and ongoing grazing, however there are patches, particularly in places on the Heffernan's property and the southern parts of the study area where a more diverse native groundcover is present.

The canopy is dominated by Yellow Box and Apple Box and also includes a few individuals of Blakely's Red Gum *Eucalyptus blakelyi*, Red Box and Red Stringybark in places to a height of 16-18 m and PFC of approximately 10-20%.

The understorey is generally sparse and includes species such as Blackthorn, Silver Wattle, Black Wattle, Early Wattle, Grey Guinea-flower, Burgan, Shiny Cassinia, Common Cassinia *Cassinia aculeata* and Sticky Hop-bush *Dodonaea viscosa* subsp. *angustifolia* to a height of approximately 1-2 m and PFC of generally less than 10%. The weed Sweet Briar *Rosa rubiginosa* is common throughout, and other shrubby weeds such as Blackberry*,* Cotoneaster *Cotoneaster* sp., and Large-leaved Privet *Ligustrum lucidum* occur in places.

Where disturbances have been relatively low the groundcover includes a diverse range of native grasses, sedges, ferns and forbs such as Kangaroo Grass *Themeda australis*, Snow Grass, *Austrodanthonia racemosa* and other Wallaby Grasses*,* Wheatgrass *Elymus scaber* var. *scaber*, Red Leg, *Plantago varia*, Scaly Buttons, Common Everlasting, Wattle Mat-rush, Stinking Pennywort *Hydrocotyle laxiflora*, Common Buttercup *Ranunculus lappaceus*, Bluebells, Native Leek *Bulbine bulbosa*, Hoary Sunray, *Acaena ovina*, Poverty Raspwort, Cutleaf Cranesbill *Geranium solanderi*, Mulga Fern, Twining Pea, Many-flowered Mat-rush, Love Grass *Glycine* spp., Blushing Bindweed *Convolvulus erubescens* and *Pimelea curviflora.* However St. Johns Wort *Hypericum perforatum* is abundant throughout and exotics such as Cocksfoot *Dactylis glomerata*, Paterson's Curse *Echium plantagineum*, Great Mullein *Verbascum thapsus*, Phalaris *Phalaris* spp., *Trifolium* spp., Wild Oats, Sheep Sorrel *Acetosella vulgaris*, Wild Sage *Salvia verbenaca*, and various thistles are typically

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common, and in places, are abundant. In these more disturbed areas the most common native groundcovers are typically more resilient species such as Speargrass *Austrostipa* spp., Short Wallaby Grass *Austrodanthonia carphoides*, Fuzzweed *Vittadinia cuneata*, Berry Saltbush *Einadia hastata*, and Common Everlasting. Tall Sedge *Carex appressa* is common in creek and drainage channels in places.

The Tableland Dry Grassy Woodland within the study area comprises the White Box, Yellow Box, Blakely's Red Gum Woodland endangered ecological community listed on Schedule 1 Part 3 of the TSC Act (hereafter referred to as the Box-Gum Woodland EEC)(Figure 6).

South Eastern Tablelands Dry Shrub/Grass/Herb Forest (Grassland-Woodland Mosaic)
Along the drainage line just to the north of Googong Dam Road, there is a narrow band of vegetation where the canopy is dominated by Candelbark *Eucalyptus rubida,* Apple Box and Broad-leaved Peppermint *Eucalyptus dives* but also includes a few Yellow Box individuals (Figure 5). The presence of Candlebark and Broad-leaved Peppermint indicate the influence of cold air drainage in this area. This community does not correlate well with any of the communities of Gellie (2005) but has affinities with the South Eastern Tablelands Dry Shrub/Grass/Herb Forest, sharing the dominant canopy species and some of the understorey and groundcovers. The community also includes many of the species associated with the Tableland Dry Grassy Woodland and to a lesser extent the Tablelands Dry Shrub/Tussock Grass Forest which it abuts (Figure 5). The community would be classified as Grassland Woodland Mosaic using the vegetation classification of Fallding (2002) and BES (2008), but would not comprise the Box-Gum Woodland EEC given the low abundance of Yellow Box.

There is a sparse sub-canopy of Black Wattle and Cherry Ballart and the understorey includes Silver Wattle, Blackthorn and *Acacia kettlewelliae*. Sweet Briar is also prevalent as it is elsewhere in the grassy parts of the study area. The groundcover includes species such as Snow Grass, Kangaroo Grass, Wallaby Grass, Common Everlasting, Scaly Buttons, Stinking Pennywort, Hoary Sunray, Bluebells, Many-flowered Mat-rush, Native Leek, *Acaena ovina*, Poverty Raspwort, Cutleaf Cranesbill, Poverty Raspwort, Forest Goodenia, *Plantago varia,* Dusky Scurf-pea *Cullen microcephalum* and Australian Carraway *Oreomyrrhis eriopoda*. There are also a diverse range of weedy grasses and herbs particularly where there have been disturbances to the substrate and in the immediate vicinity of the drainage line, where Tall Sedge is also common.

3.1.2.4 Native Vegetation Connectivity

Connectivity between the vegetation within the subject site and the surrounding native vegetation varies considerably. Connectivity is best in the northern parts of the study area, north of Wickerslack Lane where there are extensive areas of contiguous, relatively undisturbed native vegetation either side of the subject site. This vegetation is associated with a regional biolink (BES 2008). Connectivity is also relatively good in the southern parts of the study area where there are patches of good condition Dry Forest and Box-Gum Woodland on either side of the study area associated with a local biolink (BES 2008).

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Figure 6a: Species, communities and habitats of conservation significance in northern portion of the study area

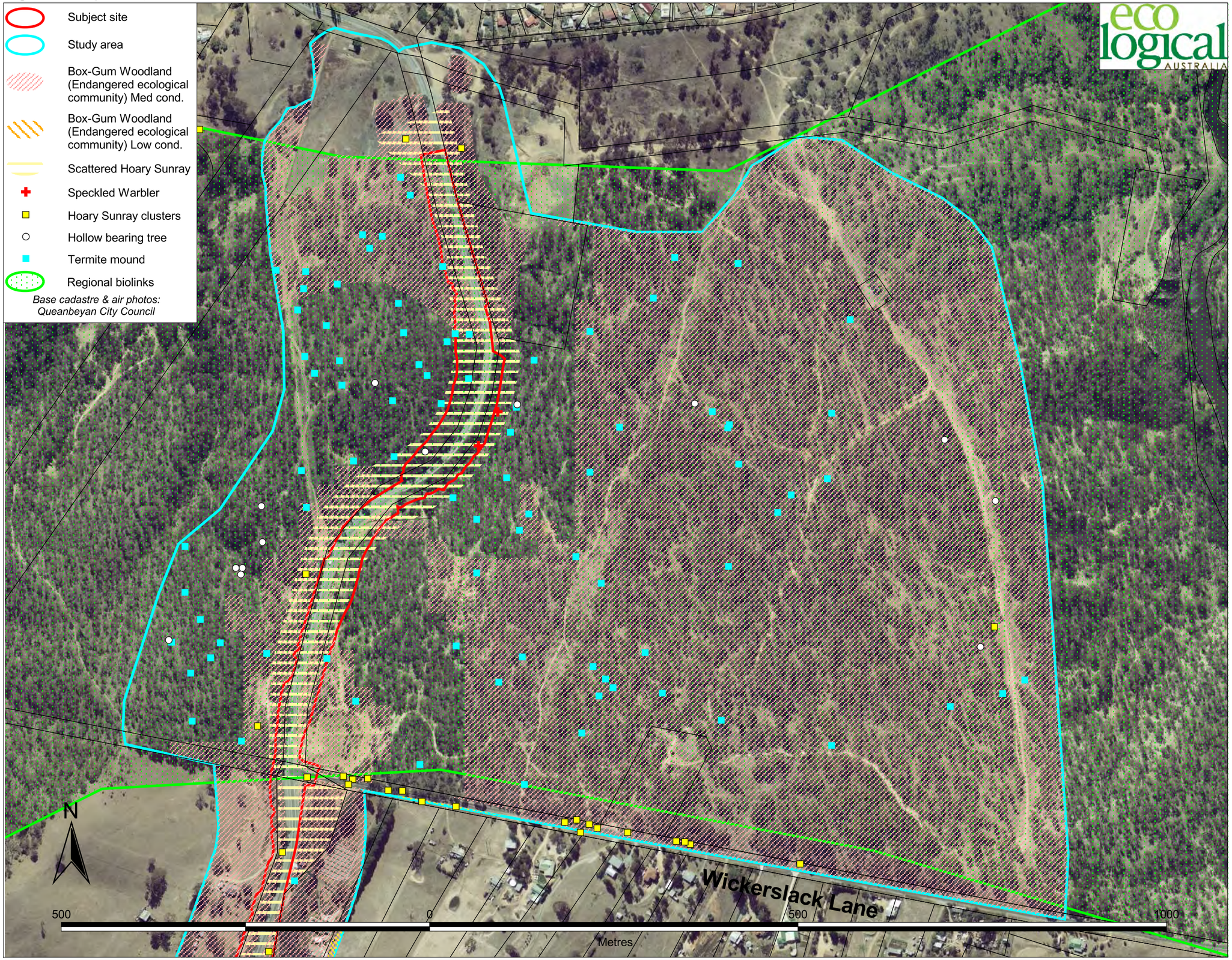


Figure 6b: Species, communities and habitats of conservation significance in central portion of the study area

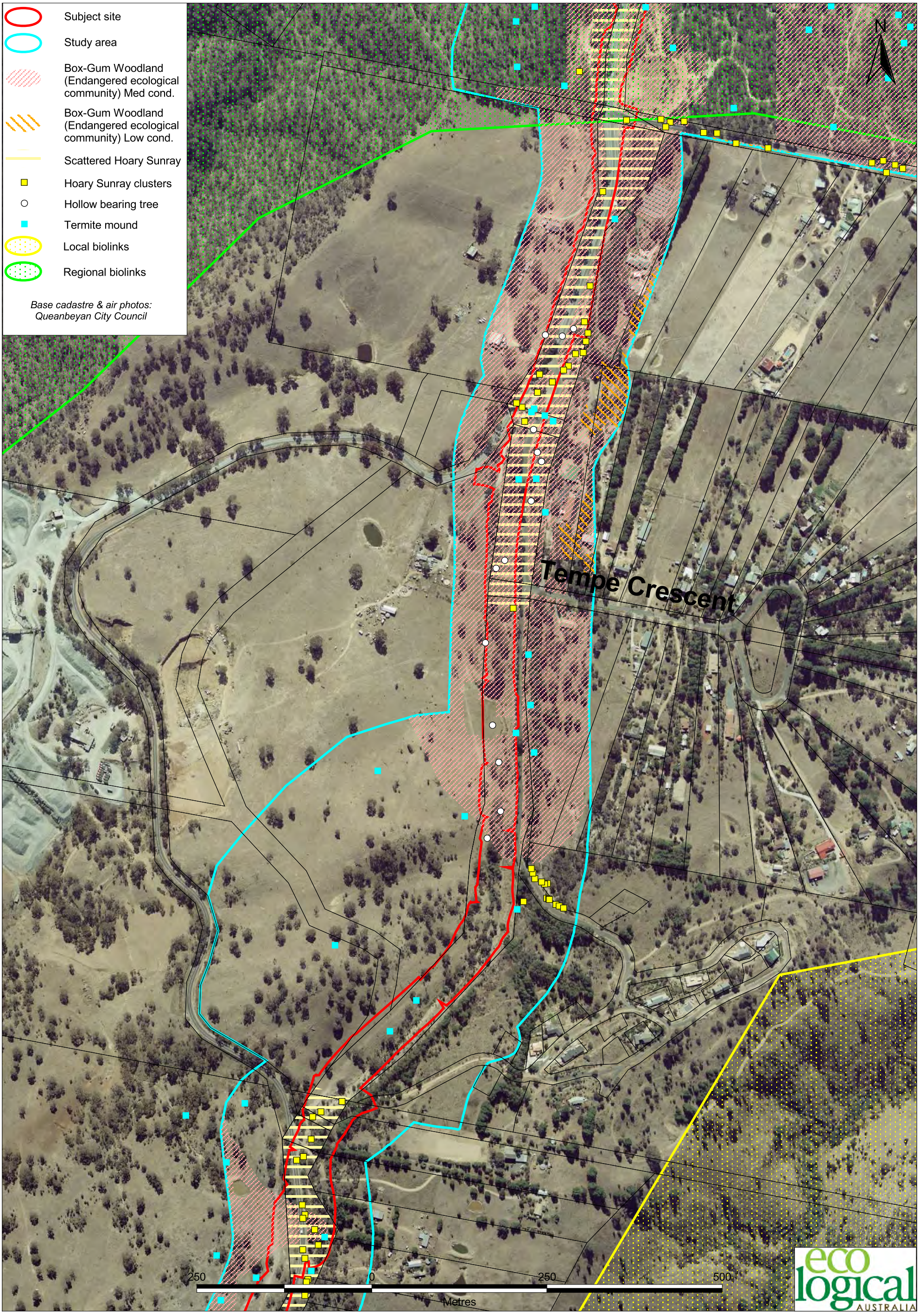
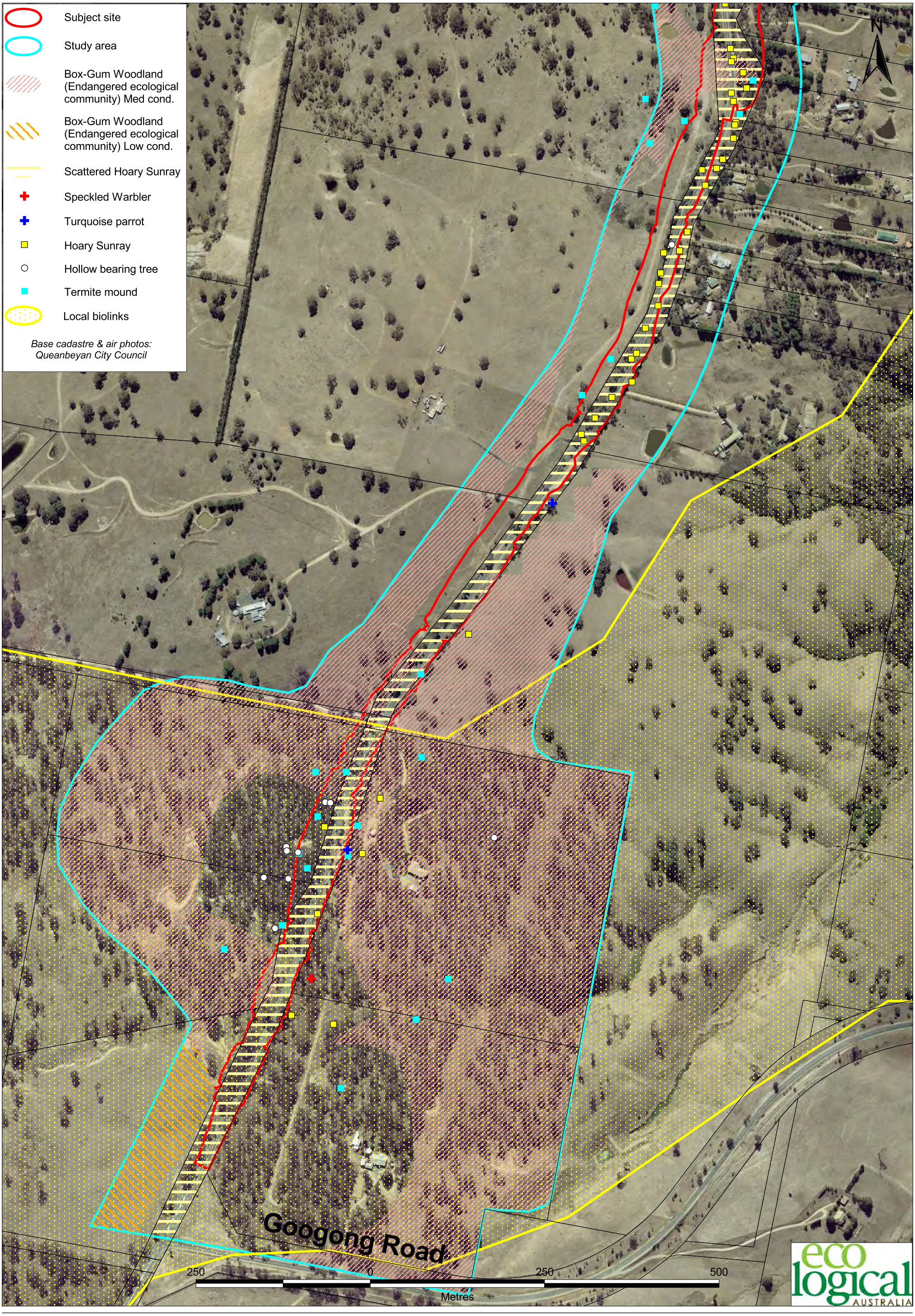


Figure 6c: Species, communities and habitats of conservation significance in southern portion of the study area



Connectivity in the central parts of the study area has been compromised by historic clearing for agriculture and more recently by rural residential development. As a result connectivity in the central parts of the study area is generally tenuous. Although in the absence of large gross disturbances such as those associated with the Cooma Road Quarry or extensive residential development, connectivity, albeit compromised, still remains within the central parst of the study area, with the most significant disruption comprising the existing Old Cooma Road surface.

3.1.3 Results – Fauna and Fauna Habitat

A total of three amphibian, 54 bird, 13 mammal and 11 reptile species were recorded within the study area during the survey period. This includes ten introduced fauna species. A full list of fauna species recorded within the study area has been compiled using data from the current survey and previous records (Appendix 4).

3.1.3.1 Amphibians

The three species of ground frogs recorded during the survey were generally found under rocks, logs or debris rather than in aquatic habitats, as aquatic habitats in the study area were limited and of relatively low quality for amphibians. All are common species in the locality and are unlikely to be substantially affected by the proposal. Specific targeted surveys for amphibians were not undertaken due to the very limited habitat for threatened amphibians. No threatened amphibians were recorded, or are expected to occur, in the study area.

3.1.3.2 Birds

A range of bird species were recorded in the study area which reflect the range of habitats present in the study area and surrounding landscape. Three introduced species, the Common Blackbird *Turdus merula*, Indian Mynah *Acridotheres tristis,* and Starling *Sturnus vulgaris*, were recorded from more disturbed areas. Two threatened woodland bird species were recorded during targeted surveys by ELA, and one other threatened bird species has been recorded in the study area during previous surveys, as discussed below.

3.1.3.3 Mammals

Mammals recorded during the survey reflected the disturbed rural nature of much of the study area. Seven of the 13 mammals species recorded were introduced: Cat, Cow, Dog, European Rabbit, Fox, Sheep and Horse. Eastern Grey Kangaroos were common inhabitants of the rural/bushland matrix, and by far the most numerous fauna species recorded by Wildcare as killed or injured in the study area along Old Cooma Road. Other native mammals recorded in the study area are common and widespread species. No threatened mammals were recorded during surveys.

Comprehensive mammal trapping and nocturnal surveys were not undertaken for this study. The study area provides suitable habitat for other mammals, particularly microchiropteran bats (including several threatened species which are discussed below), and it is assumed that they could occur in the study area.

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3.1.3.4 Reptiles

The reptile species recorded in the study area included two Dragons, four Skinks, two Snakes and one Blind Snake. Most of the reptiles recorded were from the rocky habitats near the centre of the study area, and were located under rocks during targeted surveys for the Pink-tailed Worm-lizard and Little Whip Snake. No threatened reptiles were recorded in the study area during targeted surveys by ELA.

Wildcare records of reptiles killed, injured or rescued in or near the subject site included Burton's Legless Lizard and Rosenberg's Goanna. Rosenberg's Goanna is the only threatened reptile to have been recorded in the study area, and is discussed further below.

3.1.3.5 Threatened Fauna

Two threatened fauna species listed as vulnerable under the TSC Act were recorded during in the study area during the survey period, the Speckled Warbler and Turquoise Parrot (Figure 6). At least one Speckled Warbler was recorded in a gully in the northern portion of the study area on two occasions. The species was recorded from the same general area on both occasions from within suitable breeding habitat. While breeding was not confirmed, it is possible that the records represent a breeding area for a pair of Speckled Warblers. Another record of the Speckled Warbler was made on one occasion in more open habitat in the south of the study area. This area may comprise part of another home range for one or more individuals, although appears unlikely to represent breeding habitat. The Turquoise Parrot was recorded from two locations in the southern portion of the study area. No evidence of breeding was observed. The open grassy habitats in the southern part of the site provide at least occasional foraging habitat for the species.

The Rosenberg's Goanna and Brown Treecreeper, also listed as Vulnerable under the TSC Act, have also been recorded in the study area via other studies. Habitat for the Rosenberg's Monitor occurs predominantly in forest and woodland to the north of Wickerslack Lane. This habitat comprises foraging, sheltering and breeding resources. The Brown Treecreeper was recorded previously from more heavily vegetated habitat in and around the southern parts of the study area (Thompson & Mullins 2004). A record of nestlings from the Wickerslack Lane area (Wildcare Queanbeyan) is adjacent to similar habitat within the study area.

3.1.3.6 Fauna Habitat

Fauna habitat in the study area varies from areas of relatively intact forest and woodland to areas heavily disturbed by rural and residential activities and infrastructure. The vegetation communities within the study area provide a range of foraging, sheltering and breeding resources for fauna.

Habitat quality for fauna is considered to be generally poor in much of the subject site, due to disturbances associated with the existing road corridor and adjacent rural and residential activities. The relatively intact forest and woodland to the north of Wickerslack Lane provides better quality habitats, as do some areas in the central and southern portions of the site that are less disturbed.

Specific fauna habitats or features of the study area are described further below.

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Drainage features: The subject site contains two substantial ephemeral drainage lines, associated with areas of steeper terrain. One is in the northern-most portion of the site immediately to the east of Old Cooma Road and drains to Barracks Creek at Karabar. While parts are heavily eroded and disturbed by the original construction of Old Cooma Road and close proximity to the road, this creek provides defined gully habitats for a range of species, including temporary water habitats for amphibians and likely nesting habitat for the Speckled Warbler.

The second substantial drainage feature originates near the southern Heights Road junction with Old Cooma Road and flows in a generally northward direction within the study area to the Wickerslack Lane area, and then flowing to the northwest into Barracks Creek. Substantially eroded in parts, this creek is also affected by grazing, weeds and road disturbances. Notwithstanding these disturbances, the creek provides sheltering habitats and ephemeral water habitats for a range of species. A small farm dam has been constructed along this creek and provides sustained water habitats, although disturbed by stock.

Two smaller ephemeral drainage lines occur in the south of the study area where they flow to the east under Old Cooma Road and then to the Queanbeyan River in a north-easterly direction. These drainage lines are not well defined and apart from retaining small pools of water after heavy rainfall, are unlikely to provide substantially different habitats to those in the surrounding landscape.

Wildlife corridors: The study area passes through an area of relatively intact woodland and dry forest to the north of Wickerslack Lane, which is part of a near contiguous area of habitat between the Queanbeyan River and Jerrabomberra. This area is recognised as part of a regionally significant biolink for flora and fauna (BES 2008) and would function as a wildlife corridor for many fauna species and contains known habitat (including suitable breeding habitat) for Rosenberg's Monitor, Speckled Warbler and probably Brown Treecreeper.

The subject site also bisects a smaller area of forest and woodland habitat in the southern portion of the study area, and while this habitat is relatively isolated, it has been identified as part of a disturbed local biolink between Jerrabomberra Creek and the Queanbeyan River (BES 2008). Three species of threatened woodland birds have been recorded within this habitat, and woodland birds in particular are expected to cross the road corridor in this area, given the presence of very similar habitat on both sides of the road. Corridors or biolinks from BES (2008) are shown in Figures 6 & 8.

Woodland & forest habitats: The more intact areas of dry forest and woodland in the study area, which essentially reflect the wildlife corridor areas above, provide a range of resources for fauna through more structurally diverse habitat. These habitats are of particular importance to woodland birds, microbats and some reptiles including the Rosenberg's Goanna. These areas provide a diverse range of foraging, sheltering and breeding resources from ground to canopy, in tree hollows, dense foliage and groundcovers, among fallen branches and leaf litter. Associated insect foraging resources are important for birds and bats, while terrestrial termite mounds provide breeding sites for the Rosenberg's Goanna. The Rosenberg's Goanna is likely to utilise only the more intact of these habitats in the north of the study area.

Trees with Hollows: Thirty eight hollow-bearing trees were identified throughout the study area (Figure 6), containing 18 small, 13 medium and 6 large hollows in upper

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trunks or branches and 9 base hollows and 5 stump hollows. Hollow size classes were as follows: small - up to 5cm, medium - 5-15 cm, large >15 cm diameter.

Hollow-bearing trees provide important shelter and/or breeding habitat for a range of fauna, including the subject species Eastern False Pipistrelle, Greater long-eared Bat, Brown Treecreeper and Turquoise Parrot. Fifteen hollow-bearing trees occurred within the subject site, mostly in the central section near Heights Road. No hollow-dependant threatened species were recorded in this section of the study area, however a Wildcare record of Brown Treecreeper nestlings came from the vicinity of Wickerslack Lane and Old Cooma Road. Most of the hollows to be removed provide only limited habitat for fauna given their proximity to the existing roadway and associated disturbances.

Termite Mounds: One hundred and thirty-two terrestrial termite mounds (potential nesting habitat for Rosenberg's Monitor) were recorded in the study area (Figure 6a, b & c). While these features were recorded throughout the study area, those termite mounds that coincided with primary habitat for the Rosenberg's Monitor (north of Wickerslack Lane) were considered the only resources with the potential to be utilised by the species for breeding. The 100 ha portion of the study area considered to be primary habitat for Rosenberg's Monitor contained approximately 86 mounds (0.86 per ha).

Rock Habitats: Rock habitats can provide important sheltering sites for reptiles, including the subject species Pink-tailed Worm-lizard and Little Whip Snake. Rock outcropping and surface rocks were mainly associated with steeper terrain in the central portion of the study area (Heffernan property and adjoining areas east of the quarry). However, these areas had been subject to substantial removal of vegetation, intensive grazing, soil loss, introduced grasses and introduced trees and other physical disturbances from rural and infrastructure uses. The southern parts of the study area contain discontinuous sparse scatters of surface rock in association with largely cleared or semi-cleared rural land and Crown land. These areas are considered marginal habitat for the Pink-tailed Worm-lizard and generally unsuitable for the Little Whip Snake. More intact areas of forest and woodland vegetation in the north of the study area contain sparsely scattered surface rocks and logs that are considered unlikely habitat for the Pink-tailed Worm-lizard and marginal habitat for the Little Whip Snake.

Grassy Habitats: Areas of native grasses can provide important habitats for threatened species such as the Golden Sun Moth, Grassland Earless Dragon and Striped Legless Lizard. In the study area, such habitats were generally small, patchy, discontinuous and degraded by clearing, introduced species and grazing. Predominantly native grassy habitats mainly occur in the south-west of the study area, which abuts higher quality habitats known to support the Golden Sun Moth. Generally, all open grassy areas were heavily grazed during the survey period, apart from small patchy areas within crown land or road reserves not subject to grazing.

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4. Assessment Of Likely Impacts Upon Threatened Species and Communities

4.1 Assessment to Determine Affected Species

In order to determine which species and communities may be affected by the proposal, consideration has been given to the following issues:

- The distribution and habitat preferences of threatened species and communities known from the locality;
- Suitability of habitats to be affected for threatened species and communities known from the locality;
- The movement patterns and home range sizes of threatened species known from the locality;
- The likelihood of threatened species and communities known from the locality to occur in the habitats affected;
- The condition and quality of habitats to be affected;
- The nature of the development and extent of direct and indirect impacts;
- The results of current and previous field surveys in and around the study area; and
- The results of other flora and fauna studies in the locality (Figure 7, 8 and 9).

It is considered that the threatened species and ecological communities that may be affected by this proposal are:

- Box-Gum Woodland;
- Hoary Sunray;
- Pink-tailed Worm-lizard;
- Rosenberg's Goanna;
- Brown Treecreeper;
- Diamond Firetail;
- Flame Robin;
- Gang-gang Cockatoo;
- Hooded Robin;
- Scarlet Robin;
- Speckled Warbler;
- Turquoise Parrot;
- Varied Sittella;
- Eastern Bent-wing Bat;
- Eastern False Pipistrelle;
- Greater Long-eared Bat;
- Golden Sun Moth.

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Figure 7: Vegetation communities in the locality (BES 2008, Fallding 2002)

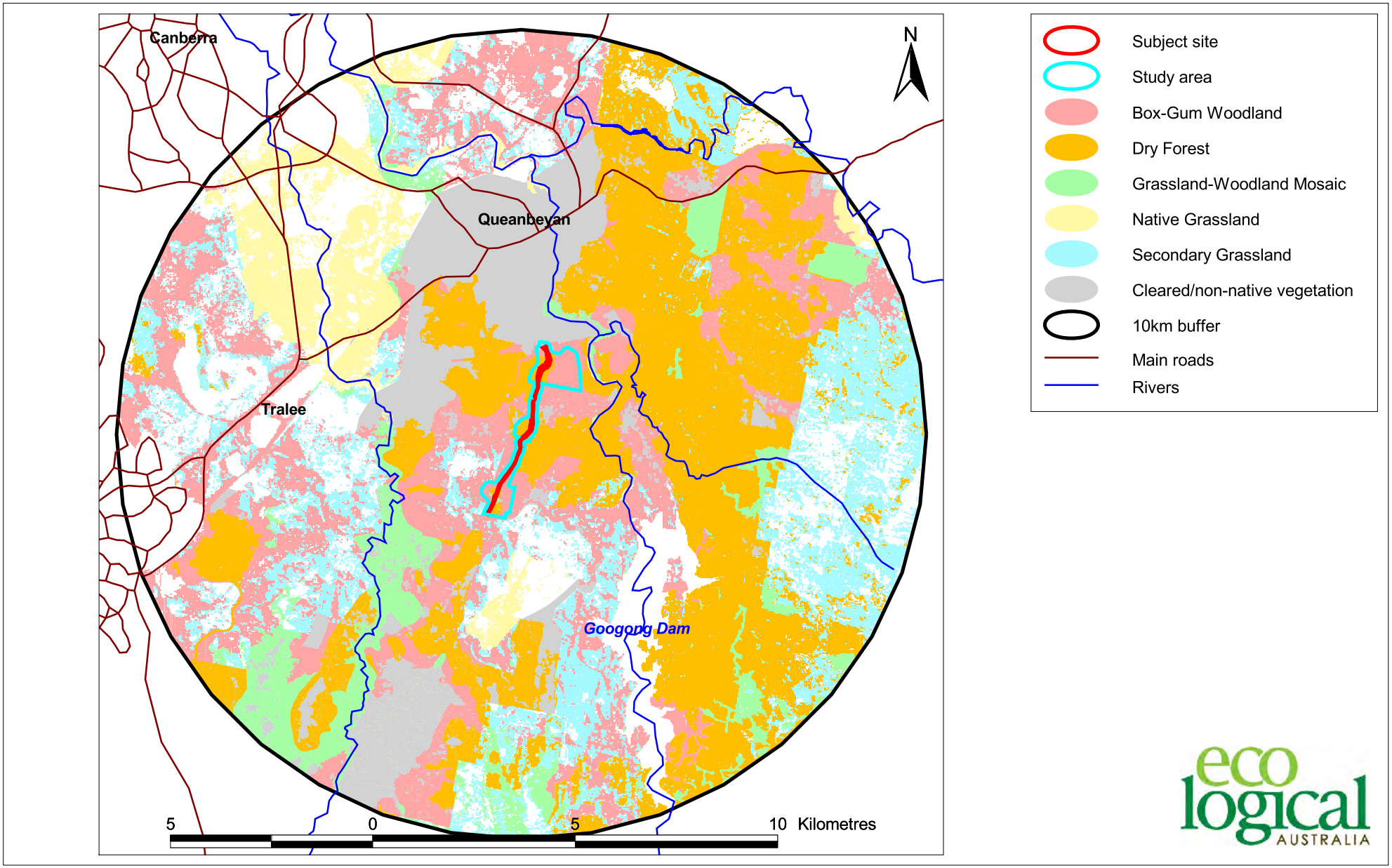


Figure 8: Vegetation conservation values and biolinks in the locality (BES 2008)

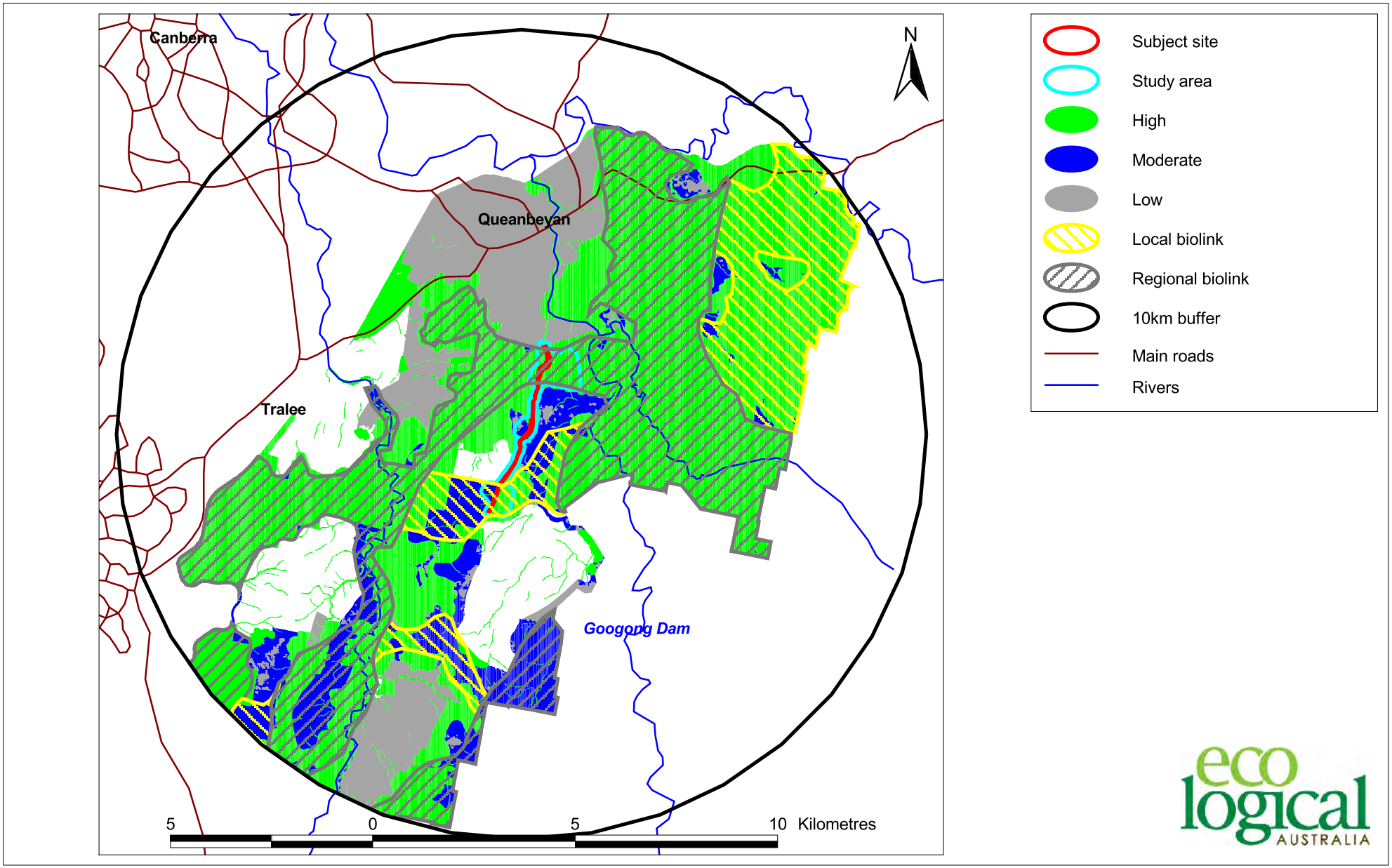
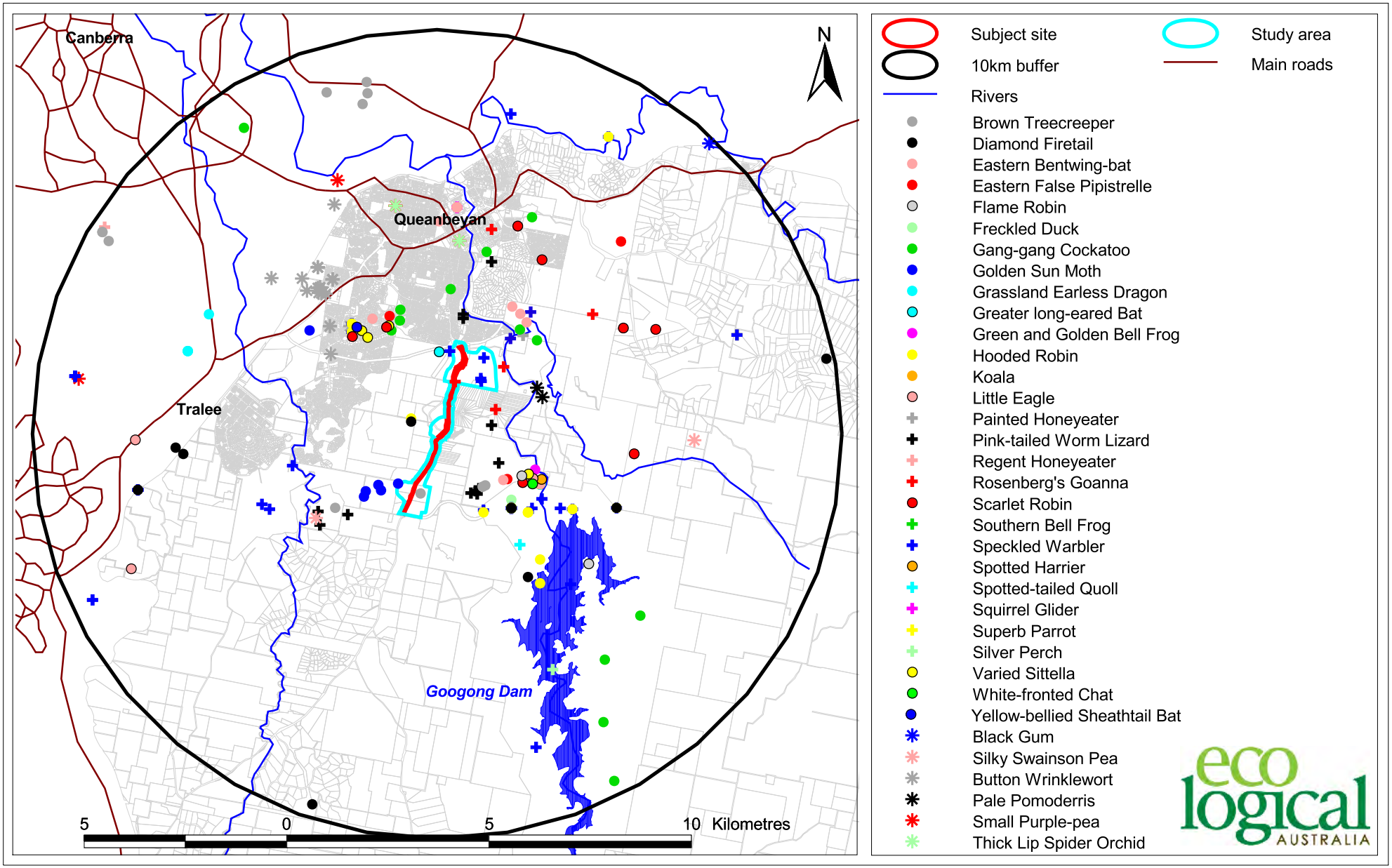


Figure 9: Threatened flora and fauna records in the locality



4.2 Assessment of Affected Species and Communities

4.2.1 Box-Gum Woodland

Local Abundance

The validation of the vegetation mapping of Fallding (2002) by BES (2008) estimated that the locality supports approximately 2,275 ha of Box-Gum Woodland (Figure 7). However, this did not include any of the Box-Gum Woodland in those areas to the west of the southern parts of the study area, that are known to support relatively extensive areas of Box-Gum Woodland (these areas were excluded from the study area for the Queanbeyan Biodiversity Study BES (2008)). The Box-Gum Woodland in this area has not been heavily grazed in recent years and are subsequently in good condition with excellent recovery potential. The 2,275 ha figure also did not include areas within the locality that are beyond the boundaries of Queanbeyan LGA.

For the purposes of this assessment, the unvalidated mapping of Fallding (2002) has been used in those areas not covered by BES (2008). As such, Biometric condition data (after Gibbons *et. al*. 2005) is only available for those areas covered by BES (2008), which comprise approximately 37% of the locality. In this context, the locality is estimated to support approximately 5,652 ha of Box-Gum Woodland, at least 1,765 ha of which is in moderate to good condition, the rest either being in low condition or has not been validated.

Regional Abundance

The regional extent of the Box-Gum Woodland has not been defined, however Fallding (2002) estimates that there is more than 106,000 ha of Box-Gum Woodland within the NSW Southern Tablelands and ACT region, which covers part of the South Eastern Highlands Bioregion. This does not include areas of secondary grassland that may comprise the community.

The validation of the vegetation mapping of Fallding (2002) by BES (2008) estimated that the Queanbeyan LGA supports approximately 2,807 ha Box-Gum Woodland. However, as mentioned above, this did not include some parts of the LGA which are known to support good quality occurrences of Box-Gum Woodland.

Keith (2006) estimates that there is 140,000-230,000 ha of Southern Tablelands Grassy Woodlands extant. The Southern Tablelands Grassy Woodlands equates to the Box-Gum Woodland EEC. A substantial proportion, more than 50% of the Southern Tablelands Grassy Woodlands occurs within the Bioregion.

Parts of the Tableland Clay Grassy Woodlands of Keith (2006) equate to the Box-Gum Woodland EEC. Keith (2006) estimates that there is 160,000-250,000 ha of Tableland Clay Grassy Woodlands extant. Approximately 50%, of the Tableland Clay Grassy Woodlands occurs within the Bioregion.

Whilst, the regional extent of the Box-Gum Woodland has not been defined precisely the estimates described above suggest that the regional extent of the community is more than 100,000 ha.

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Assessment of Habitat
Much of the Box-Gum Woodland within the study area has been modified by historic and ongoing disturbances associated with agriculture, the construction and maintenance of Old Cooma Road, the provision of electricity services, and in association with surrounding rural residential development. Disturbances have been heaviest in the central and northern parts of the study area where long-term grazing and disturbances associated with the Old Cooma Road and around Barracks Creek, have resulted in extensive weed invasion and modification of the groundcover and understorey. The Box-Gum Woodland within the southern parts of the study area is generally in much better condition with a relatively diverse native groundcover and understorey and relatively minor weed infestation in places.

Despite these modifications only a few small areas of the Box-Gum Woodland within the study area would be classified as low condition using the Biometric condition class definition (Gibbons *et. al*. 2005). Using the Biometric condition class definition (Gibbons *et. al*. 2005), the subject site supports approximately 4.71 ha of Box-Gum Woodland in moderate to good condition and approximately 0.79 ha of Box-Gum Woodland in low condition as shown in Figure 6a, b & c.

As described above, the bulk of the Box-Gum Woodland in the northern parts of the study area has undergone extensive modification as a result of historic and ongoing disturbances associated with agriculture and the construction and maintenance of Old Cooma Road. However the Box-Gum Woodland in the southern, and to a lesser extent central parts of the study area, are generally in better condition.

Northern Areas in association with Barracks Creek – Where Box-Gum Woodland continues to exist there is evidence of historic clearing and grazing and of ongoing disturbances associated with the maintenance of Old Cooma Road. On the western side of Old Cooma Road there are areas where road base has been spread and probably stored. The Box-Gum Woodland on the western side of the road has also been subject to minor sheet erosion or other disturbances such as vehicle traffic, which have removed or compacted the topsoil leaving bare earth. There are other areas where there appears to have been historic scraping of the surface and removal of topsoil, and where there has been subsequent weed invasion, mainly of weedy grasses. Disturbances seem to have been concentrated on the lower parts of the site or closer to Old Cooma Road with the areas further upslope being less disturbed. However, theses areas are more ecotonal with the adjoining Tablelands Dry Shrub/Tussock Grass Forest.

Despite these disturbances, and in part because of them, this area supports many individuals of Hoary Sunray. There is recruitment of canopy species and a reasonably diverse range of more resilient native groundcovers in those areas where disturbances have been less intensive. However, much of the groundcover on the lower areas is dominated by or includes substantial cover of a diverse range of weeds, the most common of which are St John's Wort, Lamb's Tongue *Plantago lanceolata,* Hairgrass *Aira* sp., African Lovegrass, Hop Clover *Trifolium campestre*, Haresfoot Clover *Trifolium arvense* and Wild Sage.

The Box-Gum Woodland on the eastern side of Old Cooma Road is also heavily disturbed. There is extensive evidence of historic disturbances to the substrate which

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have resulted in a predominance of exotic groundcovers in most areas. There has also been some gully erosion along the drainage line that traverses the area. There appears to historically have been some attempts at active revegetation which have resulted in a dense sub-canopy of Black Wattle in places. The Box-Gum Woodland in this area supports a diverse range of weedy groundcovers associated with waste places and degraded pastures in the locality, and also includes weeds, such as Japanese Honeysuckle *Lonicera japonica,* which appear to be escapes from the adjacent landfill. Whilst the characteristic canopy species remain on the eastern side of Old Cooma Road, the groundcover is generally dominated by exotic species.

Notwithstanding the historic and ongoing disturbances, the Box-Gum Woodland in this area would all be considered to be in moderate to good condition using the Biometric condition class definition (Gibbons *et. al*. 2005), given the canopy cover.

Central Areas from Heffernan's Property North to Wickerslack Lane– Where Box-Gum Woodland continues to exist there is evidence of historic clearing and grazing and impacts associated with construction, use and maintenance of Old Cooma Road and Heights Road. The disturbances have been heaviest in the northern parts of this area, to the west of the Old Cooma Road road reserve where long-term heavy sheep grazing has reduced the groundcovers to only the most resilient of native species. Notwithstanding the historic and ongoing disturbances, the Box-Gum Woodland in this area would all be considered to be in moderate to good condition using the Biometric condition class definition (Gibbons *et. al*. 2005), again given the canopy cover.

Southern Areas from Lot 1 DP 513432 south to Googong Road – The Box-Gum Woodland in the southern parts of the study area is generally in relatively good condition although there are areas that have been degraded through grazing and disturbances associated with the road *i.e*. road base and drainage. Whilst exotic groundcovers and shrubs occur throughout and particularly ubiquitous species such as Briar Rose and St John's Wort, there is generally a diverse range of natives, even in adjoining private property where grazing levels predominately appear to have been relatively low, at least in recent times, throughout most of this part of the study area.

The rest of the Box-Gum Woodland within this part of the study area is within the road reserve, and thus has generally been protected from grazing, although impacts associated with the road are apparent throughout and particularly closer to the road. With the exception of the small areas on the southern extremities of the study area, where the canopy has been entirely removed and grazing has been particularly heavy, the Box-Gum Woodland in this area would all be considered to be in moderate to good condition using the Biometric condition class definition (Gibbons *et. al*. 2005).

Habitat Values

The habitat values of the Box-Gum Woodland varies across the study area. The habitat values are higher in the southern parts of the study area where the groundcover is generally less weedy and has higher native richness. Given historic disturbances however, the abundance of fallen timber is generally low throughout the Box-Gum Woodland within the study area and there are relatively few (17) hollow-bearing trees present.

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The habitat values of the Box-Gum Woodland within the study area are typical of the community elsewhere within the locality and probably throughout the region, with the habitat values generally being diminished by historic and ongoing disturbances, particularly clearing and grazing. However as with other parts of the locality, there are patches of better quality habitats where grazing has been limited i.e. road reserves, or has been relaxed in recent times i.e. in the properties in and adjoining the southern parts of the study area, but they are generally fragmented and relatively limited in extent.

Distribution and Condition of Regional Habitats
As described above the distribution and condition of the Box-Gum Woodland within the region has not been defined precisely. However it is likely that the vast majority of the Box-Gum Woodland within the region has been heavily modified by historic and ongoing disturbances, particularly clearing and grazing. However given the relatively small amount of cropping and pasture improvement within the region, it is likely that much of the Box-Gum Woodland within the region would still be classified as moderate to good using the Biometric condition class definitions (Gibbons *et. al*. 2005). This is consistent with observations within the Queanbeyan LGA, where the bulk of the extant Box-Gum Woodland is in moderate to good condition.

Conservation Status
The Box-Gum Woodland is listed as an EEC under both the TSC and EPBC Acts.

At a State level the extent of Box-Gum Woodland is considered to have been drastically reduced since European settlement with estimates of between 1 and 7 % of the community's pre-European extent still extant in central and southern NSW (NSW Scientific Committee 2006). Impacts on the community have been less severe in northern NSW (Threatened Species Scientific Committee, undated).

The regional extent of the Box-Gum Woodland has not been defined, however Fallding (2002) estimates that there is more than 106,000 ha of Box-Gum Woodland within the NSW Southern Tablelands and ACT region, which covers part of the South Eastern Highlands Bioregion. This does not include areas of secondary grassland that may comprise the community.

Keith (2006) estimates that there is 140,000-230,000 ha of Southern Tablelands Grassy Woodlands extant. The Southern Tablelands Grassy Woodlands equates to the Box-Gum Woodland EEC. A substantial proportion, more than 50% of the Southern Tablelands Grassy Woodlands occurs within the Bioregion. Parts of the Tableland Clay Grassy Woodlands of Keith (2006) equate to the Box-Gum Woodland EEC. Keith (2006) estimates that there is 160,000-250,000 ha of Tableland Clay Grassy Woodlands extant. Approximately 50%, of the Tableland Clay Grassy Woodlands occurs within the Bioregion.

Whilst, the regional extent of the Box-Gum Woodland has not been defined precisely the estimates described above suggest that the regional extent of the community is more than 100,000 ha.

The validation of the vegetation mapping of Fallding (2002) by BES (2008) estimated that the locality supports approximately 2800 ha of Box-Gum Woodland. However,

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this did not include any of the Box-Gum Woodland in those areas to the west of the southern parts of the study area, that are known to support relatively extensive areas of Box-Gum Woodland (these areas were excluded from the study area for the Queanbeyan Biodiversity Study BES (2008)). For the purposes of this assessment, the unvalidated mapping of Fallding (2002) has been used in those areas not covered by BES (2008). In this context, the locality is estimated to support approximately 5652 ha of Box-Gum Woodland, at least 1765 ha of which is in moderate to good condition, the rest either being in low condition or has not been validated.

Key Threatening Processes
The following key threatening processes (KTP's) apply to Box-Gum Woodland:

- Invasion of native plant communities by exotic perennial grasses;
- Competition and grazing by the feral European Rabbit;
- Clearing of native vegetation;
- Loss of hollow bearing trees; and
- Removal of dead wood and dead trees.

The proposal has the potential to result in some of these KTP's being exacerbated, particularly clearing of native vegetation. In addition, the use of construction vehicles such as heavy machinery during the construction process and during ongoing maintenance, has the potential to result in increased invasion from exotic perennial species particularly grasses.

Recovery Planning
A draft national recovery plan for the Box-Gum Woodland has been produced by DECCW (2010). The objectives of the plan are to minimise the risk of extinction to the endangered ecological community through:

- achieving no net loss in extent and condition of the ecological community throughout its geographic distribution;
- increasing protection of sites in good condition;
- increasing landscape functionality of the ecological community through management and restoration of degraded sites;
- increasing transitional areas around remnants and linkages between remnants; and
- bringing about enduring changes in participating land manager attitudes and behaviours towards environmental protection and sustainable land management practices to increase extent, integrity and function of Box-Gum Grassy Woodland.

The draft recovery plan lists 34 recovery actions for the community, under five strategies: Improve baseline information; Increase protection of Box-Gum Grassy Woodland; Improve Community Engagement; Continue ecosystem function and management research; and Improve compliance and regulatory activities.

With the 129 ha offset site, the proposal is consistent with several of the objectives of the recovery plan in relation to no net loss of the community; increased protection of

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sites in good condition and; increasing landscape functionality of the community through management and restoration of degraded sites.

Ameliorative measures
The main method for mitigating the overall impact on Box-Gum Woodland is the offset strategy to be negotiated between QCC and DECCW. A local offset site containing 129 ha of Box-Gum Woodland has been identified and an offset plan will be prepared, which will involve long-term protection and improvement of the community. On-site measures include fencing the edge of the development footprint and indication for construction workers to prevent unnecessary disturbance to adjacent areas of Box-Gum Woodland. Longer-term edge effects will be minimised by monitoring and maintenance of the development perimeter. Long-term security of Box-Gum Woodland on Crown Land within the biolinks to the north east and south west of the site would be improved by sympathetic management of these areas for conservation values where possible.

4.2.2 Hoary Sunray

An estimated 2,500 Hoary Sunray individuals occur throughout the development footprint, predominantly along the disturbed road verges. A concentration of at least 1,700 individuals (BES 2007) occurs in the central parts of the development footprint, associated with Stage 1. At least several hundred more individuals are scattered through the northern and southern sections of the development footprint (Stage 2). The species also occurs in numerous locations within the study area beyond the development footprint, although the number of individuals has not been estimated.

Beyond the study area, the Hoary Sunray appears to be relatively abundant at a number of locations elsewhere in the locality, and has been recorded in numerous locations within 1 km of the study area by BES, ELA and GHD during surveys in recent years (BES 2007a & b, BES 2008a & b, BES 2009, GHD 2009, ELA 2009), including along the proposed Edwin Land Parkway. The species is known to occur at a number of other locations within Queanbeyan LGA, including within the road reserve of Wickerslack Lane; within the council reserve to the north of Wickerslack Lane; Jumping Creek (BES 2009); on the northern and western slopes of Mount Jerrabomberra; at nine locations within the Stringybark Reserve; the Carwoola area in road reserves and less heavily grazed areas near the junction of Wanna Wanna Road and Captains Flat Road, to the south of Captains Flat road in the Stony Creek catchment, and adjacent to the Kings Highway; sporadically throughout the Gale Precinct south of Wickerslack Lane; on the lower eastern slopes of Mount Campbell adjacent to Old Cooma Road (BES 2008b); in grassy woodland in the north of the Royalla Crown Lands; Queanbeyan Nature Reserve; Stony Creek Nature Reserve and; Cuumbeun Nature Reserves.

The species is also known from numerous other locations in the region to the north, south and east of the study area including Adaminaby, Cooma, Goulburn, Bungendore, Michelago and east to Braidwood (Sinclair 2009), and has been recorded by ELA at other locations including Breadalbane, Tuena, Dalton, and Jerrabomberra (BES 2008b).

There is insufficient information available at present to definitively determine the level of exchange of genetic material between the discrete occurrences of the species that have been recorded within the study area and elsewhere within the locality.

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However, where there is inadequate information on a species with which to assess the extent to which genetic material is exchanged, a population can be defined using the "rule of thumb" given by Keith et al. (1997) as a "geographic discontinuity of more than 1 kilometre". Given this, the discrete occurrences of the species within the study area and the bulk of those described elsewhere in the locality, such as along Old Cooma Road, Wickerslack Lane, on the proposed Edwin Lane Parkway, near Tempe Crescent, on Mount Jerrabomberra, Stringybark Reserve, Jumping Creek, in the Gale Precinct, and within Stony Creek, Queanbeyan and Cuumbeun Nature Reserves can be considered to be a single population. On the basis of the surveys undertaken for this and other assessments within the Queanbeyan LGA, the size of the local population of the species is estimated to be at least tens of thousands of individuals in size and probably in the hundreds of thousands of plants. There are also thousands of hectares of potential habitat within the region.

The primary mitigation measure for the species is the provision of compensatory habitat and sympathetic management of this habitat. Approximately 129 ha of Box-Gum Woodland will be managed for conservation purposes as an offset to the action proposed, and this area provides potential habitat for the Hoary Sunray. The proposed offset site is currently subject to permissible landuses i.e. grazing, that are known to be detrimental to the species. However, in the absence of moderate to heavy grazing, the proposed offset provides suitable habitat for the species. Hoary Sunray is common in Stringybark Reserve, just to the west of the proposed offset, and in other non-grazed or lightly grazed Box-Gum Woodlands nearby i.e. Wickerslack Lane Reserve. Under these circumstances, it is reasonable to assume that the species will recolonise the proposed offset in time, given its relatively long-range wind dispersal capabilities. As the species seed is wind dispersed over relatively long distances (many kilometres (Sinclair 2010)), any affects of habitat fragmentation are likely to be less adverse than in species with more localised dispersal vectors.

4.2.3 Pink-tailed Worm-lizard

Local and regional abundance

This species is not known to occur in the study area and was not located during surveys of potential habitat during this study or other targeted surveys in the study area (BES 2007a, Thompson and Mullins 2004). The abundance of the Pink-tailed Worm-lizard in the locality is not clear, but the species is known from a number of other sites in the locality, where it has been recorded in low numbers. The species is likely to be more widespread than current records indicate, given the widespread occurrence of potential habitat and that the species is not obvious to observe.

The regional abundance of the species is not known and few records exist. Apart from a concentration of records in the Queanbeyan/Canberra areas, the only other regional records are from near Bathurst, Cooma and Yass.

Other known local populations

The species is known from a number of local sites including three to the north of the study area near the Queanbeyan River, on several ridges between the study area and the Queanbeyan River (Thompson & Mullins 2003, BES 2008), to the south-west of the study area on the northern margins of Fernleigh Estate, the south western side of

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Beaty Hill (BES 2008), the 'Poplars' (Biosis 2003a) and 'Tralee' (Biosis 2003b). Local populations occur on freehold land.

Habitat requirements and utilisation
The Pink-tailed Worm-lizard occurs in areas of predominantly native grassland or open woodland areas with rocky outcrops or small, scattered, partially embedded rocks. The species shelters under suitable rocks and in burrows constructed by ants and termites. It feeds on the ants and ant larvae that utilise the same microhabitat. Sites are typically sloping, well drained and often dominated by Kangaroo Grass (DECCW 2009).

Potential habitat for the species within the vicinity of the study area was surveyed by rock-rolling at appropriate times of the year. Previous targeted surveys for the species were undertaken in the central parts of the study area by BES (2007a) and southern parts of the study area by Thompson & Mullins (2004). None of these surveys recorded the species or evidence of the species (shed skins), and none of the potential habitat surveyed was considered to be high quality habitat. The species is therefore considered unlikely to utilise the study area and unlikely to be directly affected by the proposal.

Corridors
The two biolonks occurring in the study area (BES 2008) are unlikely to be utilised by the Pink-tailed Worm-lizard. In the south of the study area, records of the species do occur on both sides of Old Cooma Road, at distances of more than 1km from the road. Connectivity between these closest populations to the east and west of the study area has already been limited to varying degrees by farming practices and existing roads. However, a potential area of connectivity through lower quality habitat does exist through the south of the study area, generally through the area identified as a local biolonk by BES (2008). The proposal would extend the area of disturbance through this biolink, but would not remove or further fragment habitat for the species. Proposed drainage culverts under this and other sections of the upgraded road may provide some opportunity for the species to pass under the road.

Assessment of habitat
Habitat values
The primary area of potential habitat for the Pink-tailed Worm-lizard in the study area is in the central section between Old Cooma Road and Tempe Crescent, covering about 19 ha. This area contained the greatest concentration of suitable sized rocks on well drained slopes. However, the original dry forest vegetation had been heavily disturbed, most recently for grazing. Much of the southern ridge contained very little groundcover vegetation and soil loss was evident. Another upper-slope area close to the southern intersection of Heights Road and Old Cooma Road also contained numerous rocks of suitable size. This area was also heavily disturbed by construction of roads, electricity easements and pine plantings. The groundcover contained a high proportion of introduced species.

Small areas of potential habitat also occurred in the southern parts of the study area, where small, discontinuous scatters of surface rock occurred in woodland or forest

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vegetation. Surface rocks were considered too sparse to represent good quality habitat. Much of these areas had also been heavily grazed, cleared and/or disturbed by other rural activities.

Habitat in the north of the study area was less suitable for the species, with relatively few surface rocks occurring in shrubby, rather than grassy, vegetation. This habitat was not surveyed for the species given the lower habitat quality.

The southern 1.5km of the current study area was subject to a previous ecological study of the Googong area by Thompson & Mullins (2004). This previous study included targeted surveys for the Pink-tailed Worm-lizard in parts of the current study area (Figure 4). No Pink-tailed Worm-lizards were found closer than about 2km from the subject site (Figure 9). Habitat mapping for the Pink-tailed Worm-lizard was also undertaken by Thompson & Mullins (2004) and no habitat was defined in the current study area.

Distribution and condition of regional habitats
The condition of the habitat at the few other regional records is not known. The distribution of habitat potentially suitable for the species is much more widespread than the current records, suggesting the potential for other as yet undocumented populations in the region.

Conservation status
The Pink-tailed Worm-lizard is listed as vulnerable in NSW under the TSC Act, and vulnerable under the Commonwealth EPBC Act. Bionet lists only 14 scattered records of the species in NSW, with several in the Queanbeyan area as mentioned above. Most local and regional records appear to be on freehold land which may not be adequately protected in the long-term.

Key threatening processes
The species is potentially threatened by the processes of native vegetation clearing, bush rock removal and establishment of exotic perennial grasses. The proposal involves the removal of native vegetation, however the vast majority of the vegetation to be removed was not considered suitable habitat for the Pink-tailed Worm-lizard. Within the disturbance footprint, only small areas towards the centre of the site contained potential rock habitats, however areas to be disturbed contained low densities of rocks. The vast majority of potential habitat in the study area would not be directly affected by the proposal and none of this was considered high quality habitat.

Recovery planning
No draft or approved recovery plans are available for the Pink-tailed Worm-lizard, however 17 priority actions have been identified to help recover this species (DECCW 2009):

- Undertake a review of threats at known sites.
- Develop and implement a site management plan for Googong Foreshore Reserve.

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- Develop guidelines for habitat identification, enhancement and management.
- Implement habitat management guidelines in Buddigower NR and Goulburn River NP.
- Provide incentive payments for protection and enhanced management of known sites.
- Reserve or ensure long-term management of known populations.
- Develop and implement a site management plan for Cooma North Ridge Reserve.
- Develop and implement a site management plan for Eedy's New TSR.
- Develop and implement a site management plan for Nail Can Hill Reserve.
- Implement monitoring regime at six sites across the range of the species on a three year rotational basis.
- Investigate the genetic differences between populations and determine if revisions of taxonomy and status are warranted.
- Undertake research into biology, ecology and management.
- Undertake surveys for the species in areas of identified potential habitat using survey guidelines.
- Develop minimum disturbance survey and monitoring guidelines.
- Undertake distribution modelling or remote sensing to identify potential distribution and habitat.
- Undertake survey in Buddigower NR to determine presence and distribution of species in reserve.
- Undertake survey in Goulburn River NP to determine presence and distribution of species in reserve.

The proposal does not conflict with any of the above priority actions and is not expected to remove or affect potential Pink-tailed Worm-lizard habitat.

4.2.4 Rosenberg's Goanna

Local and regional abundance

Rosenberg's Goanna is known to occur in the north of the study area which contains and is contiguous with relatively large areas of intact bushland. The species was not recorded within the study area during surveys, but was not specifically targeted by surveys due to the large survey effort required, previous records and presence of suitable habitat.

Wildcare Queanbeyan records of animals that have been rescued or euthanized from the study area indicate that two Rosenberg's Goannas have been recorded near the junction of Old Cooma Road and Wickerslack Lane between 1 January 2008 and 31 May 09. Anecdotal evidence from a local resident indicates other individuals have been observed near the junction of Wickerslack Lane and Old Cooma Road. The species is expected to regularly occur in the local area, although with typically large home ranges, adults may not be commonly observed. The study area is expected to provide part of a home range for one to several adult goannas.

The regional abundance of the species is not known, although a number of records are known from the region (South Eastern Highlands bioregion), which contains extensive areas of suitable habitat. Other regional records are concentrated

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between Queanbeyan and Cooma and Kosciuszko National Park around Khancoban and Tooma River. Other regional records are known from Abercrombie River National Park, Blue Mountains National Park, Brindabella National Park, Morton National Park and Turon National Park. Most of these records are associated with or occur close to conservation reserves, which are likely to contain the core areas of habitat for these populations.

Other known local populations
Local records exist from the Wickerslack Lane area, the Queanbeyan River corridor to the east, to the north near the Kings Highway and close to Cuumbeun Nature Reserve. There have also been anecdotal records from the nearby Greenleigh Estate. An extended local population is expected to occur in this area, from Jerrabomberra in the west through to at least Cuumbeun Nature Reserve in the east and probably south to at least Googong Foreshores Reserve, given the extent of contiguous suitable habitat. Suitable habitat extends to the south including Tinderry Nature Reserve.

Habitat requirements and utilisation
The Rosenberg's Goanna occurs in a range of habitats from heath through to open forest and woodland, where adequate foraging resources, shelter sites and terrestrial termite mounds exist. The species forages on a range of birds, eggs, reptiles, mammals and carrion. Shelter sites include rocks crevices, hollow logs and burrows. Terrestrial termite mounds (or termitaria) are essential for nesting, as eggs are laid and incubated inside the mounds.

The northern section of the study area (i.e. north of Wickerslack Lane) is likely to be the primary area of habitat utilised by the species in the study area. This area (of approximately 100 ha) contains suitable foraging, sheltering and breeding habitat (at least 86 termite mounds). While the species may occasionally venture into adjacent rural areas, these parts of the study area are substantially compromised as habitat, due to the extent of broad scale clearing, removal of most key habitat resources, and the introduction of a range of other disturbances including barriers such as residential areas and fencing, and threats such as dogs and motor vehicles. A further 46 termite mounds were recorded in the remainder of the study area (south of Wickerslack Lane), although associated habitat for the Rosenberg's Goanna is relatively poor. The central section of the study area opposite the quarry and the southern section of the study area, which contains more intact woodland and forest, offer some marginal habitat for the species, although these areas are disturbed, too small to provide substantial habitat, and surrounded by extensive areas of unsuitable or less suitable habitat.

The primary habitat in the study area (north of Wickerslack Lane) is likely to be used, possibly as breeding habitat, by a low number of resident individuals given the relatively large home range requirement of the species (up to 500ha in this region). A number of transient individuals or dispersing juveniles are also likely to use the area as a corridor.

Corridors

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The primary habitat for the Rosenberg's Goanna north of Wickerslack Lane is recognised as part of a regional biolink (BES 2008), which connects woodland and forest around Jerrabomberra to extensive areas of habitat east of the Queanbeyan River. This corridor is also likely to be important to the Rosenberg's Goanna. While there are no confirmed records of the species between Old Cooma Road and Jerrabomberra, the Wildcare records mentioned above confirm the assumption that the local population does utilise this area of habitat.

Old Cooma Road currently bisects this corridor, and the proposal would widen the current corridor interruption. The current road is likely to have an adverse impact on the local population from road mortalities and the proposal is ultimately likely to increase this impact. However, mitigation measures such as construction of one fauna underpass in the corridor and awareness signs for motorists may reduce the impact of the proposal.

Habitat values
The subject site (north of Wickerslack Lane) is likely to be used on occasions by individual Rosenberg's Goannas where it forms part of a home range or when individuals are dispersing through the area. Habitat in the north of the subject site contains up to 3.5 ha of suitable foraging and sheltering resources, including five termite mounds which could potentially be used for breeding.

The amount of Rosenberg's Goanna habitat in the subject site and the quality of resources there are not considered significant relative to the habitat available to the species in the locality. However, the habitat in the north of the subject site is considered to be part of an important area for the movement of individuals within the local population, as the subject site occurs between 430 ha of suitable habitat near Jerrabomberra and extensive areas of known habitat to the east of Old Cooma Road.

Distribution and condition of regional habitats
As discussed above, most of the known populations of Rosenberg's Goanna in the region are associated with conservation reserves, and habitat contained within the reserves is expected to be in good condition for the species. Most regional records not associated with reserves appear to be associated with large areas of relatively intact habitat.

Conservation status
The Rosenberg's Goanna is listed as Vulnerable under Schedule 2 of the TSC Act. Of the 177 NSW records of the species on Bionet, many are associated with conservation reserves and records tend to occur in patches, indicative of extended populations.

The species is sparsely distributed in the region, with the 25 Bionet records mainly clustered in the Queanbeyan to Cooma area. Other regional Bionet records are from Capertree, Abercrombie River National Park, Brindabella National Park and Kosciuszko National Park.

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The Queanbeyan area (the locality) contains a cluster of records associated with the Queanbeyan River area from the Kings Highway to the south east of Googong Reservoir, extending west to Old Cooma Road (the study area), and east to Cuumbeun Nature Reserve. The Queanbeyan population is likely to extend further to the west, east and south of these records given the presence of suitable contiguous habitat.

The local population would appear to be reasonably secure and suitable habitat extends further to the south and connects to other known habitat. Parts of the habitat known or assumed to be used by the Queanbeyan population are subject to further development, such as the extension of Edwin Land Parkway.

Key threatening processes

The species is potentially threatened by habitat removal and fragmentation, removal of bushrock and logs providing shelter sites, removal of termite mounds, introduction of predators and inappropriate fire regimes. The proposal will result in the removal of native vegetation and habitat, which constitutes the key threatening processes *Clearing of native vegetation* and to a lesser extent *Removal of dead wood and dead trees* and *Bushrock removal*.

The amount of known habitat removed by the proposal (3.5 ha) is small relative to the extent available to the local population (580 ha west of the Queanbeyan River) and extends from an existing area of disturbance (Old Cooma Road) rather than impacting on undisturbed habitat. The removal of habitat includes removal of 25 termite mounds (potential breeding resources), however only five of these are within primary habitat north of Wickerslack Lane. At least 81 further termite mounds were recorded within the 100 ha study area north of Wickerslack Lane and would not be affected by the proposal. In adjacent habitat to the west, more than 250 termite mounds were recorded by GHD (2009) over a 130 ha area.

The key threatening processes *Removal of dead wood and dead trees* and *Bushrock removal* would also be involved in the proposal and would affect known habitat for the species north of Wickerslack Lane. Logs, fallen timber and large bushrocks may provide sheltering sites for the Rosenberg's Goanna or its prey species. These resources are sparsely distributed throughout the subject site, and are not expected to provide important habitat for the Rosenberg's Goanna.

In this context, the loss of 3.5 ha of vegetation, containing five termite mounds and similarly low numbers of bushrock and fallen timber, from known habitat is unlikely to substantially contribute to the key threatening processes affecting the species.

Recovery planning

No draft or approved recovery plans are available for the Rosenberg's Goanna, however seven recovery strategies have been identified (DECCW 2009), which include the following priority actions:

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- Develop and undertake community education strategy that reduces demand for bush rock as landscaping material and provides/promotes alternatives.
- Develop habitat identification, management and enhancement guidelines.
- Implement management strategies that reduce the prevalence of bush rock removal, including surveillance.
- Identify key habitats or areas for protection and enhanced management on private land through management agreements and incentives.
- Undertake investigations into general biology and ecology of the species, particularly movement patterns and tree use, rock crevice use and termitaria use.
- Undertake investigations into taxonomic distinctions/genetic (DNA) differences between the various forms of the 'species'.
- Identify suitable habitat across the range of the species with reference to satellite imagery and vegetation surveys.
- Undertake surveys for the species within identified suitable habitat

The proposal does not directly conflict with any of the above priority actions.

While known habitat in the north of the study area will be affected by the proposal, measures to mitigate impacts and manage adjacent habitat will be implemented as part of the proposal.

Ameliorative measures
One fauna underpass will be constructed under the road within the habitat corridor north of Wickerslack Lane, primarily to provide the Rosenberg's Goanna with a safe passage under the road. The vehicle speed limit through this corridor will remain at 70 km/h and advisory signs for motorists will also be erected. If possible, the sympathetic management of Crown Land within the area north of Wickerslack Lane will maintain or improve habitat for the Rosenberg's Goanna.

4.2.5 Brown Treecreeper

Local and regional abundance
The Brown Treecreeper was not recorded in the study area during the survey period. However, two previous records of the species are known from within or close to the study area and the species is considered likely to occur in the study area. One record of an individual Brown Treecreeper was made by CSU (Thompson & Mullins 2004) within dry forest in the south east of the study area. A Wildcare Queanbeyan record of Brown Treecreeper nestlings being rescued from the Wickerslack Lane/Old Cooma Road area is also within or close to the study area, and indicates that the species may nest in the study area. Thompson & Mullins (2004) regarded the species as a common and permanent resident within at least the Googong area. The lack of records during the current survey and during recent surveys of suitable habitat to the north-west (GHD 2009) and potential habitat to the north-east (BES 2009), suggest that the species is not common throughout all areas of potential habitat in the locality.

The regional abundance of the species is not known, however a number of scattered records exist south of Canberra, and isolated records exist in other areas

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including Ben Bullen State Forest, Wollondilly River Nature Reserve and Marulan. The heaviest concentrations of records in the region appear to be in the Queanbeyan area and south to the Victorian border.

Other known local populations
The Brown Treecreeper is known locally from a number of other records. Two other CSU records of the species exist to the south-west and south-east of the study area, both within 2km of the subject site.

Habitat requirements and utilisation
The Brown Treecreeper occupies eucalypt woodlands and dry open forests, usually with a grassy understory. The species nests in tree or stump hollows, either in pairs or co-operatively in groups of up to about five birds (DECCW 2009). The species feeds on insects (ants, beetles, larvae) by foraging on tree trunks, amongst leaf litter on the ground and on fallen logs (NSW Scientific Committee 2001a) and normally do so in pairs or small groups. Home ranges average 4.4 ha (DECCW 2009).

The local records in and near the south of the study area indicate that the species will utilise the smaller patches of woodland and forest in the general area, and is likely to utilise the more intact vegetation in the south of the study area at least on occasions. The southern patch of more intact habitat in the study area (local biolink) does contain suitable foraging and breeding resources, with nine hollow-bearing trees found within this area. The species is also likely to utilise the north of the study area, especially north of Wickerslack Lane, as suitable foraging and breeding resources occur there. Thirteen hollow-bearing trees were found within this area, although only one or two occur within the development footprint.

Corridors
As discussed above, the Brown Treecreeper is likely to utilise habitat within both corridors or biolinks that have been identified in the study area (BES 2008) and is likely to cross Old Cooma Road at both of these areas.
The proposal would expand the current road corridor by approximately 15m to 70 m and will also lead to an eventual increase in traffic volume, with the potential for the species to incur a greater mortality rate at these road crossing points.

Conservation status
The Brown Treecreeper is listed as vulnerable under the TSC Act. Bionet includes 254 records of the eastern sub-species in NSW, although many other Bionet records listed as *C. picumnus* occurring within the known range of *C. picumnus victoriae* are likely to be the threatened eastern subspecies. The species has a discontinuous occurrence throughout the Great Dividing Range and adjacent areas. Concentrations of records are associated with major conservation reserves including Wollemi, Blue Mountains, Nattai and Kosciuszko National Parks. All of the 200 regional records of Brown Treecreepers are likely to be the eastern subspecies. These records are scattered throughout the region, particularly where tracts of woodland and forest remain.

The few records of the species in the locality are mostly associated with private land, however, these records are all in close proximity to extensive areas of vegetated public land, which are expected to contain suitable habitat for the species. To the

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east of the study area approximately 4,440 ha of contiguous public land, from Cuumbeun Nature Reserve to Googong Foreshores Reserve, is expected to provide secure habitat for the Brown Treecreeper. To the west of the study area, al least 400 ha of intact potential habitat occurs between Old Cooma Road and Jerrabomberra, including Mt. Jerrabomberra Reserve and land owned by the Ngambri Aboriginal Land Council. The species has been known to decline or disappear from remnant habitat areas less than 300 ha in size (Walters *et al* 1999), however the extent of available contiguous habitat in the locality suggests that the remnant habitats in the locality could support the species in the long-term.

Key threatening processes
Threats to the species include removal and fragmentation of habitat, and ongoing degradation of habitat from overgrazing, firewood collection and inappropriate forestry management, resulting in the loss of trees with hollows, removal of fallen timber, loss of ground litter and high fire frequency (DECCW 2009).

The proposal will result in the removal of approximately 8 ha of suitable habitat and would constitute the following key threatening processes with the potential to impact on the Brown Treecreeper: *Clearing of native vegetation, Loss of hollow-bearing trees* and *Removal of dead wood and dead trees.* The proposal will only affect habitat that has been previously disturbed and/or is adjacent to the existing Old Cooma Road. The proposal is likely to result in the removal of four or five trees containing small sized (up to 5cm) hollows and two to four trees containing medium sized (5-15cm) hollows. A low number of other hollows would be indirectly affected by clearing of adjacent vegetation and increased noise and other disturbances from road construction and traffic. None of the hollow-bearing trees to be affected were found to be utilised for nesting, and generally the location of habitat to be affected by the proposal is not particularly important in the locality. The proposal will not substantially increase the application of these key threatening processes for the Brown Treecreeper.

Recovery planning
No recovery plan has been prepared for the Brown Treecreeper, although five recovery strategies have been defined (DECCW 2009), which include the following priority actions:

- Develop an Expression of Interest targeted towards private landowners to locate new sites and from this negotiate, develop and implement conservation management agreements for high priority sites.
- Increase understanding of woodland birds through promotion of the DEC website and other educational material.
- Develop habitat identification, management and enhancement guidelines for woodland birds.
- Implement sympathetic habitat management in conservation reserves, council reserves and crown reserves where the species occurs.
- Identify key habitats or areas for protection and enhanced management through incentives.
- Conduct ecological research to determine habitat and resource requirements, threats and conservation issues.

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- Undertake surveys for threatened woodland birds in new and existing conservation reserves containing suitable habitat to assess the species' conservation status and identify key breeding and foraging habitat.

The proposal does not conflict with any of these actions, and may be consistent with point four (above) which involves sympathetic habitat management of Crown Land where the species is known to occur.

Amelioration measures
Birds are often less affected by the impacts associated with roads than other species because of their greater mobility. The steeper topography in this area and subsequent height of trees above the road level is also expected to assist the species to fly above the height of vehicles and thus to avoid collisions with vehicles. Where the southern corridor traverses the subject site, the existing road passes through a low cutting, which increases the clearance distance between vehicles and birds crossing the road at this point. The proposal will be designed to minimise the road height and width of vegetation disturbance in this section of the subject site to allow birds to cross the road at canopy level and avoid or minimise impacts with vehicles.

Where possible, the appropriate long-term management of Crown Land within the regional and local biolinks for threatened woodland birds will provide habitat protection and enhancement for this species.

4.2.6 Diamond Firetail

Local and regional abundance
The Diamond Firetail has not been recorded from the study area, but is known from several other sites in the locality. Little is known of the local and regional abundance of the species. There are more than 200 regional records of the species in Bionet, scattered throughout the region with an apparent concentration of records between Queanbeyan and Cooma.

Other known local populations
The species has been recorded within about one kilometre of the study area, near the Cooma Road quarry. Other local records are known from around the Googong Foreshores Reserve, from Tralee Station, from the Carwoola area and towards Royalla.

Habitat requirements and utilisation
The Diamond Firetail is found in grassland, grassy eucalypt woodlands, forests and mallee, often in riparian areas and occurring in flocks of up to 40 or more individuals (DECCW 2009). The species forages on the ground for seeds and other plant material but also insects (NSW Scientific Committee 2001). It sometimes occurs in residential areas and farmland containing or adjacent to suitable habitat. It roosts in dense shrubs or specifically built 'nests' which it constructs in shrubby understorey or under larger bird's nests, such as hawks and ravens.

Suitable habitat for the species in the study area is very patchily distributed, occurring mostly in association with less disturbed Box-Gum Woodland and native pasture, mostly in the south and central sections. The species may occur in the study

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area on occasions, but is not expected to regularly use habitats in the study area for roosting or nesting given their marginal quality. The relatively conspicuous species was not recorded during targeted surveys, but could potentially forage in or move though the study area on occasions.

Corridors

The Diamond Firetail appears unlikely to be reliant upon either of the habitat corridors or biolinks in the study area for regular movements given the lack of records and lack of habitat connectivity through the study area for the species. However, the corridor in the south of the study area is associated with more suitable grassy habitat than the larger corridor in the north.

Habitat values

Habitat values for the species in the study area are relatively low, with small patches of grassy habitat remaining along parts of the road easement and public land to the north and south, which have been subject to less grazing pressures. There is still a prevalence of weed species along much of the road reserve which reduces foraging habitat quality for the species. Grassy understoreys in most rural zoned land were heavily grazed during the survey period.

Conservation status

The Diamond Firetail is listed as vulnerable in NSW, where it is fairly widespread, with approximately 3,300 Bionet records throughout is range. As discussed above, the species is similarly widespread throughout the region, with many records apparently associated with conservation reserves or larger areas of native vegetation. Locally there are a few records of the species, although the majority of these records are associated with larger areas of habitat on both freehold and public land.

Key threatening processes

The Diamond Firetail is threatened by removal and fragmentation of habitat, leading to populations becoming isolated and more vulnerable to stochastic events (DEC 2001). Other threats include habitat degradation, such as overgrazing, weed invasion and reduction of food plants, and an increase in predators such as the Currawong and Raven.

The proposal will not remove any important habitat for this species and, as the development footprint generally extends an existing road easement, habitat fragmentation is limited to increases in the distance between habitats rather than the fragmentation of currently contiguous habitats.

The proposal does involve the key threatening processes *Clearing of native vegetation* and may increase the potential for the *Invasion of native plant communities by exotic perennial grasses*. However the impacts of these processes on the species are considered negligible as it is not likely to regularly utilise the subject site, nor will important habitats be affected by the proposal.

Recovery planning

No recovery plan has been prepared for the Diamond Firetail, although five recovery strategies have been defined (DECCW 2009), which include the following priority actions:

- Increase understanding of woodland birds through promotion of the DEC website and other educational material.
- Develop habitat identification, management and enhancement guidelines for woodland birds.
- Implement habitat management guidelines in conservation reserves, council reserves and crown reserves containing suitable habitat.
- Identify key habitats or areas on a regional basis for protection and enhanced management through incentives.
- Conduct ecological research to determine habitat and resource requirements, threats and conservation issues.
- Undertake surveys for threatened woodland birds in new and existing conservation reserves containing suitable habitat to assess the species' conservation status and identify key breeding and foraging habitat.

The proposal does not conflict with any of the above actions. Of these actions, implementing habitat management guidelines (when available) for Crown Land in the north and south of the study area (within the two habitat corridors or biolinks) may assist in the recovery of this species. These areas are known to be used by other species of threatened woodland birds.

Ameliorative measures
No specific measures are proposed to ameliorate possible impacts on the Diamond Firetail, as the use of the subject site by this species is likely to be occasional at best, rather than regular. Measures to maintain the movement of woodland birds in general across the road in the south of the study area (through the local biolink) include minimising the width of vegetative clearing and maintaining a lower level of the road through an existing cutting to allow birds to fly above the height of traffic.

4.2.7 Flame Robin

Local and regional abundance
The Flame Robin has not been recorded from the study area but is known from the locality with two Altas of NSW Wildlife records near the north of Googong Dam. The species is likely to be more widespread in the locality than Atlas records indicate, as it is a relatively common breeding migrant in the ACT (COG 2009). The species has been recorded from a number of conservation reserves in the region.

Habitat requirements and utilisation
The Flame Robin occurs in a range of forests and woodlands and often migrates to more open habitats in the non-breeding period. The species breeds in higher altitude forest and woodlands, often with a native grassy understorey and variable shrub layer, with a preference for more open areas nearby. Breeding occurs from spring to later summer. Open cup-shaped nests are constructed from plant material and spider webs and located in sheltered sites, often close to the ground. In the non-breeding (winter) period, the species migrates to lower, drier and more open habitats, including pastures and native grasslands, but may occur in a range of different habitats. Flame Robins forage for invertebrates on the ground by pouncing from low perches or gleaning insects from the air, fallen timber, tree trunks and foliage (DECCW 2010).

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Corridors
The Flame Robin may utilise the two corridors or biolinks in the study area on occasions as they provide appropriate remnant habitat within a relatively disturbed landscape. The proposal will eventually widen the existing gap within these corridors and facilitate higher traffic volumes, but will not prevent the species from moving through the corridors.

Habitat values
Habitat values for the species in the study area are highest in the northern biolink, which is connected to large areas of forest and woodland. However, none of the study area appears to provide breeding habitat. In the non-breeding period the species could occur anywhere in the study area, although most of this area is heavily disturbed and does not provide any notable habitat values for the species.

Conservation status
The Flame Robin is listed as vulnerable in NSW, where it is fairly widespread in the east of the state. The Atlas of NSW Wildlife contains over 3,900 records of the species. Locally there are only two Atlas records of the species, although these are associated with larger areas of intact habitat.

Key threatening processes
The Flame Robin is threatened by clearing and degradation of habitat from overgrazing and removal of dead timber. Other threats include nest predation by predators such as the Currawong and dense regeneration of habitat after fire.

The proposal does involve the key threatening processes *Clearing of native vegetation* and *Removal of dead wood and dead trees*, which are detrimental to the Flame Robin. However, the impacts of these processes on the species are considered negligible, as the species is not likely to regularly utilise the subject site, nor will important habitats be affected by the proposal. These impacts will also occur at the edges disturbed areas, rather than in areas of intact habitat.

Recovery planning
No recovery plan or recovery strategies have been prepared for the Flame Robin, although DECCW (2010) lists the following actions needed to recover the species:

- Retain existing forest, woodland and remnant grassland vegetation, including paddock trees.
- Retain dead timber on the ground in open forest and woodland areas.
- Enhance potential habitat through regeneration by reducing the intensity and duration of grazing.
- Fence remnants to protect from long-term, intense grazing.
- Increase the size of existing remnants, by planting trees and establishing buffer zones of un-modified, uncultivated pasture around woodland remnants.
- Avoid the use of exotic berry-producing shrubs in landscape and garden plantings in areas adjacent to Flame Robin habitats.

The proposal does not conflict with any of the above actions.

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Ameliorative measures
No specific measures are proposed to ameliorate possible impacts on the Flame Robin, as the use of the subject site by this species is expected to be occasional at best, rather than regular. Measures to maintain the habitat connectivity for woodland birds in general across the road in the south of the study area (through the local biolink) include minimising the width of vegetative clearing and maintaining a lower level of the road through an existing cutting to allow birds to fly above the height of traffic. The long-term retention of habitat within the two biolinks in the north and south of the study area is likely to benefit this species in the locality.

4.2.8 Gang-gang Cockatoo

Local and regional abundance
The Gang-gang Cockatoo was not recorded in the study area during the survey period, but is known from the locality. The species typically occurs at relatively low densities, but is regularly observed in appropriate habitat in the locality. This is likely to be the case in and near larger forested areas elsewhere in the region, where it occurs widely.

Other known local populations
It is likely that records from the locality form part of a single, larger population given the high mobility of the species. Other local records are known from Queanbeyan River corridor and Googong Foreshores Reserve, Mt. Jerrabomberra, and numerous sites in the ACT. The species is expected to occur widely in forested areas in the locality.

Habitat requirements and utilisation
The Gang-gang Cockatoo is typically a species of taller forests, but can be found in a range of forests and woodland communities from the western slopes to the coast. Some seasonal movements have been recorded, with birds moving from highland areas to lower altitudes in winter, however the species is also known to breed near the coast in spring and summer.

The Gang-gang Cockatoo is mainly arboreal coming to the ground only to drink and forage among fallen fruits. They feed mostly on seeds and fruit (often from eucalypts and acacias, but also from other native and introduced species) and may also eat insects (NSW Scientific Committee 2005). The species nests in the hollows of large trees.

Corridors
The two biolinks in the study area contain relatively intact forest and woodland and comprise the habitats most likely to be used by the species, particularly the northern regional biolink. The species has been recorded near this corridor at Jerrabomberra and Jumping Creek, and is likely to utilise this corridor at least on occasions, but is not highly dependent on corridors for movement.

Assessment of habitat
Habitat values

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The area to the north of Wickerslack Lane provides the most suitable habitat for the species in the study area, and is well connected to other areas of known habitat. This habitat in the northern part of the study area does provide suitable foraging habitat and potential nesting habitat for the species, in a few of the 13 hollow-bearing trees recorded there. However, the subject site (development footprint) provides relatively low quality and unlikely nesting habitat for this species, which was not recorded during targeted bird surveys.

Distribution and condition of regional habitats
As mentioned above, Bionet records indicate that the species is widely distributed throughout the region, particularly where larger areas of forest and woodland habitat occur, which includes all major conservation reserves and state forests in the region. Habitats in the above public lands are generally of good quality for the species, and the extent of other suitable habitat in the region (forests and woodland on other crown and freehold land) is extensive.

Conservation status
The Gang-gang Cockatoo is listed as vulnerable in NSW under the TSC Act. Bionet lists 2,820 records of the species in NSW. As mentioned above, the species is known to be widespread in the region, with 454 Bionet records from all major conservation reserves and state forests. The species is expected to occur regularly within suitable habitat in the locality.

Key threatening processes
The species is threatened by clearing and degradation of habitat that results in a reduction in foraging resources and loss of hollow-bearing trees. The proposal involves the key threatening processes *Clearing of native vegetation* and *Removal of hollow-bearing trees*. However, the vegetation and hollows to be removed currently occur within or adjacent to highly disturbed areas, and provide low to moderate quality habitat for the species.

In the northern portion of the study area, the proposal will remove some potential foraging habitat (about 3.5 ha north of Wickerslack Lane), but no likely nesting sites. Overall, the proposal will remove approximately 17.2 ha containing potential foraging resources and 15 hollow-bearing trees, although none would be considered high quality or likely breeding sites for the species given their characteristics and close proximity to Old Cooma Road.

Recovery planning
No recovery plan has been prepared for the Gang-gang Cockatoo, although nine recovery strategies have been defined (DECCW 2009), which include the following priority actions:

- Increase landholder and public awareness of status, threats and priority actions.
- Determine the disease status of selected populations.
- Negotiate management agreements and covenants over important areas of habitat.

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- Provide input to National Park and local bushfire management plans to minimise impacts of fire on critical resources.
- Prepare and distribute information to decision makers.
- Determine the status of representative local populations distributed across the species range.
- Model the impact of global warming and develop mitigation strategies.
- Investigate the breeding biology of selected populations to improve understanding of threatening processes.
- Investigate the impacts of wildfire and hazard reduction burns on foraging and nesting resources.
- Investigate movement patterns of selected populations.
- Identify important nesting habitat on public lands.

The proposal does not conflict with any of these actions, as it is likely to affect only occasional foraging habitat for the Gang-gang Cockatoo.

Ameliorative measures
No specific ameliorative measures have been implemented for the Gang-gang Cockatoo, as impacts to the habitat of this species are likely to be minor. The movement of the species is not expected to be substantially affected by the widening of the road corridor through areas of potential habitat.

Measures to maintain avian road crossing points, including minimising the width of vegetative clearing and maintaining a lower road level through the existing cutting, in the southern biolink, may also mitigate the potential impacts on the species.

4.2.9 Hooded Robin

Local and regional abundance
The Hooded Robin was not recorded during the survey period, and is not known from the study area. The species is rarely recorded in the region, with few Bionet records, but is known from the locality and has the potential to occur in the study area.

Other known local populations
The Hooded Robin has been recorded from the locality in low numbers, including from the Queanbeyan River corridor to the north-east of the study area (Rowell & Crawford 1997), the Tralee area (Biosis 2003b, Mills 2006), near Mt. Jerrabomberra, near the Old Cooma Road quarry and from several areas around Googong Foreshores Reserve. Given the distribution of records and potential habitat in the locality, the species could occur in the study area at least occasionally.

Habitat requirements and utilisation
This form of the Hooded Robin occurs from Brisbane to Adelaide, throughout much of inland NSW but rarely on the coast (DECCW 2009). The species is usually found in family groups of 2-3 birds, in lightly timbered woodland, mallee, Acacia Shrubland and open forests. The species requires structurally diverse habitats, and favours open areas with dead timber and sparse shrub cover adjoining large woodland blocks (Fitri & Ford 1997). The Hooded Robin forages in areas of bare ground, ground cover and litter by pouncing on invertebrates (NSW Scientific Committee 2001). Home

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ranges are relatively large, ranging from 10ha in the breeding season to 30ha in the non-breeding season (DECCW 2009). Breeding occurs between July and November. Cup-shaped nests are constructed in trees or shrubs up to 5m from the ground, from bark or grass, often bound with spider webs (DECCW 2009).

The Hooded Robin could potentially occur in the more intact northern or southern parts of the study area, which offer the most likely habitat. Failure to record the species during targeted surveys suggests that the species does not use the habitats within the study area on a regular basis.

Corridors
The species may utilise either of the two habitat corridors in the study area, mainly because they contain the most suitable habitat for the species in the study area. Despite both areas having been disturbed and structurally simplified to varying degrees, they offer the only real east-west orientated 'corridors' for the species between Queanbeyan and Googong. The proposal will eventually widen the existing gap within these corridors and facilitate higher traffic volumes, but will not prevent the species from moving through the corridors.

Habitat values
Habitat over most of the study area is unsuitable or of low quality for the species as it is generally heavily cleared and largely isolated from areas of better quality habitat. The two habitat corridors (biolinks) in the north and south of the study area are more intact and offer the best potential habitat for the species in the study area.

Conservation status
The south-eastern form of the Hooded Robin is listed as vulnerable in NSW. Bionet lists 18 records of the species in NSW, with only two records in or adjacent to the region, from Wollondilly Nature Reserve and South East Forest National Park. Locally the species has been recorded at a range of sites providing large tracts of habitat, or located close to such habitats. Various land tenures are involved, from unprotected freehold land to conservation reserves.

Key threatening processes
The species is threatened by clearing and fragmentation of habitat and from modification of ground foraging habitats. The proposal involves the key threatening processes *Clearing of native vegetation*, including *Removal of dead wood and dead trees*, which affect potential habitat for this species. However, the vegetation and habitat removed by the proposal does not include any important habitat for this species. The proposal may also increase the potential for the *Invasion of native plant communities by exotic perennial grasses,* which could degrade potential habitat for this species.

The proposed ameliorative measures for woodland birds including maintenance of avian road crossing points in the south of the study area; monitoring edge effects for weed invasion and degradation of adjacent habitats; and retention of habitat in biolinks for threatened woodland birds will mitigate the effects of these key threatening processes on the species.

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Recovery planning
No recovery plan has been prepared for the Hooded Robin, although five recovery strategies have been defined (DECCW 2009), which include the following priority actions:

- Increase understanding of woodland birds through promotion of the DEC website and other educational material.
- Develop habitat identification, management and enhancement guidelines for woodland birds.
- Implement habitat management guidelines in conservation reserves, council reserves and crown reserves containing suitable habitat.
- Identify key habitats or areas on a regional basis for protection and enhanced management through incentives.
- Conduct ecological research to determine habitat and resource requirements, threats and conservation issues.
- Undertake surveys for threatened woodland birds in new and existing conservation reserves containing suitable habitat to assess the species' conservation status and identify key breeding and foraging habitat.

The proposal does not conflict with any of the above actions.

Ameliorative measures
No specific measures are proposed to ameliorate possible impacts to the Hooded Robin, as the use of the subject site by this species is likely to be occasional at best. The maintainance of avian road crossing points, the monitoring and management of edge effects and adjacent biolink areas should also mitigate any impacts on the Hooded Robin.

4.2.10 Scarlet Robin

Local and regional abundance
The Scarlet Robin has not been recorded from the study area but is known from the locality, with eight Altas of NSW Wildlife records occurring east of the Queanbeyan River. The species appears relatively widespread in the region, particularly in association with larger areas of remnant native vegetation. The Scarlet Robin is considered to be a common breeding resident in the ACT (COG 2009).

Other known local populations
A number of Scarlet Robin records are associated with conservation reserves to the south east of the Queanbeyan township, including Cuumbuen Nature Reserve and Googong Foreshores Reserve. The species has also been recoded locally at several sites between Googong and Jerrabomberra (Thompson & Mullins 2004, ELA 2010, NGH 2010).

Habitat requirements and utilisation
The Scarlet Robin predominantly occurs in a range of dry forests and woodlands, but may be found in more open habitats during the non-breeding period, including grasslands and paddocks with scattered trees. Abundant logs and fallen timber are important habitat components. The species forages for invertebrates on the ground, logs or tree trunks, and less commonly in the canopy. Breeding occurs mainly from

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July to January, with an open cup-shaped nest constructed from plant material and spider webs located in a fork of a tree. (DECCW 2010).

Corridors
The Scarlet Robin may utilise the two corridors or biolinks in the study area on occasions as they provide appropriate remnant habitat within a relatively disturbed landscape. The proposal will eventually widen the existing gap within these corridors and facilitate higher traffic volumes, but will not prevent the species from moving through the corridors.

Habitat values
Habitat values for the species in the study area are highest in the northern biolink, which is connected to large areas of forest and woodland, and to a lesser extent the southern biolink. However, none of the study area close to the subject site appears to provide breeding habitat. In the non-breeding period the species could occur anywhere in the study area, although most of this area is heavily disturbed and does not provide any notable habitat values for the species.

Conservation status
The Scarlet Robin is listed as vulnerable in NSW, where it is widespread in the east of the state. The Atlas of NSW Wildlife contains over 3,000 records of the species. Locally there are several records of the species, mostly associated with larger areas of intact habitat or adjoining open areas.

Key threatening processes
The Scarlet Robin is threatened by clearing and degradation of habitat from overgrazing and removal of dead timber, resulting in loss of structural complexity, and reduction in the size or connectivity of remnant habitat patches. Other threats include predation by predators such as the Currawong, cats and rats, and dense regeneration of habitat after fire.

The proposal does involve the key threatening processes *Clearing of native vegetation* and *Removal of dead wood and dead trees*, which are detrimental to the Scarlet Robin. However, the impacts of these processes on the species are considered negligible, as the species is not likely to regularly utilise the subject site, nor will important habitats be affected by the proposal. These impacts will also occur at the edges disturbed areas, rather than in areas of intact habitat.

Recovery planning
No recovery plan or recovery strategies have been prepared for the Scarlet Robin, although DECCW (2010) lists the following actions needed to recover the species:

- Retain existing forest, woodland and remnant grassland vegetation, including paddock trees.
- Retain dead timber on the ground in open forest and woodland areas.
- Enhance potential habitat through regeneration by reducing the intensity and duration of grazing.
- Fence remnants to protect from long-term, intense grazing.

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- Increase the size of existing remnants, by planting trees and establishing buffer zones of un-modified, uncultivated pasture around woodland remnants.
- Keep domestic cats indoors at night; desex domestic cats; assess the appropriateness of cat ownership in new subdivisions adjacent to Scarlet Robin habitat.
- Avoid the use of exotic berry-producing shrubs in landscape and garden plantings in areas adjacent to Scarlet Robin habitats.

The proposal does not conflict with any of the above actions.

Ameliorative measures
No specific measures are proposed to ameliorate possible impacts on the Scarlet Robin, as the use of the subject site by this species is expected to be occasional rather than regular. Measures to maintain the habitat connectivity for woodland birds in general across the road in the south of the study area (through the local biolink) include minimising the width of vegetative clearing and maintaining a lower level of the road through an existing cutting to allow birds to fly above the height of traffic. The long-term retention of habitat within the two biolinks in the north and south of the study area is likely to benefit this species in the locality.

4.2.11 Speckled Warbler

Local and regional abundance

The Speckled Warbler is known to occur in the study area and was recorded during the survey period in the less disturbed vegetation in the north and south of the study area. The species has been recorded from numerous sites in the locality, often associated with larger intact areas of habitat. The species is patchily distributed through much of the region, with 469 Bionet records.

Other known local populations

In the locality, the species has also been recorded from Barracks Creek about 300m to the west of the subject site (GHD 2009), in the north-eastern portion of the study area, near the Queanbeyan River and Jumping Creek intersection (BES 2009), near Mount Jerrabomberra, from several sites in or near Googong Foreshores Reserve, from 'Tralee' (Mills 2006; Biosis 2003b), Jerrabomberra Creek in Fernleigh Estate (BES 2008) and near the Burra Road/Old Cooma Road intersection (GHD 2009).

Habitat requirements and utilisation
The Speckled Warbler is found in dry forest and woodlands, generally dominated by eucalypts with a grassy understory, often in ridges or gullies. The species forages on the ground for arthropods and seeds. Preferred foraging habitat is a combination of open grassy patches, leaf litter and shrub cover (NSW Scientific Committee 2001). Dome nests are constructed from grasses and other material and located on the ground or in low vegetation. The species has a relatively large home range of 6-12 ha (NSW Scientific Committee 2001).

In the north of the study area (within the subject site), at least one individual Speckled Warbler was recorded from the same general area on two separate occasions during the breeding season (Figure 6). Suitable foraging and breeding

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habitat is present within this general area, which is expected to form part of a permanent home range. The observations were made in a well-defined gully within dry forest immediately to the east of Old Cooma Road. The species has previously been recorded in close proximity from contiguous forest habitat to the east (possibly individuals from the same home range as the above), and from contiguous habitat to the west near Barracks Creek (GHD 2009). The records of the species from the north of the subject site may represent breeding habitat. No nests were observed during the survey period, although comprehensive searches for nest sites were not undertaken.

One Speckled Warbler was also recorded on one occasion in the south of the study area, within an area of relatively disturbed dry forest close to Old Cooma Road (Figure 6). The individual observed appeared to be moving through the area, and while some suitable habitat occurs in the surrounding area (up to about 35 ha), this habitat is more disturbed, less structurally diverse and of lower quality than known habitat for the species in the north of the study area. The general area around this record may form part of a home range for the species, but the habitat where the individual was observed appears unlikely to represent breeding or otherwise particularly important habitat.

The removal of known Speckled Warbler habitat for the proposal is mostly limited to linear sections adjacent to the existing Old Cooma Road. In the south this is up to 2.5 ha, and does not appear to involve important or high quality habitat. Approximately 3.5 ha of suitable habitat is likely to be removed in the north of the study area. The northern part of the proposal does involve the removal of good quality and potentially breeding habitat in the area where the species was recorded. The proposal will also widen the current area of disturbance between known habitat for the species at two points in the study area and an eventual increase in the amount of traffic on the road will possibly lead to increased mortality from vehicle impacts when the birds cross the road.

Corridors

Two corridors or biolinks have been identified in the north and south of the study area (BES 2008), and Speckled Warbler records are associated with both of these areas. The regionally significant biolink in the north of the study area links dry forest and woodland near Jerrabomberra and Cooma Road quarry with similar vegetation in the Queanbeyan River corridor and beyond. This area contains good quality habitat for the Speckled Warbler, which is known to occur elsewhere in the corridor. During this study, the Speckled Warbler was also observed within the locally significant (and substantially disturbed) biolink (BES 2008) in the south of the study area.

Speckled Warblers using these corridors would cross Old Cooma Road in both the northern and southern parts of the study area. The proposal would extend the current dissection of these corridors by about 15-70 m. The proposal will also indirectly involve an eventual increase in traffic volume, with the potential for the species to incur a greater mortality rate at these road crossing points.

Birds are often less affected by the impacts associated with roads than other species because of their greater mobility. The Speckled Warbler is mobile, but tends to utilise

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habitats close to the ground, which may render it more susceptible to vehicle impacts when moving across roads. In the northern biolink, the topography and height of the trees above the road, may allow birds in general to pass over the road at a higher level than the vehicles. In the southern biolink, the road currently passes through a cutting that lowers the height of traffic relative to vegetation on either side. The proposal will enhance this attribute to keep the road level low while minimising the removal of vegetation on either side to facilitate bird crossings over the cutting.

Habitat values
The main areas of Speckled Warbler habitat in the study area are in the northern and southern-most sections, where areas of relatively intact dry forest and woodland occur. Up to 2.5 ha of suitable habitat may be removed in the south of the study area and approximately 3.5 ha of suitable habitat will be removed from the north of the study area. The species is unlikely to regularly utilise other parts of the study area given the much higher levels of vegetation removal and other disturbances, and lack of adjoining suitable habitat. The northern area of habitat is contiguous with similar habitat to the east and west and forms part of a substantial corridor likely to be important for movement of the species in the locality.

Distribution and condition of regional habitats
Regional habitat for the species is expected to be widespread, based on the distribution of Bionet records. However, many of the records are not associated with habitats that are not zoned for conservation, and thus condition and security of these habitats is expected to be variable.

Conservation status
The Speckled Warbler is listed as vulnerable under the TSC Act. Bionet includes more than 3,400 records of the species in NSW. In the region, most of the 469 Bionet records do not appear to be associated with conservation reserves, and thus the species and its habitats are potentially not well protected. The numerous records of the species in the locality are often associated with larger or more intact areas of forest and woodland habitat. These areas occur on a range of land tenures with varying degrees of security.

Key threatening processes
Threatening processes likely to affect the species include clearing of native vegetation, firewood collection and removal of fallen timber, frequent fires, invasive grasses and introduced predators (DECCW 2009). The proposal involves the key threatening process *Clearing of native vegetation,* which affects up to approximately 6 ha of suitable habitat for the Speckled Warbler. The habitat to be removed includes a potential breeding gully in the north of the subject site. This habitat however is immediately adjacent to the existing disturbances associated with Old Cooma Road.

Recovery planning
No draft or approved recovery plans are available for the Speckled Warbler. Seven priority actions have been identified (DECCW 2009) to help recover the species:

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- Develop an Expression of Interest targeted towards private landowners to locate new sites and from this negotiate, develop and implement conservation management agreements.
- Increase understanding of woodland birds through promotion of the DEC website and other educational material.
- Develop habitat identification, management and enhancement guidelines for woodland birds.
- Implement sympathetic habitat management in conservation reserves, council reserves and crown reserves where the species occurs.
- Identify key habitats or areas for protection and enhanced management through incentives.
- Conduct ecological research to determine habitat and resource requirements, threats and conservation issues.
- Undertake surveys for threatened woodland birds in new and existing conservation reserves containing suitable habitat to assess the species' conservation status and identify key breeding and foraging habitat.

The proposal does not conflict with any of the above actions. While the proposal does remove gully habitat in the north of the site known to be used by the Speckled Warbler, this habitat is immediately adjacent to Old Cooma Road. The removal of this habitat is necessary for any road expansion design that does not involve extensive cutting into the hill on the western side of the road.

Ameliorative measures
Ameliorative measures proposed for the Speckled Warbler largely relate to the appropriate management of remaining adjacent habitat. However certain aspects of the road design may also mitigate the impacts of the road on the continuity of habitats.

Within the two identified biolinks, which also represent Speckled Warbler habitat, short-term measures including barrier fencing, erosion controls, induction of construction workers and rehabilitation of disturbed edges will be implemented to protect adjoining habitat from unnecessary degradation. Longer-term measures to appropriately monitor and manage edge effects will be ongoing. Where possible, sympathetic management of Crown Land components of the biolinks would mitigate impacts on this species.

In terms of the indirect impact of increased traffic volume through areas of habitat, the steep topography in the northern biolink may enable the birds to fly above the traffic level and reduce the incidence of Speckled Warbler collisions with vehicles.

In the southern biolink, measures to facilitate the movement of woodland birds in general across the road involve minimising the width of vegetative clearing and maintaining a lower level of the road through an existing cutting to allow birds to fly above the height of traffic at this point.

4.2.12 Varied Sittella

Local and regional abundance

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The Varied Sittella has not been recorded from the study area, but is known to occur in the locality. Little is known of the local and regional abundance of the species, although records are relatively widespread in the region.

Other known local populations
Locally, the species has been recorded from the Googong and Jerrabomberra areas (Thompson & Mullins 2004, ELA 2010, NGH 2010) and to the north of Googong Dam.

Habitat requirements and utilisation
The Varied Sittella is found in eucalypt forest and woodlands, particularly with rough-barked species and mature smooth-barked gums with dead branches (DECCW 2010). The species forages on invertebrates taken from bark or branches in the tree canopy. A cup-shaped nest made from plant material is located high in the canopy, and the same nest site may be used in successive years (DECCW 2010).

Corridors
The Varied Sittella is likely to utilise the northern biolink for movement as it contains suitable habitat and links known locations of the species. Cleared land may act as a barrier to species movement, so maintaining connectivity is important for this species. The proposal will eventually widen the existing gap within the biolink areas and facilitate higher traffic volumes, but will not prevent the species from moving through the area.

Habitat values
More intact forest and woodland in the study area, such as the northern section and to a lesser extent the southern section, provide suitable habitat for this species. The Varied Sittella is likely to use at least the intact northern area of habitat for occasional foraging and movement. The species does not appear to use any of the affected areas for nesting. The lack of any records of the species during the survey period suggests that the species would only occasionally use the subject site, which does not provide high quality habitats.

Conservation status
The Varied Sittella is listed as vulnerable in NSW, where it is widespread, occurring throughout the state, with approximately 3,780 Atlas records throughout its range. Numbers have been declining over recent decades.

Key threatening processes
The Varied Sittella is threatened by the removal, simplification and isolation of habitat (DECCW 2010). Other threats include competition with Noisy Miners in woodland patches (DECCW 2010).

The proposal does involve the key threatening processes *Clearing of native vegetation* and *Removal of dead wood and dead trees*, which are detrimental to the Varied Sittella. However, the impacts of these processes on the species are considered negligible, as the species is not likely to regularly utilise the subject site,

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nor will important habitats be affected by the proposal. These impacts will also occur at the edges disturbed areas, rather than in areas of intact habitat.

Recovery planning
No recovery plan or recovery strategies have been prepared for the Varied Sittella, although DECCW (2010) lists the following actions needed to recover the species:

- Retain existing vegetation and remnant stands along roadsides and in paddocks.
- Increase the size of existing remnants by planting trees and establishing buffer zones.
- Where remnants have lost connective links, re-establish links by revegetating corridors or stepping stones.
- Limit firewood collection and retain dead timber in open forest and woodland areas.
- Encourage regeneration of habitat by fencing remnant stands and managing the intensity and duration of grazing.
- Control weeds in areas of known habitat.

The proposal does not conflict with any of the above actions. The removal of trees along roadsides is necessary for the proposal, but will be minimised wherever possible.

Ameliorative measures
No specific measures are proposed to ameliorate possible impacts on the Varied Sittella, as the use of the subject site by this species is likely to be occasional rather than regular. Measures to maintain the movement of woodland birds in general across the road in the south of the study area (through the local biolink) include minimising the width of vegetative clearing and maintaining a lower level of the road through an existing cutting to allow birds to fly above the height of traffic. The long-term retention of habitat within the two biolinks in the north and south of the study area is likely to benefit this species in the locality.

4.2.13 Turquoise Parrot

Local and regional abundance
One Turquoise Parrot was observed towards the south of the study area on two occasions during the survey period. The species has not apparently been recorded in the locality before, the closest record being approximately 20km to the south near Burra. The local abundance of the species is very low, and it is possible that the individual recorded during the survey is an aviary escapee. The occurrence of the species in the locality appears intermittent at best.

Records in the region are similarly sparse, with few Bionet records overall, from Lake Jindabyne, Glen Allen State Forest, Wereboldera State Conservation Area, Woomargama National Park and surrounds, near Orange, Lithgow and Gardens of Stone National Park.

Habitat requirements and utilisation

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The Turquoise Parrot favours open, grassy woodland and adjacent clearings with dead trees near permanent water. They spend most of their time on the ground foraging on seed of grasses, herb and shrubs. They also eat flowers, fruit, leaves and scale-insects (Gunn and Baker-Gabb 1993). They require hollows in trees, logs or fence posts for nesting, and breed from August to January.

The study area contains some habitat value for the species, mainly in the central and southern sections where there is a more open vegetation structure that contains some native grasses as foraging habitat. Most of this area is substantially disturbed with relatively small areas of potential foraging habitat and few hollows. Permanent water is scarce and only available from a few farm dams. Habitats in the central portion of the study area near Heights Road and in the southern portion associated with the local biolink, appear to provide the best combination of potential foraging and breeding resources, with remnant open forest, woodland or scattered trees adjacent to open paddocks.

The species may forage on the limited resources available within the subject site on occasions, particularly the patches of grassy understorey vegetation in or adjacent to the road reserve. The Turquoise Parrot could conceivably utilise potential breeding resources in the study area, although this is not expected given its general rarity and uncertain status in the locality.

Corridors
Given the habitat preferences of the species, it is unlikely to rely on either of the habitat corridors identified in the study area, however is likely to be more associated with the more open understorey of the local biolink in the south of the study area.

Distribution and condition of regional habitats
As mentioned above, there are few (Bionet) records of the species in the region, although most of these are associated with conservation reserves or state forests and adjoining areas. The condition and security of these habitats is expected to be good.

Conservation status
The Turquoise Parrot is listed as vulnerable in NSW. Bionet holds about 1,500 records of the species in the state. The relatively few regional records are mostly associated with larger conservation reserves or state forests. Locally the species appears to occur only as an occasional visitor or aviary escapee.

Key threatening processes
The Turquoise Parrot is threatened by direct habitat loss and modification to foraging and breeding habitat from the collection of firewood, weed invasion, introduction of exotic pastures, intensive grazing and burning. The species is also threatened by cat and fox predation and illegal trapping (DECCW 2009). The proposal does involve *Clearing of native vegetation,* which includes potential foraging habitat for the species, and *Loss of hollow-bearing trees,* which provide potential nesting resources for the species.

The loss of potential foraging habitat in the subject site (up to 9 ha) resulting from *Clearing of native vegetation* is not expected to substantially affect this species

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given the vast expanse of suitable foraging habitat available to the species in the locality. Most of the 15 hollow-bearing trees to be removed for the proposal are unsuitable or unlikely to be used by the species for nesting given their hollow characteristics or close proximity to Old Cooma Road. A further 23 hollow-bearing trees will be retained in less disturbed parts of the study area and numerous hollows are known to occur in the locality. The loss of hollow-bearing trees is not expected to substantially impact on this species.

Recovery planning
No recovery plan has been prepared for the Turquoise Parrot, although seven recovery strategies have been defined (DECCW 2009), which include the following priority actions:

- Select targeted areas where large populations occur and liaise with landholders to protect hollow-bearing trees.
- Develop an Expression of interest targeted towards private landowners to locate new sites and from this negotiate, develop and implement conservation management agreements for high priority sites.
- Identify sites where the species is commonly observed and target for incentives and habitat management.
- Control feral cats and foxes near high density populations (best practice: locally efficient and effective).
- Control feral goats and pigs on known or potential habitat.
- Encourage management of livestock grazing so as to improve understorey (foraging) habitat at priority sites.
- Implement sympathetic habitat management in conservation reserves, council reserves and crown reserves where the species occurs.
- Control weeds at priority sites.
- Encourage bird observer groups to undertake spot monitoring surveys at previously recorded locations. Enter data collected into Wildlife Atlas.
- Identify three targeted populations (per year over initial three years); focus recovery actions and adaptive management at these sites

The proposal does not conflict with any of these actions. The sympathetic management of Crown Land adjacent to the proposal, if possible, is consistent with the seventh action above, providing greater habitat security for the species in the locality.

Ameliorative measures
No specific measures are proposed to ameliorate possible impacts to the Turquoise Parrot, as the use of the subject site by this species is likely to be only occasional. However, measures to enhance avian road crossing points, including minimising the width of vegetative clearing and maintaining a lower road level through the existing cutting, will mitigate the potential impacts on the Turquoise Parrot. Long-term monitoring and management of edge effects and adjacent biolink areas will also mitigate impacts on the Turquoise Parrot.

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4.2.14 Microchiropteran bats (Eastern False Pipistrelle, Greater Long-eared Bat, Eastern bent-wing Bat)

Local and regional abundance

There are no records of the Eastern False Pipistrelle, Greater Long-eared Bat or Eastern bent-wing Bat in the study area. However comprehensive bat surveys were not undertaken during the surveys for this assessment and these species have the potential to occur in the study area, particularly in the more intact northern and southern biolinks.

The Eastern False Pipistrelle is known locally from Talpa to the east of the study area near the Queanbeyan River (Thompson & Mullins 2004) and from Cuumbeun Nature Reserve (Bionet). In the region, Bionet contains 467 records, most of which are associated with the larger conservation reserves and state forests.

The Greater Long-eared Bat has only been recorded in the locality recently, from adjoining habitat to the north-west (GHD 2009). The species is rare in the region, with only two Bionet records, from Woomargama State Forest and near Bathurst.

The Eastern Bent-wing Bat is known locally from several records near the Queanbeyan River, between Googong Dam and central Queanbeyan (Bionet, Thompson & Mullins 2004, BES 2009). There are also 285 scattered records in the region (Bionet), many of which are associated with conservation reserves.

Habitat requirements and utilisation

All three species forage on insects, and generally require vegetated or partially vegetated areas to sustain a foraging base. The Eastern False Pipistrelle and Greater long-eared Bat are hollow-dependent, requiring tree hollows for breeding and roosting. The Eastern Bent-wing Bat requires caves and similar structures (such as abandoned mines) for roosting.

None of these species are known to utilise the study area or subject site, but all have the potential to forage there on occasions, especially the Eastern False Pipistrelle and Eastern Bent-wing Bat, which are more regularly recorded in the general area. The study area and subject site also contain hollow-bearing trees, providing potentially suitable roosts for the Eastern False Pipistrelle and Greater long-eared Bat. However, the Eastern False Pipistrelle is more likely to utilise the site given its greater abundance in the general area. Some of the hollow-bearing trees in the study area offer potential, but not particularly high quality, roosting sites.

Corridors

The northern biolink provides the most suitable habitat for these species as it is the most intact and well connected to other areas of similar habitat. To a lesser extent, the southern biolink provides some more intact but discontinuous patches of suitable habitat.

Neither the Eastern False Pipistrelle, Greater Long-eared Bat nor Eastern bent-wing Bat are highly dependent upon habitat corridors for movement between areas of habitat. However, they are more likely to occur in the corridors (biolinks) than other

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parts of the study area, particularly in the north given the extent of suitable foraging habitat in this area and the contiguous forests and woodlands.

The proposal will widen the existing gap within these corridors and facilitate higher traffic volumes, but will not prevent these species from using the area or moving through the corridor.

Assessment of habitat
Habitat values
As mentioned above, the biolonks at either end of the study area provide the most suitable habitat for these species, although any of these species could conceivably forage elsewhere in the study area where suitable vegetation occurs. However, only the larger areas of intact forest and woodland are expected to provide any substantial foraging resources, and if used, would form a small portion of a much larger home range.

Approximately 38 hollow-bearing trees occur in the study area, some providing potential roosting sites for the Eastern False Pipistrelle and Greater long-eared Bat. Approximately 15 of these hollow-bearing trees would be removed for the proposal, although they are generally trees within the existing road reserve, which continue to be subject to high levels of disturbance, and are thus unlikely to provide important roosting sites.

Conservation status
The Eastern False Pipistrelle, Greater Long-eared Bat and Eastern Bent-wing Bat are listed as vulnerable in NSW under the TSC Act. The Greater Long-eared Bat is also listed as vulnerable under the Commonwealth EPBC Act.

Bionet contains more than 1,900 records of the Eastern False Pipistrelle, which are associated with many large conservation reserves and state forests throughout eastern NSW, indicating some level of habitat security on a state wide basis. On a regional basis, Bionet contains 467 records, with most within or close to substantial conservation reserves or state forests including Blue Mountains, Kanangra-Boyd, Abercrombie River, Wadbilliga, Deua, Tallaganda and Koscioszko National Parks; and Ben Bullen, Glenbog, Bago, Tallaganda and Badja State Forests.

Only about 10 Bionet records of the Greater Long-eared Bat exist in NSW, scattered widely over much of the state. Based on the distribution of these records, the species is rarely encountered in the region and in the locality. The species may not be a regular inhabitant of the region or locality.

The Eastern Bent-wing Bat is represented by more than 9,700 Bionet records throughout eastern NSW. In the region, 285 Bionet records are associated with forested areas including larger conservation reserves and state forests.

Key threatening processes
These species are threatened by removal or degradation of habitat and disturbance to roosting areas, pesticide use close to foraging areas and possibly predation by cats and foxes.

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The proposal involves the key threatening processes *Clearing of native vegetation* and *Removal of hollow-bearing trees,* which affect these bats species. The proposal involves the removal of potential foraging habitat for these species, and the removal of 15 hollow-bearing trees, some of which may offer potential roosting resources for the Eastern False Pipistrelle and Greater Long-eared Bat.

The 17.3 ha of vegetation to be removed is generally disturbed or occurs along the edges of existing disturbances. Given also the extent of suitable habitat in the locality, the clearing of native vegetation associated with the proposal is not expected to significantly affect these species or substantially contribute to this threatening process.

As mentioned above, the trees with hollows to be removed are generally subject to high levels of disturbances from the existing roads, and unlikely to provide important roost sites. Given also the expected extent of hollow-bearing trees in the locality (about 100 trees with hollows recorded in 130 ha of adjacent habitat by GHD (2009), the removal of 15 lower quality hollow-bearing trees for the proposal is unlikely to substantially contribute to this key threatening process in relation to the Eastern False Pipistrelle or Greater Long-eared Bat

Recovery planning

No recovery plans have been prepared for these species, however a number of recovery strategies have been defined (DECCW 2009). Of relevance to the proposal are actions relating to the encouragement of retention of hollow-bearing trees and tracts of high quality habitat.

The removal of hollow-bearing trees is a necessity for the proposal, which has limited scope to adjust the development footprint. Sympathetic management of the biolinks in the north and south of the study area would benefit these species by retaining relatively large tracts of foraging and potential roosting habitat.

Ameliorative measures

No specific ameliorative measures are proposed for these species, although sympathetic management of adjacent crown land and other freehold land within the biolinks in the north and south of the study area would be beneficial to threatened microbats along with many other species.

4.2.15 Golden Sun Moth

Local and regional abundance

The Golden Sun Moth is known to occur within open grassy woodland habitats adjacent to the south-east of the study area, and also from a low number of other sites in the locality. However, the local and regional abundance of the species is not well known. The species may be locally abundant at some sites, however all known sites are now generally relatively small and isolated. In NSW the species occurs at 48 known sites and 32 in the ACT (DEWHA 2009).

Habitat for the Golden Sun Moth within the study area is essentially limited to a relatively small area in the south-west. The Golden Sun Moth was not recorded in the

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study area during the survey period despite targeted surveys. None of the potential habitat within the study area will be removed by the proposal.

Other known local populations
The species has been recorded locally from the 'Poplars' property, Letchworth Nature Reserve and Jerrabomberra Valley to the west of Jerrabomberra, and close to the south-west of the study area where six individuals were observed (Thompson & Mullins 2004). Given the cryptic nature of the species, it is possible that other populations or sub-populations are present in appropriate habitat elsewhere in the locality.

Habitat requirements and utilisation
The Golden Sun Moth occurs predominantly in Natural Temperate Grasslands and open grassy Box-Gum Woodlands in which the ground layer is dominated by wallaby grasses (*Austrodanthonia spp.*) (DECCW 2009). However, the species is also known to occur in grasslands (including derived grasslands) dominated by other species including Redleg Grass (*Bothriochloa macra*), Speargrasses (*Austrostipa* spp.), Weeping Grass (*Microlaena stipoides*), Kangaroo Grass (*Themeda triandra*) and in degraded and weed infested patches dominated by the exotic Chilean Needlegrass (DEWHA 2009).

The larvae of the Golden Sun Moth feed on the roots of grasses, however the adults have no functioning mouthparts and so do not feed. Only the male moth regularly flies, but is thought not to travel beyond 100m from suitable habitat (Clarke & O'Dwyer 2000).

The Golden Sun Moth could potentially occur within a very limited area of suitable habitat on the south-western fringes of the study area. This area adjoins better quality known habitat for the species further to the south west. However, the species is not expected to utilise habitats within the subject site given the marginal nature of habitats there, and will not be directly affected by the proposal.

Corridors
The proposal does not fragment any areas of potential habitat, and therefore will not disrupt any obvious habitat corridors for the species. Where the species occurs near the south of the study area, the distance between areas of potential habitat on either side of Old Cooma Road (as mapped by Thompson & Mullins 2004) is at least one kilometre. The very low dispersal abilities of the species mean that populations separated by greater than 200m are effectively isolated (Clarke & O'Dwyer 2000 DECCW 2009), and thus the species is highly unlikely to use the study area as a movement corridor.

Assessment of habitat
Habitat values
The subject site contains little habitat value for the Golden Sun Moth, as suitable habitats (grassland or open grassy woodland areas dominated by Wallaby Grass or other grasses mentioned above) do not occur there apart from very small isolated patches. Potentially suitable habitats are also very limited within the study area, and occur only in the south-west and central sections. The south-western periphery of the

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study area contains some good quality potential habitat for the species and adjoins known habitat. However the species was not located in the study area during surveys for this study, or surveys by BES (2007) or Thompson & Mullins (2004). No areas of good quality habitat will be directly affected by the proposal and indirect impacts such as weed invasion will be monitored and managed as part of the proposal.

Distribution and condition of regional habitats
The NSW populations of the Golden Sun Moth are found in the area between Queanbeyan, Gunning, Young and Tumut (DECCW 2009) and have been reduced to 48 known sites (DEWHA 2009). Habitat known to support the species may be of good quality, but all known sites generally occur as small isolated fragments (TSSC 2002).

Conservation status
The Golden Sun Moth is listed as endangered under the TSC Act and critically endangered under the EPBC Act. Locally, the species is known from both protected and freehold sites; at Letchworth Nature Reserve, the Jerrabomberra area and south west of the study area.

Key threatening processes
The species is threatened by the loss, fragmentation and degradation of preferred habitat, which may be caused by various types of development and agricultural practices. Habitat may also be degraded by weed invasion and other changes to vegetation structure and composition. The proposal does not involve the removal of, or direct disturbance to, Golden Sun Moth habitat, but increases the potential for weeds to move into these habitats. The potential for invasive exotic grasses and other weeds to invade adjacent Golden Sun Moth habitat in the south-west of the study area as a result of the proposal will be controlled by monitoring and appropriate management of the crown land 'buffer' between Old Cooma Road and the Golden Sun Moth habitat.

Recovery planning
No recovery plan has been finalised for the Golden Sun Moth, although eight recovery strategies have been defined (DECCW 2009), which include the following priority actions:

- Increase understanding of the species through promotion of the DEC website and other educational material.
- Encourage landowners to join the Grassy Box Woodlands and Southern Tablelands Grassy Ecosystems CMN's.
- Develop habitat identification, management and enhancement guidelines.
- Prepare and implement PoM for Queanbeyan NR.
- Local government to record sites on section 149 notices.
- Produce and disseminate EIA guidelines for local government.
- Provide incentive payments for protection and enhanced management of identified sites on private land (see DEC for details).
- Develop and implement a conservation management plan for Gocup TSR.

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- Develop and implement a roadside management plan for populations at Bowning, Gounyan Rd, Grace's Flat Rd, Jeir Ck, Kia Ora and Tallagandra Ln.
- Develop and implement a roadside management plan for populations at Springvale and Valrosa.
- Develop and implement conservation management plans for Davis, Eady's New, Lagoon, Wargeila, Warroo, Blackburn, Coolalie, Deringullen, Lambs, McInerneys, Merriville and Nanima TSR's.
- Develop and implement conservation management plans for Tarengo, Pudman and Wolverhampton TSR's.
- Undertake biennial monitoring at Queanbeyan NR.
- Undertake regular monitoring of priority populations using survey and monitoring guidelines.
- Finalise recovery plan for the Golden Sun Moth by 2007.
- Undertake genetic analysis of newly discovered populations.
- Undertake research into biology and ecology.
- Undertake targeted surveys in areas of suitable habitat within predicted range.
- Survey newly discovered populations to determine their extent.
- Undertake distribution modelling.

DEWHA (2009) have also provided five interim research priorities to support the recovery of the species until a national recovery plan is developed:

- Investigate the effects of Chilean Needlegrass on the Golden Sun Moth (e.g. breeding, feeding and habitat).
- Increase understanding of the basic biology, life history and habitat requirements of the species (e.g. generation time, mating system, minimum patch size, larval diet breadth and food plant preferences *etc*).
- Conduct surveys to increase the knowledge of the distribution of the species, especially in Victoria and on private lands in NSW.
- Investigate the impacts of disturbances such as fire, grazing, herbicides, pesticides, and drought on the species.
- Investigate the genetic relationships between populations of golden sun moth to assist in determining high priority areas of unique genetic diversity.

The proposal does not conflict with any of the above priority actions. The proposal will not remove any likely habitat and will not affect the ability to manage nearby known habitat for conservation purposes.

Ameliorative measures

In the south-west of the study area, indirect impacts of the proposal such as potential weed spread from newly created edges, will be monitored and managed over the long-term to avoid degradation of adjacent Golden Sun Moth habitat. Short-term measures to avoid edge effects include stabilisation of disturbed edges where necessary. The provision of an offset site to the wets of the proposal, supporting 129 ha of Box-Gum Woodland, may provide some habitat for the species. The presence of the species and habitat quality in the offset land is currently unknown.

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5. Mitigation Measures

Offset measures

To compensate for the proposed removal of 5.5 ha of Box-Gum Woodland and other threatened species habitat from the subject site, an offset strategy will be provided in the locality. The details of this offset strategy are being determined and are subject to negotiation between Queanbeyan City Council and DECCW. A potential offset site has been identified to the west of the proposal and contains approximately 129 ha of Box-Gum Woodland, with an offset plan currently being prepared (NGH Environmental 2010).

Fauna underpass

One fauna underpass will be incorporated into the northern section of the road where it passes through the regional biolink. This will either be a dedicated fauna underpass, or modified drainage culvert, depending on the engineering possibilities in the relatively flat section of road within 450 m to the north of Wickerslack Lane. Other areas in the biolink are considered less suitable for provision of a fauna underpass due to steeper terrain, reduced habitat connectivity and/or greater disturbances.

The provision of a fauna underpass in the northern section of the proposal is primarily to provide safe crossing opportunities for the Rosenberg's Goanna, but will be functional for a range of small to medium sized fauna. The similar Lace Monitor *Varanus varius* is known to use road underpasses and the Sand Goanna *V. gouldii* has been recorded using box culverts (1.2 x 1.2m and 1.2m x 0.45m in cross section and 20 - 45m in length) to move under roads (Harris *et al.* 2010), so it is expected that Rosenberg's Goanna would also use similar structures.

The fauna underpass will be designed in Stage 2 and include several features to enhance its use by fauna. The design of the underpass will consider inclusion of details such as raised dry sections, appropriate rocky 'furniture' and one or more sections with open grill ceilings to allow sunlight to penetrate. The entrances to the underpass will include habitat enhancement, including provision of different sized rocks, logs and planting of appropriate vegetation to improve connectivity with adjacent habitats. Limited mesh fencing of up to one metre in height would be provided in an attempt to guide fauna into the underpass and deter above road crossing in that area.

The engineering feasibility to modify a culvert to improve fauna use in the south of the proposal will also be investigated during detailed design of Stage 2. This area is located approximately 450 m north of Googong Dam Road within the patch of relatively intact forest and woodland forming part of the local biolink. This underpass would be provided mainly for smaller reptiles and terrestrial mammals, including the Pink-tailed Worm-lizard, which occurs some distance to the east and west of this site.

Avian Linkages

In the southern habitat corridor or biolink, Old Cooma Road currently passes through one or more cuttings, which allow birds to fly directly across the road at a higher level than most vehicles, thereby avoiding impacts with vehicles. This feature will be retained by the proposal to encourage safer crossing points for birds, particularly

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threatened woodland birds. Through this area, the width of the disturbance footprint will be minimised while the Stage 2 road surface level will be kept as low as practicable.

Pre-clearance fauna surveys

Prior to clearing of vegetation or disturbance to rock habitats, searches for fauna are to be conducted by a suitably qualified ecologist.

- If hollow-dwelling native fauna are recorded within any of the hollow-bearing trees to be removed: the animals are to be captured and released in nearby suitable habitat; the tree or hollow/s being occupied are to be lowered to the ground to allow animals to be captured and relocated; or, the inhabited tree is to be marked and retained (after clearing of surrounding vegetation) for one night to allow nocturnal animals to relocate. Trees left standing will be checked for the presence of fauna prior to work commencing the next day, to determine if the animal has moved of its own accord.
- If threatened fauna are found and need to be removed from the subject site, provisions for alternative habitat for these animals will be made in conjunction with DECCW before on-site activity commences (or recommences).
- Other fauna requiring removal from the subject site prior to clearing are to be relocated into the closest appropriate habitat by an appropriately licensed person, or temporarily housed by an appropriately licensed person until clearing has been completed and then released into adjacent habitat.
- During removal of trees and other habitat, a person licensed under the *National Parks and Wildlife Act* 1974 (such as a registered wildlife carer) will be present to rescue, relocate and rehabilitate fauna that may be disturbed by this process.

Timing of clearing works

Scheduling the removal of vegetation and habitat from the site should avoid winter ad spring, in minimise impacts to fauna. In winter, microchiropteran bat species may be in torpor in tree hollows, and reptiles may also undergo similar periods of inactivity. Spring is a key nesting period for many bird species.

Relocation of selected habitats

Selected tree hollows and logs to be removed from the subject site are to be placed in nearby areas of public land to provide habitat for fauna. Only Crown land to the immediate north-east and south-west of the subject site will be used as receiving areas, in consultation with a suitably qualified ecologist or DECCW staff.

Selected rocks removed from the subject site shall be placed in public land in the north and south of the study area to provide habitat for reptiles and other biota. Rocks removed from the subject site may also be used to enhance habitat at entrances to fauna underpasses.

Temporary fencing

Where necessary, the outer edge of the proposal footprint will be temporarily fenced to avoid accidental damage to vegetation and habitats beyond the subject site. Temporary fencing should be robust and easily visible but should not prevent the movement of fauna in areas identified as habitat corridors or biolinks.

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Induction program

All workers involved in the construction process, including provision of services and facilities, will undergo an induction to highlight the conservation significance of various areas of vegetation and habitats, and the measures required to avoid unnecessary impacts on these resources.

Minimisation of habitat removal

The proposal should be designed to minimise the removal of vegetation and habitats, particularly in areas of Box-Gum Woodland and habitat corridors. Where the proposal deviates from the existing road reserve, the existing road reserve should be rehabilitated where possible.

Location of construction related materials and facilities

All temporary storage of materials, equipment and vehicles, and provision of service areas and facilities are to be fully contained within the immediate road alignment (development footprint) or other designated areas nearby.

Soil and drainage

A soil and water management plan should be prepared for the construction phase and beyond, to ensure that erosion and scouring is minimized and that sedimentation and water quality do not degrade downstream habitats.

Rehabilitation and landscaping

Rehabilitation of newly disturbed areas is most important adjacent to areas of Box-Gum Woodland and the more intact vegetation forming part of habitat corridors in the north and south of the subject site. A vegetation management plan should be prepared to detail the rehabilitation of disturbed edges, stabilization of exposed soils, weed control and ongoing protection of adjacent Box-Gum Woodland and areas of Hoary Sunray. Seed stock of local provenance should be used where available and regeneration works should commence as soon construction works are completed on the various stages and sections of the proposal.

Long term management strategies and monitoring

The primary strategy for long-term management of ecological values is the protection and improvement of the Box-Gum Woodland within the offset site near the Cooma Road Quarry. Management strategies will be guided by a long-term plan and will include weed control, rehabilitation and monitoring.

A post construction monitoring program shall be implemented along affected areas of Old Cooma Road to provide feedback on the effectiveness of mitigation measures and to identify when and where additional work may need to be undertaken. The following aspects of the proposal should to be monitored on an ongoing basis:

- Watercourses and the effectiveness of erosion and sediment controls;
- Condition of roadside vegetation, particularly in relation to the presence of weed species and erosion;
- The persistence or presence of threatened woodland birds in the northern and southern habitat corridor areas adjacent to the road;

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- The use of fauna underpasses or modified culverts by fauna species (particularly Rosenberg's Goanna) and the condition of underpasses and fencing; and
- Native fauna killed or injured on the road (particularly Rosenberg's Goanna and other threatened fauna), in conjunction with the local wildlife rescue organisation).

The results of the monitoring program should inform maintenance and management strategies, and future road development projects.

It may be beneficial and cost effective to combine monitoring with Stage 2 of the proposed Edwin Land Parkway.

Advisory signs for motorists

The provision of traffic signs to alert motorists to the presence of Goannas crossing the road should be considered to the north of Wickerslack Lane, an area known to be used by the Rosenberg's Goanna. Kangaroo signs should continue to be used, as kangaroo impacts with traffic are relatively common along the current alignment.

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6. Feasible Alternatives and Justification for the Proposal

Alternatives

There are no clear feasible alternatives to the proposal to upgrade the road transport corridor between Googong and Queanbeyan. Alternative direct routes between Googong and Queanbeyan do not currently exist, and new routes would likely involve similar or greater impacts to the natural environment. New routes would involve unnecessarily duplicating the existing Old Cooma Road corridor and would likely involve fragmentation of intact habitat and corridors important to threatened species and communities. New road concepts such as the Dunns Creek linkage are likely to involve substantial environmental impacts and the construction of this link road is not likely to sufficiently reduce future traffic volumes on the existing Old Cooma Road between Gogoong and Queanbeyan (Gabites Porter 2009).

Do nothing option

This would eliminate most of the impacts on the Box-Gum Woodland and threatened species, but would not provide the transport infrastructure needed for the planned land releases at Googong. Not undertaking the proposal would invalidate the future Googong development and result in a substantial loss of growth potential in the Queanbeyan area.

Modified development options

Stage 1 only:

This option would develop only Stage 1, which is the construction of the new road between the southern and northern entrances of Heights Road, to bypass the winding section of road adjacent to the Cooma Road quarry. This option would limit the impact of the current proposal while substantially improving the safely aspects of the current road. This option would avoid direct impacts to local and regional biolinks and known threatened fauna habitat. However, this option would still involve the removal of Box-Gum Woodland and a number of the endangered Hoary Sunray individuals. It would not address the long-term traffic capacity and safety issues required to support proposed land releases at Googong.

Not developing northern section of Stage 2:

The option to undertake the entire proposal apart from those areas north of Wickerslack Lane would avoid direct impacts on the regional biolink area; retain an additional 1.8 ha of BGW and up to 6 ha of known Speckled Warbler and Rosenberg's Goanna habitat. It would also avoid further widening of the existing disruption to the regional biolink.

While this option has obvious conservation benefits, it would create a traffic bottleneck, increasing the time that traffic spent moving through the area, and is likely to still result in adverse impacts on fauna crossing Old Cooma Road, including Rosenberg's Goanna. It would also not address the longer-term safety and capacity requirements of the road resulting from the proposed Googong development.

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Justification

The proposal is closely linked to major planned land releases at Googong, which are expected to involve the creation of 5,550 households for 16,000 people over 20-25 years.

A recent draft transport study (Gabites Porter 2009) identifies Old Cooma Road between Googong and Karabar as part of the road network placed under the most stress by future developments. This study predicted an increase of 4,404 vehicle movements per day (am and pm peak periods) on Old Cooma Road between Googong and the future Edwin Land Parkway as a result of the Googong development.

The recommended option from the above study included the four land upgrade of Old Cooma Road between Gogoong and Karabar, to be constructed by 2031. The study concluded that the four lane upgrade of Old Cooma Road between Googong and Karabar (the proposal) would be necessary to support the Googong development and to maintain a suitable level of service during peak periods. No alternative option considered in the study (including the Dunns Creek linkage) was able to reduce traffic flow along the two lane Old Cooma Road to a level that would preclude the need for a four lane upgrade.

The Googong development itself is relatively low-impact and will occur largely on degraded land. Studies such as Thompson and Mullins (2004) have identified habitats of conservation significance to be retained early in the planning process.

For the most part, the proposal uses the existing road corridor and associated public land and is considered to be the most appropriate way to increase the capacity of the major road linkage between Googong and Queanbeyan. The impacts of the proposal will be offset by the protection of up to 129 ha of Box-Gum Woodland and other mitigation measures for threatened species have been incorporated into the proposal. Under these circumstances, the proposal is considered to be an appropriate response to the transport needs associated with the Googong development, which minimises and offsets impacts on biodiversity values.

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7. Assessment of significance of likely effects of proposed action

Assessments of significance of the likely effects of the proposal on affected species and communities have been undertaken and appear in Appendix 6. A summary of the results of these assessments is given in Table 8. These assessments concluded that the proposal may have a significant effect on the local population of Rosenberg's Goanna and Speckled Warbler, but is unlikely to have a significant effect on other species or Box-Gum Woodland.

Table 8. Summary of outcomes of significance assessments

COMMON NAME	TSC Act status	Likelihood of significant impact
Endangered Communities		
Box-Gum Woodland	E	No
Birds		
Brown Treecreeper	V	No
Diamond Firetail	V	No
Flame Robin	V	No
Gang-gang Cockatoo	V	No
Hooded Robin	V	No
Scarlet Robin	V	No
Speckled Warbler	V	Yes
Turquoise Parrot	V	No
Varied Sittella	V	No
Mammals		
Eastern Bentwing-bat	V	No
Eastern False Pipistrelle	V	No
Greater Long-eared Bat	V	No
Reptiles		
Pink-tailed Worm-lizard	V	No
Rosenberg's Goanna	V	Yes
Invertebrates		
Golden Sun Moth	E	No

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8. Additional Information

8.1 Qualifications and Experience of SIS author(s) and researcher(s)

Table 9. Summary of qualifications and experience of project staff

Name	Title	Project role	Qualifications	Experience
David Coombes	Senior Ecologist	Fauna surveys & primary author	B. App. Sc	15 years
Ryan Smithers	Senior Ecologist	Flora surveys & author	B. App. Sc (Hons)	13 years
Steve Edwards	Senior GIS Officer	GIS mapping and analysis	Grad. Cert. App. Sc (GIS)	12 years GIS
Robin Kielly	Senior Field Officer	Field survey assistance	-	5 years
Kirsten Vine	Field Officer	Field survey assistance	B. Land Mgt (pending)	6 years
Les McLaren	Field Officer	Field survey assistance	-	6 years
Adam Taylor	Field Officer	Field survey assistance	-	2 years

8.2 Other Approvals

Outlined below is a summary of other environmental approvals and legislation applicable to this proposal.

8.2.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) provides a national scheme for protecting the environment and conserving biodiversity values, and in particular matters of National Environmental Significance (NES). Actions that may have a significant impact upon NES matters need to be referred to the Commonwealth Minister for the Environment. NES matters relevant to the proposal include the endangered ecological community Box-Gum Woodland and the endangered flora species Hoary Sunray *Leucochrysum albicans,* listed under the EPBC Act. Both will be impacted by the proposal and a referral to the Commonwealth Minister for the Environment has been prepared as part of the proposal. This referral has been assessed by DSEWPC (previously DEWHA), which concluded that the proposal is not a controlled action and would not have a significant impact upon any matters of NES.

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8.2.2 Environmental Planning and Assessment Act 1979 (EP&A Act)

The Environmental Planning and Assessment Act 1979 (EP&A Act) is the principal planning legislation in NSW providing a framework for the overall environmental planning and assessment of development proposals. Queanbeyan City Council is the determining authority for the proposal under Part 5 of the EP&A Act. This will require a Review of Environmental Factors (REF) to be prepared for the proposal.

8.2.3 Water Management Act 2000 (WM Act)

The Water Management Act 2000 (WM Act) replaces the Rivers and Foreshores Improvement Act 1948 which was repealed in February 2008. The WM Act aims to protect sensitive waterway and riparian environments. The Act has provisions that require a 'Controlled Activity Approval' to be sought from the Minister for Planning for excavations, fill and any other activity that affects the quantity or flow of water in a water source (rivers, estuaries and lakes), as these activities can cause significant impacts on habitat, water quality, flooding and erosion.

The definition of a river within the WM Act is very broad, and extends to

> (a) any watercourse, whether perennial or intermittent and whether comprising a natural channel or a natural channel artificially improved, and
> (b) any tributary, branch or other watercourse into or from which a watercourse referred to in paragraph (a) flows, and
> (c) anything declared by the regulations to be a river, whether or not it also forms part of a lake or estuary.

Two ephemeral drainage lines running into Barracks Creek and then the Queanbeyan River, will be substantially altered by the proposal. A 'Controlled Activity Approval' may be required to undertake works associated with this proposal. It is recommended that QCC consult the Department of Natural Resources to determine whether approval should be sought and the required conditions for a 'Controlled Activity Approval' for this proposal.

8.3 Licences and Approvals required prior to undertaking surveys

During the survey period, BES and ELA held current Section 132C Scientific Licences (Numbers S12277 and S10805 respectively) under the *National Parks and Wildlife Act, 1974* to conduct flora and fauna surveys, as issued by the NSW Department of Environment and Climate Change. Further details can be provided upon request.

BES and ELA also held current Animal Care and Ethics Committee Certificates of Approval to conduct animal research under the general working operations of an environmental consultancy.

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APPENDIX 1 Director General's Requirements for a Species Impact Statement – Old Cooma Road Realignment, Queanbeyan

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Your reference : SF071163
Our reference : DOC07/49467,FIL07/20056
Contact : Allison Treweek, 61223100

Applicant(s):

QUEANBEYAN CITY COUNCIL,

Trading as QUEANBEYAN CITY COUNCIL,

ABN 12 842 195 133,

PO BOX 90,

QUEANBEYAN NSW 2620

STANDARD POST

Dear Mr Cassidy

DIRECTOR-GENERAL'S REQUIREMENTS FOR A SPECIES IMPACT STATEMENT FOR THE

Proposed Old Cooma Road Realignment

I refer to your letter dated 27 November 2007 and received by the Department of Environment and Climate Change (DECC) on 28 November 2007 requesting the Director-General's Requirements (DGRs) for a Species Impact Statement (SIS) for the activity cited above.

Please find enclosed a copy of the DGRs (Attachment A) issued on behalf of the Director General on 19 December 2007.

DECC understands that Council is, or will in the future be, considering a development application for this site. To assist Council with the development assessment process, DECC provides the following information.

Referrals

Whilst DECC is unable to provide comment on draft SISs in their entirety, DECC will provide comment to proponents and their consultants on key issues arising in the drafting process. The ability of DECC to provide such advice is dependent on the availability of DECC resources and on other statutory priorities.

Please note that it is the determining or consent authority's responsibility to ensure that a draft or final SIS complies with the requirements issued by the Director-General. DECC is not available to perform this function on Council's behalf.

Concurrence

If Council decides to determine the development application by way of approval following a review of the final SIS lodged by the applicant, then the concurrence of the Director-General of DECC is required before consent can be granted. A concurrence application is not required should Council decide to refuse the development application.

Concurrence applications to DECC should be accompanied by:

1. Two copies of the SIS;

2. A copy of any preliminary flora and fauna assessment undertaken (i.e. the report addressing the assessment of significance that triggered the requirement for the SIS);
3. A copy of the development application;
4. A copy of Council's determination report recommending that consent be granted for the development application and the conditions of that proposed consent;
5. A copy of any submissions or objections received by Council concerning the development application;
6. A copy of any other supporting information lodged in support of the development application including social and economic impact assessments; and
7. $250 – in accordance with s.252A of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) (as amended).

Advertising

Council is reminded that in accordance with clauses 86 – 91 of the EP&A Regulation, development that is considered to be "*threatened species development*" is classified as a form of "*advertised development*" requiring the consent authority to give written and published notice of the development application.

Other Information

If DECC grants concurrence to Council's determination report, then DECC would appreciate a copy of the development consent issued by Council to the applicant. DECC would use this information to monitor the type and number of consents being issued which affect threatened species, populations or ecological communities.

DECC would also like to mention the requirements of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act requires the approval of the Federal Minister for the Environment (in addition to any State or Local Government approval or determination) for an action that will have, or is likely to have, a significant impact on a matter of national environmental significance. Threatened species and communities listed by the EPBC Act are considered to be a matter of national environmental significance.

Many of the species and ecological communities listed in the *Threatened Species Conservation Act 1995* (NSW) are also listed in the Commonwealth EPBC Act. Further information regarding the operation of the EPBC Act (including Federally listed threatened species and communities) may be obtained from the website of the Commonwealth Department of Environment and Water Resources www.dewr.gov.au or by contacting the department on 1800 803 772.

Should you require any additional information please contact Allison Treweek, Regional Biodiversity Conservation Officer, on (02) 6122 3100.

Mr Nigel Sargent

Manager

South

(by Delegation)

Dated: 20-Dec-2007

ATTACHMENT A

DIRECTOR GENERAL'S REQUIREMENTS FOR A SPECIES IMPACT STATEMENT

OLD COOMA ROAD REALIGNMENT QUEANBEYAN

INTRODUCTION

The purpose of a Species Impact Statement (SIS) in the development assessment process as it relates to your application is:

- to allow you, as applicant, to identify the issues pertaining to threatened species, populations, ecological communities or their habitats, and provide appropriate amelioration for adverse impacts resulting from the action; and
- to assist the consent or approval authorities in the assessment of your proposal pursuant to the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Section 111(1) of the *Threatened Species Conservation Act 1995* (TSC Act) requires that it must be either the applicant for the development consent or the proponent of the activity who makes the request for Director-General's Requirements (DGRs). The Department of Environment and Climate Change (DECC) notes that in this instance, Mr Simon Cassidy, Manager Engineering Services, made the request for the DGRs. Please advise the DECC contact officer, Allison Treweek, Regional Biodiversity Conservation Officer, on (02) 6122 3100, if it is not intended that Mr Cassidy will be the applicant or proponent whatever the case may be.

It is also essential to note that Section 111(1) requires that the applicant must, in preparing the SIS, comply with the requirements of the Director-General. As any consent or approval granted where the Director-General's requirements are not met may be invalid, it is strongly recommended that Council ensure that all of the requirements detailed below are complied with.

The following requirements are based on the standards developed for other SISs prepared elsewhere in NSW. As per normal practice, specific requirements have been identified for threatened species, populations and ecological communities that are known to occur on the subject site.

DEFINITIONS

The definitions given below are relevant to these requirements:

- **Development** has the same meaning as in the EP&A Act.
- **Activity** has the same meaning as in the EP&A Act
- **Proposal** is the development, activity or action proposed
- **Subject Site** means the area directly affected by the proposal.
- **Study Area** means the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area should extend as far as is necessary to take all potential impacts into account.
- **Locality** is the area within a 10km radius of the subject site
- **Subject Species, Populations or Ecological Communities** means those threatened species, populations or ecological communities that are known or considered likely to occur in the study area. The SIS is to explicitly consider the impacts of the proposal on each of these entities.
- **Direct Impacts** are those that directly affect habitat and individuals, usually within the footprint of the proposal. They include, but are not limited to, clearing and habitat removal. Consideration must be given to all of the likely direct impacts of the proposed activity or development.

- **Indirect Impacts** occur when project-related actions affect species, populations or ecological communities in a manner other than direct loss, usually beyond the footprint of the proposal. Indirect impacts can include loss of individuals through predation by domestic and/or feral animals, deleterious hydrological changes (including increased runoff and raising or lowering of the water table), erosion, weed invasion, pollution, trampling or other impacts due to increased human activity within or directly adjacent to sensitive habitat areas, altered fire regimes, habitat fragmentation and disruption of wildlife movement corridors. As with direct impacts, consideration must be given to all of the likely indirect impacts of the proposed activity or development.

- **Life Cycle** is the series or stages of reproduction, growth, development, aging and death of an organism.

- **Viable** means the capacity to successfully complete each stage of the life cycle under normal conditions.

- **Risk of Extinction** is the likelihood that the local population of the species or local occurrence of the endangered population or ecological community will become extinct either in the short, medium or long-term as a result of direct or indirect impacts on the viability of that population and includes changes to the ecological function of communities.

- **Local Population** is the population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions.

  - The local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area.
  - The local population of resident fauna species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area.
  - The local population of migratory or nomadic fauna species comprises those individuals that are likely to occur in the study area from time to time.

  In cases where multiple populations occur in the study area, each population should be assessed separately.

- **Local Occurrence** means the ecological community that occurs within the study area. However the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.

- **Composition** means both the plant and animal species present, and the physical structure of the ecological community. Note that while many ecological communities are identified primarily by their vascular plant composition, an ecological community consists of all plants and animals as defined under the TSC Act that occur in that ecological community.

All other definitions are the same as those contained in the TSC Act.

MATTERS WHICH HAVE BEEN LIMITED OR MODIFIED

The SIS need not address Section 110(2)(g) and 110(3)(d) of the TSC Act. The matters raised in these sections of the TSC Act have been clarified by these DGRs.

The following matters from Section 110 of the TSC Act need only be addressed where relevant:

- All reference to threat abatement plans. There are no threat abatement plans relevant to the key threatening processes associated with the *proposal.*

- All reference to recovery plans. There are draft recovery plans relevant to the *subject species* listed in Tables 1 and 2 and the *subject ecological community* listed in Section 3.2 of these DGRs. However, if other entities should be deemed as *subject species, populations or ecological communities* by analysis in accordance with these DGRs, then any relevant recovery plans pertaining to these entities will need to be addressed in the SIS.

- All reference to key threatening processes. Only the following key threatening processes are relevant to this proposal:
  - Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands
  - Bushrock removal
  - Clearing of native vegetation;
  - Invasion of native plant communities by exotic perennial grasses
  - Removal of dead wood and dead trees;
  - Loss of hollow-bearing trees

For each *subject species, population or ecological community* likely to be affected by any of these key threatening processes, the SIS shall address whether the action will increase this threat, and shall describe proposed measures to ameliorate such threats.

Please note that recovery plans may be approved, critical habitat may be declared and key threatening processes may be listed between the issue of these DGRs and the determination of the *proposal*. If this occurs, these additional matters will need to be addressed in the SIS and considered by the consent, determining or concurrence authority.

MATTERS TO BE ADDRESSED

The TSC Act provides that the SIS must meet all the matters specified in Sections 109 and 110 of the Act with the exception of those matters limited above. Some of the requirements outlined in Sections 109 and 110 (excluding the matters limited above) have been repeated below (italics) along with the specific Director-General's Requirements for your *proposal*.

Previous surveys and assessments may be used to assist in addressing these requirements. All references used throughout the SIS must be cited and detailed in a reference list.

1 FORM OF THE SPECIES IMPACT STATEMENT

A species impact statement must be in writing [Section 109 (1)]

A species impact statement must be signed by the principal author of the statement and by:

(a) the applicant for the licence, or

(b) if the species impact statement is prepared for the purposes of the Environmental Planning and Assessment Act 1979, the applicant for development consent or the proponent of the activity proposed to be carried out (as the case requires) [Section 109(2)].

The SIS must include the following declaration signed by the applicant or proponent:

"I...[insert name], of ..[address], being the applicant for the [choose one of the following development consent for/proponent of] the action proposed...[insert DA number, Lot & DP numbers, street, suburb and LGA names] have read and understood this species impact statement. I understand the implications of the recommendations made in the statement and accept that they may be imposed as conditions of consent or concurrence for the action proposed."

2 CONTEXTUAL INFORMATION

2.1 Description of proposal, subject site and study area

A species impact statement must include a full description of the action proposed, including its nature, extent, location, timing and layout [Section 110 (1)]

A full description of the action proposed includes a description of all associated actions. These actions may occur on or off the *subject site*. In describing the action proposed, the proportion of the *subject site* and the *study area* that will be affected is to be provided, including details of the location of any auxiliary infrastructure and all component parts of the *proposal* including, but not restricted to, (i) roadworks and temporary access and egress routes, (ii) cycleways, walkways, drainage and settling ponds, stockpile areas, diversion banks, vehicle parking areas and temporary buildings, (iii) changes in surface water flows.

The type of action proposed shall be detailed, including the timetable for the construction of the *proposal*. If a staged construction approach is adopted then the timetable shall clearly indicate this.

If subsequent development of adjacent land is proposed by the proponent in the future, including any additional road construction then this shall be identified to the extent that it is known at the time of preparing the SIS. If existing structures such as the pipeline and transmission line are to be relocated, this should also be described and assessed.

Where the proposed road passes through the White Box, Yellow Box, Blakely's Red Gum Woodland endangered ecological community, the construction methods used shall be described in detail and the feasibility of construction of the road without adversely impacting on this ecological community shall be demonstrated.

The vegetation within the study that is to be retained is to be fully documented, and shown on the relevant plans and maps. The proposed management regimes for such areas are also to be documented.

2.2 Provision of relevant plans and maps

A detailed plan of the *study area* shall be provided at a preferred scale of 1:4,000 or finer. This plan shall show the *proposal*, the location and type of vegetation communities present within the *study area*, the full extent of vegetation clearing anticipated, and the scale of the plan. This plan shall also show the location of any key habitat resources for threatened species (eg. hollow-bearing trees, identified feed trees, potential breeding sites, rock outcrops). Where the general habitat of each *subject species, population or ecological community* within the *study area* can be clearly delineated, this habitat shall be represented on the plan.

Colour aerial photography of the locality (or a reproduction of such a photograph) shall be provided. This aerial photograph shall clearly show the subject site and the scale of the photograph.

The locations of the *subject species populations or ecological communities* recorded in any survey conducted for the purposes of the SIS shall be represented on a map of the *study area* that shows the *proposal* (preferred scale 1:4,000 or finer).

A topographic map of the general *locality* at a scale of 1:25,000 is to be provided. This map is to detail the location of the action proposed, landscape features including rivers, swamps, wetlands, any locally significant sites of *subject species, populations or ecological communities*, and areas of high human activity such as townships and major roads. This map shall incorporate the area within a radius of 10km from the subject site. All available historical records are to be included of *subject species, populations of ecological communities* sourced from various databases and other sources are to be included on this map.

2.3 Land tenure information

The land tenure across the *study area* is to be described and any limitations to sampling across the *study area* resulting from this tenure (e.g. denied access to private land) shall be noted.

3 INITIAL ASSESSMENT

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 [Section 110 (2)(a)].

3.1 Identifying subject species and populations

For the purposes of this SIS, the species listed in Table 1 are to be addressed as *subject species*:

Table 1. List of *subject species*.

SPECIES	SCIENTIFIC NAME	STATUS
FAUNA		
Little Whip Snake	*Suta flagellum*	Vulnerable
Golden Sun Moth	*Synemon plana*	Endangered
Pink-tailed Worm-lizard	*Aprasia parapulchella*	Vulnerable
Rosenberg's Goanna	*Varanus rosenbergi*	Vulnerable
Brown Treecreeper	*Climacteris picumnus victoriae*	Endangered
Diamond Firetail	*Stagonopleura guttata*	Vulnerable
Hooded Robin	*Melanodryas cucullata cucullata*	Vulnerable

SPECIES	SCIENTIFIC NAME	STATUS
Speckled Warbler	*Pyrrholaemus sagittatus*	Vulnerable
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	Endangered
FLORA		
Button Wrinklewort	*Rutidosis leptorrhynchoides*	Endangered
Silky Swainson Pea	*Swainsona sericea*	Vulnerable
Endangered Ecological Communities		
White Box, Yellow Box, Blakely's Red Gum Woodland		

One of the roles of a SIS is to determine which species, populations or ecological communities may be utilising, or present, on a development site. The entities to be considered for inclusion in the list of subject species, populations and ecological communities are listed in Table 2. This list is not exhaustive and other entities may also need to be included for assessment in this SIS on the basis of desktop and habitat analyses and the outcomes of fieldwork.

Table 2. List of other entities for consideration as *subject species, populations or ecological communities*.

SPECIES	SCIENTIFIC NAME	STATUS
FAUNA		
Striped Legless Lizard	*Delma impar*	Vulnerable
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Vulnerable
Koala	*Phascolarctos cinereus*	Vulnerable
Eastern Bentwing Bat	*Miniopterus schreibersii oceanensis*	Vulnerable

In determining whether the entities listed in Table 2, as well as other entities, should also be addressed as *subject species, populations and ecological communities*, consideration shall be given to the habitat types present within the *study area*, recent records of threatened species, populations or ecological communities in the *locality* and the known distributions of threatened species, populations and ecological communities. This analysis and its conclusion are to be documented in the SIS.

Databases such as the DECC Atlas of NSW Wildlife and BioNet, as well as databases held by the Australian Museum and Royal Botanic Gardens, should be consulted to assist in compiling the list of possible entities to be analysed. It should be noted that if the DECC Atlas is the only database that is referred to, due to data exchange agreements, the data provided by DECC will only include that for which DECC is a custodian. In many cases, this may only be a small subset of the data available. Other databases must also be consulted to create a comprehensive list of entities for consideration as *subject species, populations or ecological communities.*

3.2 Identifying habitats

In describing the *study area*, consideration shall be given to the previous land uses and the effect of these land uses on the *study area*. Relevant historical events may include fire, clearing, logging, slashing, recreational use and agricultural activities.

A description of habitats including such components as the frequency of tree hollows, the presence of wetlands, the density of understorey vegetation, the composition of the ground cover, the soil type and the presence of heath and permanent or ephemeral swamps shall be given. The condition of these habitats within the *study area* shall be discussed, including the prevalence of introduced species. A description of the habitat requirements of threatened species, populations or ecological communities likely to occur in the *study area* shall be provided.

Any areas which may provide habitat connectivity between the *study area* and adjacent areas of likely habitat for *subject species, populations or ecological communities* shall be identified and described.

In defining the *study area*, consideration shall be given to possible *indirect impacts* of the proposed action on species/habitats in and surrounding the *subject site*. These could include impacts arising from altered fire and hydrology regimes, soil erosion or pollution, fencing, habitat fragmentation and disruption of wildlife movement corridors, edge effects, altered light and noise regimes, disturbance of roosting areas or other impacts due to increased use of the area by humans, and the impacts of increased levels of domestic and feral predators.

4 SURVEY

4.1 Requirement to survey

A flora and fauna survey is to be conducted in the *study area*. Targeted surveys shall be conducted for all *subject species, populations and ecological communities* determined in accordance with Section 3. Previous surveys and assessments may be used to assist in addressing this requirement. However, the efficacy of such previous surveys and assessments in meeting this requirement must be described in full. These previous surveys do not negate the need for the additional targeted survey work set out in Appendix 1 of these DGRs.

Particular attention shall be paid to the timing and climatic conditions for conducting fauna surveys including invertebrates, as many of the *subject species* will only be present or detectable for a few months each year or during certain climatic conditions. Additional advice on these matters should be sought from the DECC contact officer.

Identification of all species is essential. Identification to genus only is not acceptable. Species of taxonomic uncertainty shall be confirmed by a recognised authority such as the Australian Museum or National Herbarium at the Royal Botanic Gardens, Sydney.

4.2 Documentation of survey effort and technique

Survey technique(s) shall be described and a reference given, where available, outlining the survey technique employed.

Survey site(s) shall be identified on a map with a clear legend. The size, orientation and dimensions of quadrat or length of transect shall be clearly noted for each type of survey technique undertaken. Full AMG grid references for the survey site(s) shall be provided.

DECC survey proformas are to be used by field staff when applying a range of standard fauna survey techniques. Copies of standard proformas are included in Appendix 2 to these DGRs. Digital copies of these proformas can be requested from the nominated DECC contact officer. These proformas shall be used by field staff when undertaking fauna surveys and completed data sheets are to be included as an appendix to the SIS.

The time invested in each survey technique shall be summarised in the SIS, based on completed proformas, e.g. number of person hours / transect, duration of call playback, number of nights that traps are set.

It is not sufficient to aggregate all time spent on all survey techniques. Effort must be expressed separately for each survey technique that is applied.

Personnel details including name of surveyor(s), contact phone number, qualifications and experience must be included. The person who identified records (e.g. Anabat, hair tubes, scat analysis) shall also be identified in this manner.

Environmental conditions during the survey shall be noted from the commencement of each survey technique until its completion. These conditions must be documented in the SIS.

An assessment of the efficacy of each survey regime in detecting each species under the intensity utilised by the study is to be provided. The effect of the season and weather at the time of the field survey shall be considered with respect to the adequacy of survey results. An assessment will also be made of the adequacy of the survey and background information used to assess the likely area of use (home range) for each *subject species, population or ecological community*, and the areas providing habitat connectivity.

A full list of all flora and fauna species recorded during the course of surveys shall be included (such information is indicative of the habitat quality of the site). Completed Atlas of NSW Wildlife cards are to be provided for each threatened species record in any survey conducted for the purposes of the SIS. For confidentiality, these cards are not to be included in the SIS but rather shall accompany the SIS when supplied to the DECC.

4.3 Specific survey requirements

Appendix 1 details the specific survey requirements for the *subject species, populations or ecological communities* identified in Table 1 of these DGRs. These survey requirements can determine the presence of *subject species, populations or ecological communities* known or likely to be in the *study area* and/or can provide contextual information on habitats to allow appropriate assessment of impacts at a broader scale. The flora and fauna survey of the *study area* must include the use of these survey methods.

You are advised that discussions between the consultant(s) engaged to prepare the SIS and DECC may be necessary in order to derive an appropriate survey regime for some of these requirements, and to confirm the survey regimes proposed for any additional *subject species, populations and ecological communities* derived by analysis as part of this SIS.

5 ASSESSMENT OF LIKELY IMPACTS ON THREATENED SPECIES, POPULATIONS AND ECOLOGICAL COMMUNITIES

For all *subject species, populations and ecological communities*, the SIS shall describe the following:

a. the location, nature and extent of habitat removal or modification which will result from the action proposed;

b. the likely and potential impact of the removal of habitat. Particular attention shall be given to the loss of:

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

   ii. habitat for Pink-tailed Worm Lizard, Little Whip Snake and,

   iii. the likelihood of and extent of loss of hollow-bearing trees and termite mounds utilised for breeding, roosting or denning by threatened fauna such as micro-chiropteran bats, small woodland birds and Rosenberg's Goanna respectively.

   Similarly, attention is to be given to the likelihood of and extent of loss of food resources and the impact this may have on the *subject species, populations or ecological communities*.

c. any indirect impacts of the proposal including:

   i. the fragmentation or isolation of *local populations* and/or *local occurrences*, and the increased distance required for the movement of individuals/genetic material between habitat patches,

   ii. change in vegetation floristics and structure resulting from edge effects,

   iii. altered hydrology regimes (including increased runoff and raising or lowering of the water table),

   iv. soil erosion and pollution,

   v. disturbance to feeding or nesting/breeding of species,

   vi. trampling or other impacts due to increased use of the area by humans, particularly on White Box, Yellow Box, Blakely's Red Gum Woodland,

   vii. increased mortality rates due to road deaths,

   viii. habitat fragmentation and disruption of wildlife movement corridors and pollination mechanisms,

   ix. altered light and noise regimes,

   x. the likely contribution of the action proposed to the threatening processes already acting on populations of those *subject species or populations* and occurrences of *subject ecological communities* in the *locality*.

All of the above contextual information (which can be incorporated into Sections 5.1 - 5.5 below) will assist with the assessment of cumulative impacts on the *subject species, populations and ecological communities*.

5.1 Assessment of species likely to be affected

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 [Section 110(2)(b)].

This requirement allows refinement of the list of *subject species or populations* (given the outcome of survey and analysis of likely impacts) in order to identify which threatened species or populations may be affected, and the nature of the impact.

The remaining requirements in this section (5.2 – 5.5) need only be addressed for those threatened species or populations that are likely to be affected by the proposal.

5.2 Discussion of local and regional abundance

An estimate for the local and regional abundance of those species or populations [Section 110 (2)(d)]

5.2.1 Discussion of other known local populations

A discussion of other known *local populations* in the *locality* shall be provided. The long-term security of other habitats shall be examined as part of this discussion. The relative significance of the *subject site* for the *subject species, populations and ecological communities* in the *locality* shall be discussed. It is essential that the SIS includes some surveys conducted beyond the *study area* to clarify the conservation significance of the *subject site* to the *subject species and populations*.

The need for off-site surveys to provide context to the anticipated impacts of the *proposal* may also be required for other threatened species recorded during the surveys of the *study area* for

5.2.2 Discussion of habitat utilisation

An estimate of the number of individuals of each *subject species* utilising the *study area* shall be provided as well as a description of how these individuals use the *study area* (e.g. residents, transients, adults, juveniles, nesting, foraging). A discussion of the significance of these individuals to the viability of the *subject species* in the *locality* shall be provided.

5.2.3 Description of vegetation
The vegetation present within the *study area* and the surface area covered by each vegetation community shall be mapped and described. Reference to the vegetation classification system used (e.g. Specht, Benson, Keith) and to the ecological communities determined as endangered by the NSW Scientific Committee shall be provided. Classification must have regard to both structural and floristic elements.

5.2.4 Discussion of corridors
Particular attention shall be given to identifying movement corridors for *subject species* within the *study area*. The impact of the proposal on these corridors and the resulting impact on the resident *subject species* shall be discussed.

5.3 Assessment of habitat

A full description of the type, location, size and condition of the habitat (including critical habitat) of those species, populations and ecological communities and details of the distribution and condition of similar habitats in the region [Section 110 (2)(f) and Section 110 (3)(c)]

5.3.1 Description of habitat values
Specific habitat features in the *study area* shall be described and quantified (e.g. frequency and location of stags, hollow bearing trees, culverts, rock shelters, rock outcrops, crevices, caves, drainage lines, soaks, area of ecological communities etc.), as well as the density of understorey vegetation and groundcover.

The condition of the habitat within the *study area* shall be discussed, including the prevalence of introduced species, species of weeds present and an estimate of the total weed cover as a percentage of each vegetation community, whether trampling or grazing is apparent, effects of erosion, prevalence of rubbish dumping, history of resource extraction or logging and proximity to roads. Details of the *study area's* fire history (e.g. frequency, time since last fire, intensity) and the source of fire history (e.g. observation, local records), shall be provided.

5.3.2 Distribution and condition of regional habitats
For the habitats of *subject species and populations* found in the study area, the SIS shall discuss the distribution and condition of similar habitats in the region. For the *subject ecological communities* found in the study area, the SIS shall discuss the distribution and condition of these ecological communities in the region. Regional information may be obtained from existing datasets and from other sources.

5.4 Discussion of conservation status

For each species or population likely to be affected, and for each ecological community present, details of its local, regional and State-wide conservation status,...[and]... its habitat requirements ... [Section 110(2)(c) and Section 110(3)(b)]

Assessment shall include reference to the threatening processes that are generally accepted by the scientific community as affecting the *subject species, population or ecological community* and which are likely to be caused or exacerbated by the *proposal*. Assessment shall also include reference to any approved or draft recovery plans which may be relevant to the *proposal*. Up-to-date lists and copies of approved and draft recovery plans are available on the DECC website www.environment.nsw.gov.au by following the links to threatened species.

5.5 Description of feasible alternatives

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 [Section 110(2)(h) and Section 110(3)(e)].

In this instance, any planning documents relating to urban expansion in Queanbeyan (e.g. Googong), as well as any traffic analyses, shall be provided to support this description.

6 IMPACT AMELIORATION

6.1 Description of ameliorative measures

A full description and justification of the measures proposed to mitigate any adverse effect of the action on the species, populations and ecological communities including a compilation (in a single section of the statement) of those measures [Section 110 (2)(i) and Section 110 (3)(f)].

6.1.1 Long term management strategies
Consideration shall be given to the information contained in approved and draft recovery plans or threat abatement plans for existing taxa, known or likely to occur in the *study area*, and whether any recommendation is applicable to the *proposal*.

The development of long-term management strategies shall be considered to protect areas within the study area which are of particular importance for the *subject species, populations or ecological communities* likely to be affected by the *proposal*. This may include proposals to restore or improve habitat on site where possible. If mitigation is to include rehabilitation of the site, then the rehabilitation strategy shall be detailed.

Any measures proposed to mitigate the effect of the proposal on *local populations* of threatened species and populations and/or *local occurrences* of ecological communities shall be described. The potential effectiveness of any such amelioration in maintaining a viable *local population* and/or *local occurrence* in the short, medium and long term shall be discussed (e.g. fauna underpasses, vegetation management).

6.1.2 Compensatory strategies
If significant modification of the *proposal* to minimise impacts on *subject species, populations or ecological communities* is not possible, then compensatory strategies shall be considered. These may include other off-site or local area proposals that contribute to long term conservation of the *subject species, populations or ecological communities*.

The areas proposed to be used for compensatory strategies must be described in full including a detailed description of their biodiversity.

Where such proposals involve other lands, or where involvement of community groups is envisaged in such proposals, landholders, land managers and/or community groups are to be consulted and *proposals* shall contain evidence of support from these stakeholders and relevant land managers.

Compensatory benefits likely to result from such measures proposed for alternative sites are to be discussed and evaluated along with a discussion of the mechanisms through which they might best occur.

6.1.3 Ongoing monitoring
Any proposed pre-construction monitoring plans or on-going monitoring of the effectiveness of the mitigation measures shall be outlined in detail, including the objectives of the monitoring program,

method of monitoring, reporting framework, duration and frequency. Generally, ameliorative strategies that have not been proved effective should be undertaken under experimental design conditions and appropriately monitored.

6.1.4 Translocation

DECC does not consider that translocation of threatened species, populations and ecological communities is an appropriate ameliorative strategy for the purposes of considering impacts of a particular development/activity. It strongly supports the view that development proposals which may impact on significant local populations of *subject species and populations* or significant local occurrences of *subject ecological communities* as determined by the SIS should aim to:

i. minimise the impacts by considering all possible alternatives to the *proposal*, such that a significant impact is not likely; and

ii. manage the remaining habitat (if any) to ensure that the *local population* and/or *local occurrence* continues to exist in the long term.

The translocation of *subject species, populations and ecological communities* is only supported by DECC in specific conservation programs (e.g. recovery planning).

7. ASSESSMENT OF SIGNIFICANCE OF LIKELY EFFECT OF PROPOSED ACTION

An assessment of significance (s5A EP&A Act) is to be provided for each *subject species, population or ecological community* identified in the SIS, incorporating relevant information from sections 5.1 to 7 of the SIS. On the basis of these assessments, a conclusion is to be provided concerning whether, based on more detailed assessment through the SIS process and consideration of alternatives and/or ameliorative measures proposed in the SIS, the proposal is still considered likely to have a significant effect on threatened species, populations or ecological communities or their habitats.

8 ADDITIONAL INFORMATION

8.1 Qualifications and experience

A species impact statement must include details of the qualifications and experience in threatened species conservation of the person preparing the statement and of any other person who has conducted research or investigations relied on in preparing the statement [Section 110(4)]

8.2 Other approvals required for the development or activity

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 or ecological community [Sections 110(2)(j) and 110(3)(g)]

In providing a list of other approvals the following shall be included:

- Where consent is required under Part 4 of the *Environmental Planning and Assessment Act 1979*, the name of the consent authority and the timing of the development application shall be included; or
- Where approval is required under Part 5 of the *Environmental Planning and Assessment Act 1979*, the name of the determining authority, the basis for the approval and when the approval is proposed to be obtained shall be included.
- Where consent or approval is required under any other Act, the name of the consent or determining authority and the timing of the development application, basis for the approval and when the approval is proposed to be obtained shall be included

8.3 Licensing matters relating to flora and fauna surveys

Persons conducting flora and fauna surveys must have appropriate licences or approvals under relevant legislation. The relevant legislation and associated licences and approvals that may be required are listed below:

National Parks and Wildlife Act 1974:

- General Licence (Section 120) to harm or obtain protected fauna (this may include threatened fauna).
- Licence to pick protected native plants (Section 131).
- Scientific Licence (Section 132C) to authorise the carrying out of actions for scientific, educational or conservation purposes.

Threatened Species Conservation Act 1995:

- Licence to harm threatened animal species, and/or pick threatened plants and/or damage the habitat of a threatened species (Section 91).

Animal Research Act 1985:

- Animal Research Authority to undertake fauna surveys.

8.4 Reports of State-wide conservation status

Section 110(5) of the *Threatened Species Conservation Act 1995* has the effect of requiring DECC to provide available information regarding the State-wide conservation status of the subject species, populations or ecological communities, in order to satisfy ss.110(2)&(3) of the Act.

DECC has also produced a set of profiles for a number of threatened species, populations and ecological communities that are available on the DECC threatened species website (www.threatenedspecies.environment.nsw.gov.au). Some of these are relevant to the list of *subject species, populations and ecological communities* for this *proposal.*

Proponents and consultants should note that DECC has no further published information available to satisfy s.110(5) of the Act and that receipt and use of the above profiles can be taken to have satisfied the requirements of ss.110(2)&(3) in relation to the State-wide conservation status of the listed species, populations and ecological communities.

Appendix 1: Survey Requirements for Subject Species - DGRs for Old Cooma Road Realignment

SPECIES	SURVEY REQUIREMENTS
Pink-tailed Worm-lizard Little Whip Snake	Surveys of the *subject site* and *study area* shall be undertaken for this species. These shall involve rock rolling and searching under logs and debris at a suitable intensity to provide appropriate survey coverage. Surveys shall be undertaken between mid-August and the end of October preferably after rain. Daily temperatures shall not exceed 25^{0}C during the survey period. Rocks, logs and debris shall be replaced carefully to sustain habitat integrity. Surveys of the *locality* for habitat of the species shall be undertaken. These shall involve determining the extent of potentially suitable habitat from aerial photographs or other means, and ground-truthing selected sites to validate habitat suitability, condition and extent. The sites sampled shall be used to provide context to the habitat affected by the action proposed. Habitat surveys can be undertaken at any time of the year under varied seasonal conditions.
Rosenberg's Goanna	Surveys of the *subject site*, *study area* and *locality* shall be undertaken for termite mounds. This shall involve intensive searches for termite mounds in the *subject site* and *study area*. Representative sampling of the *locality* for termite mounds shall involve the use of transects in selected locations and the gathering of data in conjunction with ground-truthing for endangered ecological communities. The number of termite mounds recorded shall be used to provide context to the potential breeding habitat affected by the action proposed. Surveys can be undertaken at any time of the year under varied seasonal conditions.
Brown Treecreeper, Diamond Firetail, Hooded Robin, Speckled Warbler	Diurnal bird census shall be undertaken in the early morning and/or late afternoon within the *subject site* on three occasions each separated by a period of one week. Each census shall comprise observations for birds, including call recognition, for a period of 45 minutes at a minimum of three locations spread across the subject site. Additional opportunistic bird census shall be employed across the *study area* and *locality* during the course of other surveys for the SIS. Surveys can be undertaken at any time of the year, but shall avoid high-wind and/or rainy days.
Eastern False Pipistrelle	Surveys of the *subject site*, *study area* and *locality* shall be undertaken for hollow-bearing trees. This shall involve intensive searches for hollow-bearing trees in the *subject site* and *study area*. Representative sampling of the *locality* for hollow-bearing trees shall involve the use of transects in selected locations and the gathering of data in conjunction with ground-truthing for endangered ecological communities. The number of hollow-bearing trees recorded shall be used to provide context to the potential breeding habitat affected by the action proposed. Surveys can be undertaken at any time of the year under varied seasonal conditions.
Golden Sun Moth	Surveys of the *subject site* and *study area* shall be undertaken for this species. These surveys should target areas with higher than 40% *Austrodanthonia* in the groundcover. Areas of habitat should be hand-netted during known flight periods. The flight period for this species is short therefore surveys should be undertaken when other known populations in the area are flying. The consultant should discuss these periods with the DECC prior to the survey being conducted. Surveys of the *locality* for habitat of the species shall be undertaken. These shall involve determining the extent of potentially suitable habitat from

Appendix 1: Survey Requirements for Subject Species - DGRs for Old Cooma Road Realignment

SPECIES	SURVEY REQUIREMENTS
	aerial photographs or other means, and ground-truthing selected sites to validate habitat suitability, condition and extent. The sites sampled shall be used to provide context to the habitat affected by the action proposed. Habitat surveys can be undertaken at any time of the year under varied seasonal conditions.
White Box, Yellow Box, Blakely's Red Gum Woodland	Surveys shall identify the extent and condition of this ecological community in the *subject site*, *study area* and *locality*. This shall involve the use of vegetation surveys in the *subject site* and the *study area*. The use of existing datasets held by DECC in combination with ground-truthing of selected sites within areas mapped by DECC as the ecological community is recommended for surveys of the *locality*. The sites sampled shall be used to provide context to the ecological community affected by the action proposed. Surveys can be undertaken at any time of the year under varied seasonal conditions.
Button Wrinklewort.	Systematic surveys using evenly spaced transects located about 10 m apart through all areas of woodland and grassland.
Silky Swainson Pea	Systematic surveys using evenly spaced transects located about 10 m apart through all areas of woodland/grassland must be undertaken. DECC should be consulted by the Ecological consultant to confirm flowering times and seasons, and appropriate survey methods.

Appendix 2: Examples of suitable survey pro-formas

DIURNAL HERPETOFAUNA CENSUS SURVEY PROFORMA

Survey Details

Date of survey _____

Name of surveyor _____ Contact number _____

Number of surveyors _____

Total effort expressed in person-hours _____ Total effort expressed in number of rocks/logs rolled _____

Location Details

Location (including basic habitat) description _____

_____

_____

_____

Map number _____ Map name _____

Type of survey, e.g. transect or quadrat _____ AMG Zone _____

Active or passive search _____ Size of survey area (ha) _____

Survey area

Eastings (6 digits) _____ Northings (7 digits) _____

Eastings (6 digits) _____ Northings (7 digit) _____

Start time (24hr) End time (24 hr) _____

Appendix 1: Survey Requirements for Subject Species - DGRs for Old Cooma Road Realignment

Weather Details

At start of survey, record:

		Cloud cover*	
Wind direction and speed*		Rain*	
Temperature (°C)		Moon*	

At end of survey, record:

Temperature (°C)

Comments

Appendix 2: Examples of suitable survey pro-formas

Species name (Scientific/Common)	Ob. type*	MH type*	Grid reference (full AMGs i.e. Eastings and Northings)	Accuracy

Appendix 1: Survey Requirements for Subject Species - DGRs for Old Cooma Road Realignment

* See Appendix 3: Standard reporting codes

Appendix 2: Examples of suitable survey pro-formas

DIURNAL BIRD CENSUS SURVEY PROFORMA

Survey Details

Name of surveyor		Contact number	
Number of surveyors		Date of survey	
Total effort expressed in person hours		Number of hectares covered or transect or point dimensions	

Location Details

Location description			
Map number		Map name	
Full AMG reference(s) for survey site or transect		AMG Zone	
Start details		Finish details	
Easting (6 digits)		Easting (6 digits)	
Northing (7 digits)		Northing (7 digits)	
Start time (24hr)		End time (24 hr)	

Weather Details

At start of survey, record:		Cloud cover*	
Wind direction and speed*		Rain*	
Temperature (°C)		Moon*	
At end of survey record:			
Temperature (°C)			

Appendix 2:Examples of suitable survey pro-formas

Comments

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy

* See Appendix 3: Standard reporting codes

Appendix 2:Examples of suitable survey pro-formas

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy

Appendix 2:Examples of suitable survey pro-formas

* See Appendix 3: Standard reporting codes

Appendix 2: Examples of suitable survey pro-formas

DIURNAL HOLLOW-BEARING TREE CENSUS SURVEY PROFORMA

Survey Details

Date of survey _____

Name of surveyor _____ Contact number _____

Number of surveyors _____ _____

Total effort expressed in person-hours _____

Location Details

Location (including basic habitat) description _____

_____

_____

_____

Map number _____ Map name _____

Type of survey, e.g. transect or quadrat _____ AMG Zone _____

_____ Size of survey area (ha) _____

Survey area

Eastings (6 digits) _____ Northings (7 digits) _____

Eastings (6 digits) _____ Northings (7 digit) _____

Start time (24hr) End time (24 hr) _____

Appendix 2: Examples of suitable survey pro-formas

Tree No.	Species (Scientific Name)	Number, sizes and types of hollows *	Grid reference (full AMGs i.e. Eastings and Northings)	Accuracy

Appendix 2:Examples of suitable survey pro-formas

* See Appendix 3: Standard reporting codes

Appendix 2: Examples of suitable survey pro-formas

DIURNAL TERMITE MOUND CENSUS SURVEY PROFORMA

Survey Details

Date of survey _____

Name of surveyor _____ Contact number _____

Number of surveyors _____ _____

Total effort expressed in person-hours _____

Location Details

Location (including basic habitat) description _____

_____

_____

_____

Map number _____ Map name _____

Type of survey, e.g. transect or quadrat _____ AMG Zone _____

_____ Size of survey area (ha) _____

Survey area

Eastings (6 digits) _____ Northings (7 digits) _____

Eastings (6 digits) _____ Northings (7 digit) _____

Start time (24hr) End time (24 hr)

Termite mound no.	Grid reference (full AMGs)	Accuracy

Appendix 2: **Examples of suitable survey pro-formas**

Appendix 2: **Examples of suitable survey pro-formas**

Appendix 2: Examples of suitable survey pro-formas

VERTEBRATE FAUNA SURVEY OPPORTUNISTIC RECORDS

Survey name _____ Fauna surveyors _____

Surveyor's contact details _____ Call analysis _____

AGM Zone _____

Date	Time	Site #	Easting (full 6 digits)	Northing (full 7 digits)	Species Name	No Ind	Ob. type*	MH* type*	Notes/Field No**

Appendix 2: **Examples of suitable survey pro-formas**

* See over ** Include initials of observer and any other information that will help relocation of site.

Cloud cover. Record cloud cover in eights of sky.

Moon. Record using the following codes. 0=None, 1=1/4 moon, 2=1/2 moon, 3=3/4 moon, 4=full moon.

Wind direction and speed. Record wind direction to nearest cardinal point. Record wind speed using the following codes. 0=calm 1= Light, leaves rustle 2= Moderate, branches move 3=Strong, tops of trees move

Rain. Record using the following codes. 0=none, 1=drizzle - light, 2=drizzle - heavy 3=heavy rain

Sizes of hollows. Record using the following codes. S=Small (1-5cm diameter), M=Medium (5-15cm diameter), L=Large (greater than 15cm diameter).

Types of hollows. Record using the following codes. T=Trunk hollow, B=Branch hollow

Observation type

Use the following codes:

O	Observed (sighted)	R	Road kill	F	Tracks, scratching
W	Heard call	D	Dog kill	Z	In raptor/owl pellet
X	In scat	C	Cat kill	M	Miscellaneous
P	Scat	V	Fox kill	E	Nest or roost
T	Trapped or netted	K	Dead	B	Burnt
H	Hair or feathers	S	Shot	Y	Bones or teeth
A	Stranded/beached	I	Fossil/subfossil	N	Not located

MH (microhabitat) type

Use the following codes:

AC	Flying above canopy	IB	In burrow	OB	On (beach) sand
BR	In/on bridge	IC	In cave	OL	On log
BU	In building	IG	In grass	OR	On rock
CK	Crevice in rock	IH	In tree hollow	OW	Over water
CL	Crevice in log	IL	In litter	RD	On road
DA	Farm/fire dam	IR	In reeds	TK	On trunk
DT	In dead tree (stag)	IS	In soil	UB	Under bark
EW	Edge of water	IT	In (live) tree	UC	Upper canopy

Appendix 2: **Examples of suitable survey pro-formas**

FC In/on post or stump	IW In water	UG Undergrowth
FL Flying within canopy	LC Lower canopy	UL Under log
GR On ground	LS Low shrub	UR Under rock
HS High shrub	MC Mid canopy	UT Under iron
		WH Waterhole

Your reference: SF071287/C09115493
Our reference: DOC09/58557; FIL07/20056
Contact: Mathew Makeham, 6229 7002

Derek Tooth
Manager Engineering Services
Queanbeyan City Council
PO Box 733
QUEANBEYAN NSW 2620

Dear Mr Tooth

22 January 2010

RE: OLD COOMA ROAD RELIGNMENT – EPBC Act CONSIDERATIONS

I refer to your letter dated 4 December 2009 requesting the *Department of Environment, Climate Change and Water* (DECCW) to consider certain listed threatened species that may be impacted by Queanbeyan City Council's proposed Old Cooma Road realignment proposal.

On 19 December 2007, the Department of Environment & Climate Change (as it then was) issued its Director General's Requirements for the preparation of a Species Impact Statement (SIS) pursuant to s.111 of the *Threatened Species Conservation Act* 1995.

It is understood from your letter of 4 December 2009, that Council has referred the proposal to the Commonwealth Government due to the potential for impacts on Commonwealth listed threatened species and populations. You have requested that DECCW amend its original Director General's Requirements to include Commonwealth listed threatened species under the *Environmental Protection and Biodiversity Conservation Act 1999* (EBPC Act) for consideration in the SIS.

The DECCW agrees to amend its requirements in order to minimise duplication during the environmental assessment process. Council should note that a separate approval (ie. in addition to any approval under NSW legislation) will be required from the Commonwealth if the project is to proceed.

The species listed below are to be addressed as subject species in the SIS and are included as additional requirements to those outlined in our letter to Council of 19 December 2007. Please note this list is not exhaustive an other species, populations or communities may also need to be included for assessment in the SIS on the basis of desktop and habitat analyses and the outcomes of fieldwork, which includes an EPBC protected maters search.

Species	**Scientific Name**	**EPBC Status**	**Survey Requirements**
Hoary Sunray	*Leucochrysum albicans* var. *tricolor*	Endangered	Systematic surveys using evenly spaced transects located about 10m apart through all areas of woodland and grassland during the known flowering period, spring-summer.

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11 Farrer Place Queanbeyan NSW
Tel: (02) 6229 7000 Fax: (02) 6229 7001
ABN 30 841 387 271
www.environment.nsw.gov.au

Endangered Ecological Communities
Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory

If a proposed action is covered by an environmental assessment bilateral between the Commonwealth and NSW, then that action is can be assessed under the accredited NSW environmental assessment process. After assessment, the proposed action still requires approval from the relevant Commonwealth Minister under the EPBC Act.

For information in regards to the bilateral agreement between the Commonwealth and States/Territories please refer to http://www.environment.gov.au/epbc/assessments/index.html

Should you require any additional information please contact Mathew Makeham, A/Regional Biodiversity Conservation Officer on (02) 6229 7002.

Yours sincerely

JULIAN THOMPSON
Unit Head - Operations
Environment Protection and Regulation Group

APPENDIX 2 TSC Act and EPBC Act Threatened Species data search results

Bold text indicates subject species.
Highlighted rows represent threatened species known or likely to utilise the subject site and likely to be affected by the proposal (affected species).

An assessment of likelihood of occurrence in the study area and potential to be affected by the proposal was made for threatened species identified from the database search, other records and species outlined in the Director General's requirements. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the subject site, and results of previous studies, field surveys and professional judgement. The terms for likelihood of occurrence are defined below:

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

TSC Act = *NSW Threatened Species Conservation Act 1995*
EPBC Act = *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*

CE = Critically Endangered species,
E = Endangered species,
V = Vulnerable species,
E2 = Endangered population,
E3 = Endangered Ecological Community

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FLORA SPECIES

Species	Status in Locality	Conservation Significance		Habitat Associations	Likelihood of Occurrence in Study Area
		TSC Act	EPBC Act		
Thick Lip Spider Orchid *Caladenia tessellata*	Has been recorded within the locality	E	V	This species is generally found in grassy sclerophyll woodland on clay loam or sandy soils and is known from one record in the Queanbeyan LGA, within Dry Forest along the Queanbeyan River corridor. Not recorded during flora surveys.	Unlikely
Calotis glandulosa	Not recorded in the locality	-	V	This species appears to be a coloniser of bare patches and occurs in the subalpine habitats of the Australian Alps, often on roadsides. The species is known from montane grasslands dominated by Poa species, native temperate grassland (NTG) dominated by Kangaroo Grass, and Snow Gum Woodlands in the Monaro and Shoalhaven regions. It has not been recorded in the Queanbeyan LGA however there is potential habitat in association with the NTG within the LGA.	Unlikely
Black Gum *Eucalyptus aggregata*	Has been recorded within the locality	V	-	This species occurs predominantly in grassy woodlands on alluvial soils in moist sites along creeks on broad, cold and poorly-drained flats and frost hollows. It commonly occurs with *E. rubida* (Candlebark), *E. viminalis* (Ribbon Gum), and *E. pauciflora* (White Sally, Snow Gum), with a grassy understorey of River Tussock *Poa labillardieri*.	Unlikely
Hoary Sunray *Leucochrysum albicans* var. *tricolor*	**Relatively abundant and widespread in appropriate habitats within the locality**	**-**	**E**	**The Hoary Sunray is associated primarily with Grassy Woodlands in the region and is locally common, occurring throughout much of the Queanbeyan LGA, particularly in the north-eastern parts. The species persists in areas that are not heavily grazed and as such commonly occurs in road reserves.**	**Yes**

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Species	Status in Locality	Conservation Significance		Habitat Associations	Likelihood of Occurrence in Study Area
		TSC Act	EPBC Act		
Pale Pomaderris *Pomaderris pallida*	Has been recorded within the locality	V	V	This species usually grows in open forest or shrub communities surrounded by Brittle Gum, Red Stringybark or Cypress Pine Woodland. In the Queanbeyan LGA, it is only known from two records in Dry Forest within the Queanbeyan River Corridor below Googong Reservoir and east of Wickerslack Lane.	Unlikely
Button Wrinklewort *Rutidosis leptorrhynchoides*	**Has been recorded within the locality**	**E**	**E**	**This species is known to occur at several sites to the west of Mount Jerrabomberra, including a population of around 1500 in Queanbeyan NR, primarily in association with Box-Gum Woodland. A population of around 700 plants is also known from "The Poplars", where the species occurs in semi-natural grassland. Several individuals also occur in a small reserve in Jerrabomberra Estate. This species tends to occupy areas where there is relatively less competition from herbaceous species (either due to the shallow nature of the soils, or at some sites due to the competitive effect of woodland trees). It exhibits an ability to colonise disturbed areas (e.g. vehicle tracks, bulldozer scrapings and areas of soil erosion), however it is susceptible to grazing and is now known only from un-grazed or lightly grazed sites. Some potential habitat present, but not found during targeted surveys.**	**Unlikely**

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Species	Status in Locality	Conservation Significance		Habitat Associations	Likelihood of Occurrence in Study Area
		TSC Act	EPBC Act		
Mountain Swainson-pea *Swainsona recta*	Has been recorded within the locality	E	E	This species is associated with Box-Gum Woodlands and grows in association with Kangaroo Grass, Poa tussocks and spear-grasses. It is known to occur within the Queanbeyan LGA along the Queanbeyan River as well as in the north-west of Royalla in association with Box-Gum Woodland, in NTG at Tuggeranong and Royalla, and also to the west of Letchworth in grassland - woodland mosaic. A population of 800-1000 plants of this species has also been recorded in the railway easement between ACT and NSW adjacent to far south-western corner of Tralee Station, around 9 km southwest of Queanbeyan. Further potential habitat occurs at Tralee Station, in association with grassland in the broad valley of Dunns Creek. Some potential habitat present, but not found during targeted surveys.	Unlikely
Silky Swainson-pea ***Swainsona sericea***	**Has been recorded within the locality**	**V**	**-**	**The Silky Swainson-pea is associated with Grassy Woodlands and Native Grasslands and is relatively widespread within the region. It is known from a number of sites within the LGA including in the Jerrabomberra Creek area, Beatty Hill, from a paddock to the east of Tralee Station, at Googong in a grassland area beneath a canopy of Yellow Box, and from a grassy paddock in Royalla. Further potential habitat occurs at Tralee Station, in association with Kangaroo Grass grassland in the central-west of the property. Some potential habitat present, but not found during targeted surveys.**	**Unlikely**
Austral Toadflax *Thesium australe*	Not recorded in the locality	V	V	This species is generally associated with damp sites in native grasslands and grassy woodlands and is a hemi-parasite of Kangaroo Grass. It has not been previously recorded in the Queanbeyan LGA however there is potential habitat for the species anywhere where there is an abundance of Kangaroo Grass and thus particularly in association with Grassy Woodlands and Native Grasslands that are in good condition and where grazing has been relatively light. Some potential habitat present, but not found during targeted surveys.	Unlikely

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FAUNA SPECIES

Species	Status in Locality	Conservation Significance		Habitat Associations	Likelihood of Occurrence in Study Area
		TSC Act	EPBC Act		
FROGS					
Green and Golden Bell Frog *Litoria aurea*	No recent records, presumed to be extinct	E	V	This species has been observed utilising a variety of natural and man-made water bodies (Pyke & White 1996) such as coastal swamps, marshes, dune swales, lagoons, lakes, other estuary wetlands, riverine floodplain wetlands and billabongs, stormwater detention basins, farm dams, bunded areas, drains, ditches and any other structure capable of storing water (DECC 2007). Fast flowing streams are not utilised for breeding purposes by this species (Mahony 1999). Preferable habitat for this species includes attributes such as shallow, still or slow flowing, permanent and/or widely fluctuating water bodies that are unpolluted and without heavy shading (DECC 2007). Large permanent swamps and ponds exhibiting well-established fringing vegetation (especially bulrushes–Typha sp. and spikerushes–Eleocharis sp.) adjacent to open grassland areas for foraging are preferable (Ehmann 1997; Robinson 1993). The few dams in the study area generally lack emergent or fringing vegetation and adjoining shelter sites. Ephemeral creeks in the study area also lack preferred habitat components. Thought to be extinct in the locality, no recent records and no likely habitat in the study area.	No
Yellow Spotted Tree Frog *Litoria castanea*	No recent records, presumed to be extinct	E	E	Ponds, wetlands and slowly moving streams with abundant marginal growth of bulrushes and other vegetation (DECC 2007). The southern population has been noted to occur in both woodland and improved pastoral areas (DECC 2007). Thought to be extinct in the locality, no recent records and no likely habitat in the study area.	No

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Species	Status in Locality	Conservation Significance		Habitat Associations	Likelihood of Occurrence in Study Area
		TSC Act	EPBC Act		
Southern Bell Frog *Litoria raniformis*	No recent records, presumed to be extinct	E	V	Relatively still or slow-flowing sites such as billabongs, ponds, lakes or farm dams, especially where bulrushes (Typha sp., Eleocharis sp. and Phragmites sp.) are present (DECC 2007; Ehmann 1997). This species is common in lignum shrublands, black box and River Red Gum woodlands, irrigation channels and at the periphery of rivers in the southern parts of NSW (DECC 2007). This species occurs in vegetation types such as open grassland, open forest and ephemeral and permanent non-saline marshes and swamps (DECC 2007). Open grassland and ephemeral permanent non-saline marshes and swamps have also been associated with this species (Ehmann 1997). Thought to be extinct in the locality, no recent records and no likely habitat in the study area.	No
REPTILES					
Pink-tailed Worm-lizard *Aprasia parapulchella*	**Present**	**V**	**V**	**The Pink-tailed Worm Lizard is found at four sites in eastern Australia: near Canberra, ACT, Tarcutta and Bathurst, NSW and Bendigo, Vic (DEWHA 2009a). The habitat of this species mainly consists of well-drained areas with rocky outcrops or partially buried rocks and native grasses (particularly Kangaroo Grass) on sloping open woodland areas (DECC 2009a). Pink-tailed Worm Lizards are commonly found under small rocks in burrows and feed on the larvae and eggs of the ants that are found there (DEWHA 2009a). Has been recorded in the locality, some areas of potential habitat occur in the study area.**	**Potential**

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Species	Status in Locality	Conservation Significance		Habitat Associations	Likelihood of Occurrence in Study Area
		TSC Act	EPBC Act		
Striped Legless Lizard *Delma impar*	Present (in ACT)	V	V	The distribution of the Striped Legless Lizard is through the Southern Tablelands, the South Western Slopes and possibly on the Riverina. Also occurring in ACT, Victoria and South Australia (DECC 2009n). They are found mainly in Natural Temperate Grassland but also in secondary grassland and open Box-Gum Woodland (DECC 2009n). All occupied sites have a grassy ground cover such as Kangaroo Grass, spear-grasses and Poa tussocks (DEWHA 2009d). The Striped Legless Lizard actively hunts for spiders, crickets, moth larvae and cockroaches (DECC 2009n). No typical habitat in or adjacent to the study area and unlikely to occur there. Not recorded during targeted reptile surveys.	Unlikely
Little Whip Snake *Suta flagellum*	**Not recorded in locality**	**V**		**Occurs in Natural Temperate Grasslands and grassy woodlands, including those dominated by Snow Gum or Yellow Box. Also occurs in secondary grasslands derived from clearing of woodlands. Found on well drained hillsides, mostly associated with scattered loose rocks. Most specimens have been found under rocks or logs lying on, or partially embedded in the soil (DECC 2007). Some potential habitat present, although species was not recorded during targeted surveys. The species is not known from the locality.**	**Unlikely**
Grassland Earless Dragon *Tympanocryptis pinguicolla*	Present (in ACT)	E	E	Restricted to a small number of Native Temperate Grassland sites in NSW, including south of Cooma, and west of Jerrabomberra and nearby areas in the ACT. No typical habitat in or adjacent to the study area and unlikely to occur there.	Unlikely
Heath Monitor, Rosenberg's Goanna *Varanus rosenbergi*	**Present**	**V**		**In NSW, associated with Sydney sandstone forest, woodland and heath, also occurs through the southern highlands to ACT and Victoria. Rocks, hollow logs and burrows are utilised for shelter (Environment Australia 2000). Terrestrial termitaria are required for reproduction (King and Green 1999). Forages on a range of smaller birds, mammals, reptiles and carrion over a large home range. Has been recorded in and adjacent to the study area.**	**Yes**

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Species	Status in Locality	Conservation Significance		Habitat Associations	Likelihood of Occurrence in Study Area
		TSC Act	EPBC Act		
DIURNAL BIRDS					
Gang-gang Cockatoo *Callocephalon fimbriatum*	**Present**	**V**		**During summer in dense, tall, wet forests of mountains and gullies, alpine woodlands (Morcombe 2004). In winter they occur at lower altitudes in drier more open forests and woodlands, particularly box-ironbark assemblages (Shields & Chrome 1992). They sometimes inhabit woodland, farms and suburbs in autumn/winter (Simpson & Day 2004).**	**Likely**
Spotted Harrier *Circus assimilis*	Present	V		The Spotted Harrier occurs throughout mainland Australia, apart from densely forested areas. Occurs most commonly in native grassland, but suitable habitat includes grassy open woodland, riparian woodland, shrub steppe and agricultural land. Constructs a stick nest in a tree.	Unlikely
Brown Treecreeper *Climacteris picumnus*	**Present**	**V**		**Distributed through central NSW on the western side of the Great Dividing Range and 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 Brown Treecreeper occupies eucalypt woodlands, particularly open woodland lacking a dense understorey. It is sedentary and nests in tree hollows within permanent territories. (NSW Scientific Committee 2001).**	**Yes**
Varied Sittella *Daphoenositta chrysoptera*	Present	V		The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands, with a nearly continuous distribution in NSW from the coast to the far west. It inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland. The Varied Sittella feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees, and from small branches and twigs in the tree canopy. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years (DECC 2009).	Potential

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		TSC Act	EPBC Act		
White-fronted Chat *Epthianura albifrons*	Present	V		This species occurs in the southern half of Australia, primarily in damp habitats near the coast or waterways and swamps away from the coast.	No
Little Eagle *Hieraaetus morphnoides*	Present	V		The Little Eagle is found throughout mainland Australia apart from densely forested areas. Prefers open forest and woodland habitats. Forages on a range of birds, reptiles, mammals and sometimes insects and carrion. Nests in tall trees within remnant patches.	Potential – occasional foraging habitat only
Swift Parrot *Lathamus discolor*	Occasional visitor only	E	E	Breeds in Tasmania between September and January. Migrates to mainland in autumn, where it forages on profuse flowering Eucalypts (Blakers et al. 1984; Schodde and Tidemann 1986; Forshaw and Cooper 1981). Hence, in this region, autumn and winter flowering eucalypts are important for this species. Favoured feed trees include winter flowering species such as Swamp Mahogany (Eucalyptus robusta), Spotted Gum (Corymbia maculata), Red Bloodwood (C. gummifera), Mugga Ironbark (E. sideroxylon), and White Box (E. albens) (DECC 2007a).	Potential – occasional foraging habitat only
Hooded Robin *Melanodryas cucullata*	**Present**	**V**		**Associated with a wide range of Eucalypt woodlands, Acacia shrubland and open forests (Blakers et al. 1984). In temperate woodlands, the species favours open areas adjoining large woodland blocks, with areas of dead timber and sparse shrub cover (NSW Scientific Committee 2001). Hooded Robin home ranges are relatively large, averaging 18ha for birds from the New England Tableland (NSW Scientific Committee 2001).**	**Potential**

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Species	Status in Locality	Conservation Significance		Habitat Associations	Likelihood of Occurrence in Study Area
		TSC Act	EPBC Act		
Turquoise Parrot ***Neophema pulchella***	**Present - occasional visitor or aviary escapee (not previously recorded from locality)**	**V**		**Steep rocky ridges and gullies, rolling hills, valleys and river flats and the plains of the Great Dividing Range compromise the topography inhabited by this species (Marchant & Higgins 1993). The Turquoise Parrot favours open, grassy woodland and adjacent clearings with dead trees near permanent water. They spend most of their time on the ground foraging for grass and herb seeds. They also eat flowers, fruit, leaves and scale-insects (Australian Museum 2006c). The species is associated with coastal scrubland, open forest and timbered grassland, especially low shrub ecotones between dry hardwood forests and grasslands with high proportion of native grasses and forbs (Environment Australia 2000). Requires hollows in trees, logs or fence posts for nesting, and breeds from August to January.**	**Yes**
Scarlet Robin *Petroica boodang*	Present	V	-	The Scarlet Robin occurs through south-eastern Australia and south-west Western Australia from coastal areas to inland slopes. Prefers dry forest and woodland with an open grassy understorey and abundant logs and fallen timber. Forages from low perches and feeds on invertebrates taken from the ground or from logs or the base of tree trunks. Constructs an open cup nest from plant material and cobweb, and generally breeds between July and January.	Potential, foraging habitat
Flame Robin *Petroica phoenicea*	Present	V	-	The Flame Robin is found in south-eastern Australia (Queensland border to Tasmania, western Victoria and south-east South Australia). In NSW it breeds in upland moist eucalypt forests and woodlands, often on ridges and slopes, in areas of open understorey. It migrates in winter to more open lowland habitats such as grassland with scattered trees and open woodland on the inland slopes and plains.	Potential, foraging habitat

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		TSC Act	EPBC Act		
Superb Parrot *Polytelis swainsonii*	Not recorded	V	V	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. Inhabit Box-Gum woodland and Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest foraging at or near the ground. Nest in hollows. Not known from locality.	Unlikely
Speckled Warbler ***Pyrrholaemus sagittatus***	**Present**	**V**		**Occupies a wide range of eucalypt dominated communities with a grassy understorey, often on rocky ridges or in gullies (DECC 2009). Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy (DECC 2009). Large, relatively undisturbed remnants are required for the species to persist in an area (DECC 2009). Pairs are sedentary and occupy a breeding territory of about ten hectares, with a slightly larger home-range when not breeding (DECC 2009).**	**Yes**
Australian Painted Snipe *Rostratula (benghalensis) australis*	Occasional visitor only	E	V	Shallow inland wetlands, fresh or brackish, permanent or ephemeral. Forages near edge of water on invertebrates and seeds. Nests on the ground in tall reeds or similar vegetation (DEH 2003).	No
Diamond Firetail ***Stagonopleura guttata***	**Present**	**V**		**Typically found in grassy eucalypt woodlands, but also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities (DECC 2009). It is often found in riparian areas and sometimes in lightly wooded farmland (DECC 2009). Appears to be sedentary, though some populations move locally, especially those in the south (DECC 2009).**	**Potential**

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		TSC Act	EPBC Act		
Regent Honeyeater *Xanthomyza phrygia*	Occasional visitor only	CE	E	Associated with temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts, and riparian forests of River Oak (Casuarina cunninghamiana) (Garnett 1993). Areas containing Swamp Mahogany (Eucalyptus robusta) in coastal areas have been observed to be utilised (NPWS 1997). The Regent Honeyeater primarily feeds on nectar from box and ironbark eucalypts and occasionally from banksias and mistletoes (NPWS 1995). As such it is reliant on locally abundant nectar sources with different flowering times to provide reliable supply of nectar (Environment Australia 2000).	Potential – occasional foraging habitat only
MAMMALS (EXCLUDING BATS)					
Spotted-tailed Quoll *Dasyurus maculatus maculatus*	Presumed present within larger reserves from a few historic records.	V	E	The Spotted-tailed Quoll inhabits a range of forest communities including wet and dry sclerophyll forests, coastal heathlands and rainforests (Mansergh 1984; DECC 2007j), more frequently recorded near the ecotones of closed and open forest. This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage in (DECC 2007). Maternal den sites are logs with cryptic entrances; rock outcrops; windrows; burrows (Environment Australia 2000). Historic records from near Googong Foreshores Reserve. Not known from study area or adjoining lands. Not expected to occur in study area.	Unlikely
Koala *Phascolarctos cinereus*	Occasionally recorded – one recent record from locality	V		Associated with both wet and dry Eucalypt forest and woodland that contains a canopy cover of approximately 10 to 70% (Reed et al. 1990), with acceptable Eucalypt food trees. The study area contains no primary feed tree species but seven secondary feed tree species relevant to the area (DECC 2008). One historic record near Googong Dam, one recent (2007) record from Greenleigh Estate. Not known from the study area or adjoining lands. Not expected to occur in study area.	Unlikely

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Species	Status in Locality	Conservation Significance		Habitat Associations	Likelihood of Occurrence in Study Area
		TSC Act	EPBC Act		
MAMMALS (BATS)					
Eastern False Pipistrelle *Falsistrellus tasmaniensis*	**Present**	**V**		**Prefers moist habitats with trees taller than 20m (DECC 2009). Roosts in tree hollows but has also been found roosting in buildings or under loose bark (DECC 2009).**	**Potential**
Eastern Bent-wing Bat *Miniopterus schreibersii oceanensis*	**Present**	**V**		**Associated with a range of habitats such as rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland (Churchill 1998). It forages above and below the tree canopy on small insects (AMBS 1995, Dwyer 1995, Dwyer 1981). Will utilise caves, old mines, and stormwater channels, under bridges and occasionally buildings for shelter (Environment Australia 2000, Dwyer 1995).**	**Potential**
Large-footed Myotis *Myotis adversus*	Not recorded	V		Will occupy most habitat types such as mangroves, paperbark swamps, riverine monsoon forest, rainforest, wet and dry sclerophyll forest, open woodland and River Red Gum woodland, as long as they are close to water (Churchill 1998). While roosting is most commonly associated with caves, this species has been observed to roost in tree hollows, amongst vegetation, in clumps of Pandanus, under bridges, in mines, tunnels and stormwater drains (Churchill 1998). However the species apparently has specific roost requirements, and only a small percentage of available caves, mines, tunnels and culverts are used (Richards 1998).	Unlikely
Grey-headed Flying-Fox *Pteropus poliocephalus*	Not recorded	V	V	Inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas (Churchill 1998, Eby 1998). Camps are often located in gullies, typically close to water, in vegetation with a dense canopy (Churchill 1998). Travels widely to forage on flowering and fleshy fruited trees. Mainly occurs in coastal areas, few records from the region, apparently no records in the locality.	Unlikely

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Species	Status in Locality	Conservation Significance		Habitat Associations	Likelihood of Occurrence in Study Area
		TSC Act	EPBC Act		
Yellow-bellied Sheathtailed Bat *Saccolaimus flaviventris*	Not recorded	V	V	Wide ranging species, utilising many habitats from forest to treeless areas. Forages for insects above the canopy and roosts in tree hollows, also known to roost in buildings and mammal burrows where other roosts are absent. Few records in the region, although the vast range of the species and suitability of habitat in the study area suggest occurrence is possible, although unlikely. The study area would not provide habitat of particular importance to this species.	Unlikely
INVERTEBRATES					
Golden Sun Moth *Synemon plana*	**Present**	**E**	**E**	**It is found in native open temperate grasslands and open grassy woodlands dominated by wallaby grass tussocks (*Austrodanthonia* spp). In the ACT the grasses present are predominantly Silvertop Wallaby Grass (*A. carphoides*), in Vic. the grass species are *A. auriculata, A. carphoides, A. pilosa, A. eriantha* and *A. setacea*, while in NSW the species are *A. carphoides, A. setacea* and *A. auriculata*. Other native grasses such as *Bothrichloa macra, Themeda triandra* and *Austrostipa bigeniculata*, plus herbs such as *Wahlenbergia* spp, *Chrysocephalum apiculatum* and *Lomandra filiformis* may also be present. At least a 40% cover of *Austrodanthonia* species is optimal for the species (O'Dwyer 1999; O'Dwyer & Attiwill 1999), however it is also known from areas dominated by other grasses, including the introduced Chillean Needlegrass (DEWHA 2009).** **Suitable soils are generally low in phosphorus (below 14 mg/g), slightly acidic, sandy, clay loams (O'Dwyer 1999; O'Dwyer & Attiwill 1999). All of the known sites are less than 720 m above sea level, although sites of suitable habitat have been identified above this in central and southwest NSW (Clarke 2001).**	**Potential – only in south west**

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Appendix 3 Flora Species List

Species in **bold and grey highlight** are subject species for the purpose of this SIS

SCIENTIFICE NAME	COMMON NAME
*Acacia baileyana**	Cootamundra Wattle
Acacia dealbata	Silver Wattle
Acacia genistifolia	Early Wattle
Acacia falcata	Sickle Wattle
Acacia implexa	Hickory
Acacia kettlewelliae	
Acacia mearnsii	Black Wattle
Acacia obliquinervia	Mountain Hickory
Acacia penninervis	Mountain Hickory
Acacia pycnantha	Golden Wattle
Acacia rubida	Red-stemmed Wattle
Acaena echinata	-
Acaena novae-zelandiae	Bidgee-widgee
Acaena ovina	-
*Acetosella vulgaris**	Sheep Sorrel
Aira sp.*	
Allocasuarina verticillata	Drooping She-oak
Amyema miquelii	-
Amyema pendula	-
*Arctotheca calendula**	Capeweed
Aristida ramosa	A wiregrass
Asperula conferta	Common Woodruff
Astroloma humifusum	Cranberry Heath
Austrodanthonia caespitosa	Ringed Wallaby Grass
Austrodanthonia carphoides	Short Wallaby Grass
Austrostipa bigeniculata	Speargrass

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SCIENTIFICE NAME	COMMON NAME
Austrostipa scabra subsp. falcata	Speargrass
*Avena fatua**	Wild Oats
Bossiaea buxifolia	
Bossiaea prostrata	-
Bothriochloa decipiens	Redleg Grass
Bothriochloa macra	Red Grass
Bracteantha viscosa	
Brachychiton populneus	Kurrajong
Brachyloma daphnoides	Daphne Heath
Brachyscome rigidula	Hairy cutleaf daisy
*Briza maxima**	Quaking Grass
*Briza minor**	Shivery Grass
*Bromus catharticus**	Prairie Grass
*Bromus diandrus**	Great Brome
*Bromus rubens**	Red Brome
Bulbine bulbosa	Native Leek
Bursaria spinosa	Blackthorn
Callitris endlicheri	Black Cypress Pine
*Capsella bursa-pastoris**	Shepherd's Purse
Carex appressa	Tall Sedge
Cassinia aculeata	Common Cassinia
Cassinia longifolia	Shiny Cassinia
Casssinia quinquefaria	Rosemary Cassinia
Celtis sp.*	
Cheilanthes sieberi	Mulga Fern
Chrysocephalum apiculatum	Common Everlasting
Chrysocephalum semipapossum	Clustered Everlasting
*Cirsium vulgare**	Spear Thistle

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SCIENTIFICE NAME	COMMON NAME
Clematis microphylla	Small-leaved Clematis
Convolvulus erubescens	Blushing Bindweed
Conyza sp.*	A fleabane
Cotoneaster sp.*	Cotoneaster
*Crataegus monogyna**	Hawthorn
Cryptandra amara	Bitter Cryptandra
Cullen microcephalum	Dusky Scurf-pea
Cymbopogon refractus	Barbed-wire Grass
Cynoglossum suaveolens	-
Daucus glochidiatus	Native Carrot
*Dactylis glomerata**	Cocksfoot
Daviesia acicularis	-
Daviesia mimosoides	-
Derwentia perfoliata	Digger's Speedwell
Dianella revoluta	Blue Flax-Lily
Dichelachne sp.	A Plume Grass
Dichondra repens	Kidney Weed
Dillwynia sericea	-
Dodonaea viscosa subsp. *angustifolia*	A hop bush
*Echium plantagineum**	Paterson's Curse
*Echium vulgare**	Vipers Bugloss
Einadia hastata	Berry Saltbush
Einadia nutans	Climbing Saltbush
Elymus scaber var. *scaber*	Wheatgrass
Enneapogon nigricans	Nine-awn Grass
*Eragrostis curvula**	African Love Grass
*Erodium cicutarium**	Common Storksbill
Eucalyptus blakelyi	Blakley's Red Gum

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SCIENTIFICE NAME	COMMON NAME
Eucalyptus bridgesiana	Apple Box
Eucalyptus dives	Broad-leaved Peppermint
Eucalyptus macrorhyncha	Red Stringybark
Eucalyptus mannifera	Brittle Gum
Eucalyptus melliodora	Yellow Box
Eucalyptus nortonii	Mealy Bundy
Eucalyptus polyanthemos	Red Box
Eucalyptus rossii	Inland Scribbly Gum
Eucalyptus rubida	Candlebark
Euchiton involucratus	Star Cudweed
Exocarpos cupressiformis	Cherry Ballart
*Foeniculum vulgare**	Fennel
*Fumaria sp.**	A fumitory
*Galium aparine**	Goosegrass
Genista sp.*	A broom
Geranium solanderi	Cutleaf Cranesbill
Glycine clandestina	Love Creeper
Glycine tabacina	Love Creeper
Gnaphalium sp.	A cudweed
Gonocarpus tetragynus	Poverty Raspwort
Goodenia hederacea	Forest Goodenia
Goodenia pinnatifida	
Gratiola sp.	A Brooklime
Grevillea juniperina	-
Hardenbergia violacea	Twining Pea
Hibbertia obtusifolia	Grey Guinea-flower
*Holcus lanatus**	Yorkshire Fog
Hordeum sp.*	A barley grass

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SCIENTIFICE NAME	COMMON NAME
Hovea heterophylla	-
Hydrocotyle laxiflora	Stinking Pennywort
Hypericum gramineum	Small St John's Wort
*Hypericum perforatum**	St. Johns Wort
*Hypochaeris radicata**	Flatweed
Indigofera australis	Native Indigo
Joycea pallida	Silvertop Wallaby Grass
Juncus sp.	-
Juncus subsecundus	Finger Rush
Kunzea ericoides	Burgan
Kunzea parvifolia	Pink Kunzea
*Lagurus ovatus**	Hare's Tail Grass
Lepidosperma laterale	Variable Sword-sedge
Leptorhynchos squamatus	Scaly Buttons
Leucochrysum albicans	**Hoary Sunray**
*Ligustrum lucidum**	Large-leaved Privet
Lissanthe strigosa	Peach Heath
*Lolium perenne**	Perennial Rye Grass
*Lonicera japonica**	Japanese Honeysuckle
Lomandra filiformis subsp. *filiformis*	Wattle Mat-rush
Lomandra filiformis subsp. *coriacea*	Wattle Mat-rush
Lomandra longifolia	Spiny-headed Mat-rush
Lomandra multiflora	Many-flowered Mat-rush
Lythrum hyssopifolium	Hyssop Loosestrife
*Marrubium vulgare**	Horehound
Melichrus urceolatus	Urn-heath
Microlaena stipoides	Weeping Meadow Grass
*Modiola caroliniana**	Red-flowered Mallow

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SCIENTIFICE NAME	COMMON NAME
Monotoca scoparia	-
*Nasella trichotoma**	Serrated Tussock
*Oenothera stricta**	-
Oreomyrrhis eriopoda	Australian Carraway
*Orobanche minor**	A broomrape
Oxalis perennans	Wood Sorrel
Oxalis sp.*	A wood-sorrel
Panicum effusum	Hairy Panic
*Parorynchia brasiliana**	Brazilian Whitlow
*Petrorhagia nanteuilii**	Proliferous Pink
*Plantago lanceolata**	Lambs Tongue
Plantago varia	-
Phalaris sp.*	-
Pimelea curviflora	
*Pinus □adiate**	Radiata Pine
Poa annua	Winter Grass
Poa labillardierei	Tussock Grass
Poa meionectes	Snowgrass
Poa sieberana	Snowgrass
Podolepis jaceoides	Showy Copper-wire Daisy
Pomaderris angustifolia	
Pomaderris eriocephala	
Populus sp*	A poplar*
Poranthera microphylla	-
Pultenaea microphylla var. *microphylla*	-
Pultenaea procumbens	-
Ranunculus lappaceus	Common Buttercup
*Rosa rubiginosa**	Briar Rose

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SCIENTIFICE NAME	COMMON NAME
Rubus fruiticosus complex*	Blackberry
Rumex brownii	Swamp Dock
Salix sp.*	A willow
*Salvia verbenaca**	Wild Sage
Senecio quadridentatus	Cotton Fireweed
Spyridium parvifolium	Dusty Miller
*Solanum nigrum**	Blackberry Nightshade
Solenogyne dominii	Smooth Solenogyne
Stackhousia monogyna	Creamy Candles
Stylidium graminifolium	Grass Trigger-plant
Styphelia triflora	Pink Five-Corners
*Taraxacum officinale**	Dandelion
Themeda australis	Kangaroo Grass
Tricoryne elatior	Yellow Rush-lily
*Trifolium arvense**	Haresfoot Clover
*Trifolium campestre**	Hop Clover
*Trifoilum repens**	White Clover
Typha orientalis	Broadleaf Cumbungi
Velleia paradoxa	Spur Velleia
*Verbascum thapsus**	Great Mullein
Veronica calycina	Hairy Speedwell
*Vicia villosa**	Russian Vetch
Vittadinia cuneata	Fuzzweed
Vittadinia muelleri	-
Vulpia sp.*	A fescue
Wahlenbergia communis	Tufted Bluebell
Wahlenbergia stricta	Australian Bluebell

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Appendix 4 Fauna Species List

Summary of all fauna species identified in the study area by ELA during 2008/9. Records from other sources have been added as indicated.
Species in **bold and grey highlight** are subject species for the purpose of this SIS.
* denotes introduced species.

CATEGORY	COMMON NAME	SCIENTIFIC NAME
Birds	Australian Hobby	*Falco longipennis*
	Australian Magpie	*Grallina cyanoleuca*
	Australian Raven	*Corvus coronoides*
	Black-faced Cuckoo-shrike	*Coracina novaehollandiae*
	Brown Treecreeper	***Climacteris picumnus* (T&M (2004)/Wildcare)**
	Brown-headed Honeyeater	*Melithreptus brevirostris*
	Brown Thornbill	*Acanthiza pusilla*
	Buff-rumped Thornbill	*Acanthiza reguloides*
	Common Blackbird*	*Turdus merula**
	Common Bronzewing	*Phaps chalcoptera*
	Crested Pigeon	*Geophaps lophotes*
	Crimson Rosella	*Platycercus elegans*
	Eastern Rosella	*Platycercus eximius*
	Eastern Yellow Robin	*Eopsaltria australis*
	Fan-tailed Cuckoo	*Cacomantis flabelliformis*
	Galah	*Cacatua roseicapilla*
	Golden Whistler	*Pachycephala pectoralis*
	Grey Butcherbird	*Cracticus torquatus*
	Grey Currawong	*Strepera versicolor*
	Grey Fantail	*Rhipidura fuliginosa*
	Grey Shrike-thrush	*Colluricincla harmonica*
	Indian Mynah*	*Acridotheres tristis**
	Jacky Winter	*Microeca fascinans*
	Kookaburra	*Dacelo novaeguineae*
	Leaden Flycatcher	*Myiagra rubecula*

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CATEGORY	COMMON NAME	SCIENTIFIC NAME
	Magpie Lark	*Grallina cyanoleuca*
	Noisy Friarbird	*Philemon corniculatus*
	Noisy Miner	*Manorina melanocephala*
	Olive Backed Oriole	*Oriolus sagittatus*
	Pallid Cuckoo	*Cuculus pallidus*
	Pied Currawong	*Strepera graculina*
	Red-rumped Parrot	*Psephotus haematonotus*
	Red Wattlebird	*Anthocaera carunculata*
	Rufous Whistler	*Pachycephala rufiventris*
	Silvereye	*Zosterops lateralis*
	Speckled Warbler	***Pyrrholaemus saggitatus***
	Spotted Pardalote	*Pardalotus punctatus*
	Starling*	*Sturnus vulgaris**
	Striated Pardalote	*Pardalotus striatus*
	Striated Thornbill	*Acanthiza lineata*
	Sulphur Crested Cockatoo	*Cacatua pastinator*
	Superb Fairy-wren	*Malurus cyaneus*
	Turquoise Parrot	***Neophema pulchella***
	Weebill	*Smicrornis brevirostris*
	White-browed Scrubwren	*Sericornis frontalis*
	White-throated Gerygone	*Gerygone olivacea*
	White-winged Chough	*Corcorax melanorhamphos*
	White-faced Heron	*Ardea novaehollandiae*
	Willie Wagtail	*Rhipidura leucophrys*
	Wood Duck	*Chenonetta jubata*
	Yellow-faced Honeyeater	*Lichenostomus chrysops*
	Yellow-tail Black-cockatoo	*Calyptorhynchus funereus*
	Yellow Thornbill	*Acanthiza nana*
	Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*
Mammals	Antechinus	*Antechinus* sp. (Wildcare)

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CATEGORY	COMMON NAME	SCIENTIFIC NAME
	Cat *	*Felis catus* *
	Cow *	*Bos Taurus* *
	Common Brushtail Possum	*Trichosurus vulpecula* (Wildcare)
	Common Wombat	*Vombatus ursinus*
	Dog *	*Canis familiaris* *
	Eastern Grey Kangaroo	*Macropus giganteus*
	European Rabbit *	*Oryctolagus cuniculus* *
	Fox*	*Vulpes vulpes**
	Sheep*	*Ovis aries**
	Short-beaked Echidna	*Tachyglossus aculeatus* (Wildcare)
	Swamp Wallaby	*Wallabia bicolour* (Wildcare)
	Horse *	*Equus caballus* *
Reptiles	Bearded Dragon	*Pogona vitticeps*
	Blackish Blind Snake	*Ramphotyphlops nigrescens*
	Boulenger's Skink (South-eastern Morethia Skink)	*Morethia boulengeri*
	Burton's Legless Lizard	*Lialis burtonis* (Wildcare)
	Dwyer's Snake	*Parasuta dwyeri (*syn. *Suta dwyeri)*
	Eastern Brown Snake	*Pseudonaja textilis*
	Grass Skink	*Lampropholis delicata*
	Jacky Lizard	*Amphibolurus muricatus*
	Robust Ctenotus	*Ctenotus robustus*
	Rosenberg's Goanna	***Varanus rosenbergi* (Wildcare)**
	Skink	*Ctenotus orientalis*
Amphibians	Spotted Marsh Frog	*Limnodynastes tasmaniensis*
	Bibron's Toadlet	*Pseudophryne bibroni*
	Common Eastern Froglet	*Crinia signifera*

T&M (2004) = Thompson & Mullins (2004).

Wildcare = Wildcare records from Old Cooma Road between Karabar and Googong Dam Road between 1 January 2008 and 31 May 2009.

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Appendix 5 Species Profiles

Subject Species and Communities

Pink-tailed Worm Lizard (*Aprasia parapulchella*)
The Pink-tailed Worm Lizard resembles a worm in shape where only the non-forked tongue and the presence of small hind-limb flaps distinguish it from a juvenile snake. These lizards can reach up to 25 cm in length (DECC 2009).
The Pink-tailed Worm Lizard is found at four sites in eastern Australia: near Canberra, ACT, Tarcutta and Bathurst, NSW and Bendigo, Vic (DEWHA 2009). The habitat of this species mainly consists of well-drained areas with rocky outcrops or partially buried rocks and native grasses on sloping open woodland areas (DECC 2009). Pink-tailed Worm Lizards are commonly found under small rocks in burrows and feed on the larvae and eggs of the ants that are found there (DEWHA 2009).

Rosenberg's Goanna (*Varanus rosenbergi*)
The distinguishing feature of the Rosenberg's Goanna is the pairs of narrow, regular bands along the entire length of the tail. They can grow up to 1.5 m.
The Rosenberg's Goanna can be found in heath, open forest and woodland in the areas of the Wollemi National Park, Goulburn and ACT regions and Cooma as well as the South West Slopes where termite mounds are present (DECC 2009). The goanna will nest in the termite mounds and shelter in hollow logs, rock crevices and burrows. These reptiles feed on carrion, birds, eggs, reptiles and small mammals (DECC 2009).

Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*)
The Brown Treecreeper is a grey-brown bird with black streaking on the lower breast and belly and black bars on the under tail (DECC 2009) and is the largest of the treecreepers in Australia at a height of 16-18 cm (Australian Museum 2006).
The eastern subspecies of the Brown Treecreeper is endemic to eastern Australia and occurs through central NSW on the western side of the Great Diving Range and less commonly to the east of the Divide in drier areas (NSW Scientific Committee 2001). They nest in the tree hollows of eucalypt woodlands and dry open forests, usually with a grassy understory (DECC 2009c). The Brown Treecreeper feeds on insects (ants, beetles, larvae) by foraging on tree trunks, amongst leaf litter on the ground and on fallen logs (NSW Scientific Committee 2001) and normally do so in pairs or small groups (Australian Museum 2006).

Diamond Firetail (*Stagonopleura guttata*)
The Diamond Firetail is a striking finch with an ash brown body and a grey crown, forehead and neck and the under feathers are white with a crimson rump and range in size from 10 to 13 cm (Australian Museum 2006).
The Diamond Firetail is distributed through central and eastern NSW, mostly west of the Great Dividing Range but also in drier coastal areas, southern and central Queensland, Victoria, South Australia and ACT (NSW Scientific Committee 2001). This species is found in grassy eucalypt woodlands, forests and mallee, often in riparian areas (DECC 2009) where they forage on the ground for mostly seeds and other plant material but also insects (NSW Scientific Committee 2001).

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Gang-gang Cockatoo (*Callocephalon fimbriatum*)
The Gang-gang Cockatoo is mostly slate-grey, with the males having a distinct scarlet head and wispy crest. They range in size from 32 to 37 cm (DECC 200).
During summer, the Gang-gang Cockatoo is found in tall mountain forests and woodlands, with dense shrubby understoreys. They will move to lower altitudes into drier, more open forests and woodlands in winter (Australian Museum 2005). The distribution of this Cockatoo is from southern Victoria through south and central NSW. The Gang-gang Cockatoo is mainly arboreal coming to the ground only to drink and forage among fallen fruits. They feed on mostly seeds but also eat fruit, nuts and insects (NSW Scientific Committee 2005).

Hooded Robin (south-eastern form) (*Melanodryas cucullata cucullata*)
The south-eastern form of the Hooded Robin is a large Australian robin reaching a size of 17 cm. The adult male is black and white with a black hood extending down a white breast (DECC 2009).
This form of the Hooded Robin occurs from Brisbane to Adelaide, throughout much of inland NSW but rarely on the coast (DECC 2009). Hooded Robins are found in lightly timbered woodland mainly dominated by acacia or eucalypts (Australian Museum 2007). This species forages on bare ground, ground cover and litter by pouncing on insects (NSW Scientific Committee 2001).

Speckled Warbler (*Pyrrholaemus sagittata*)
The Speckled Warbler is a small ground-dwelling bird reaching a length of 13 cm (DECC 2009). It is well-camouflaged and its whole body is covered in dark streaks.
The distribution of the Speckled Warbler is from south-eastern Queensland, central and eastern NSW and Victoria (NSW Scientific Committee 2001), with most sightings in the hills and tablelands of the Great Dividing Range and rarely on the coast (DECC 2009). This species is found in woodlands dominated by *Eucalyptus* with a grassy understory, often in ridges or gullies and forage on the ground for arthropods and seeds (DECC 2009; NSW Scientific Committee 2001).

Turquoise Parrot (*Neophema pulchella*)
The male Turquoise Parrot has bright green upperparts and a turquoise-blue crown and face (DECC 2009j) and ranges in size between 20 and 22 cm (Australian Museum 2006).
The Turquoise Parrot extends from southern Queensland to northern Victoria and from the coastal plains to the western slopes of the Great Dividing Range (DECC 2009) and favours open, grassy woodland with dead trees near permanent water (Australian Museum 2006). They spend most of their time on the ground foraging for seeds. They also eat flowers, fruit, leaves and scale-insects (Australian Museum 2006).

Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*)
Eastern Bent-wing Bats are chocolate to reddish brown. The last bone of the third finger is much longer than the other finger-bones giving the 'bent wing' appearance. It weighs up to 20 grams (DECC 2009).
These bats are found along the east and north-west coasts of Australia (DECC 2009). They use caves as the main roosting habitat but also use mines, storm-water tunnels and buildings and in south-eastern Australia they will hibernate in cold caves during winter (Australian Museum 2009). The Eastern Bent-wing Bat catches moths and other flying insects above the tree canopy in forested areas (DECC 2009).

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Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
The Eastern False Pipistrelle is relatively large with a length of 65 mm and weighing 28 grams. It is dark to reddish-brown above and paler grey on the underside (DECC 2009).
This species is found from southern Queensland to Victoria and Tasmania on the coast and ranges preferring moist habitats and roosting in eucalypt hollows generally in trees taller than 20 m. The Eastern False Pipistrelle hunts beetles, moths and other flying insects above or just below the tree canopy (DECC 2009).

Greater Long-eared Bat (south-eastern form) (*Nyctophilus timoriensis*)
The south-eastern form of the Greater Long-eared bat is dark grey-brown with ears about 3 cm long and larger than the head (DECC 2009) and is the largest of the long-eared bats (Australian Museum 2009). The distribution of this form coincides approximately with the Murray Darling Basin, from Queensland through New South Wales to Victoria and South Australia in areas of River Red Gum forest, semi-arid woodlands and savannahs (DECC 2009; DEWHA 2009). They roost in tree hollows and under loose bark (Australian Museum 2009) and feed on non-flying prey, especially caterpillars and beetles (DECC 2009).

Golden Sun Moth (*Synemon plana*)
The Golden Sun Moth is a medium-sized, diurnal moth. The upper side of both the male and female wings are patterned with pale grey (DECC 2009).
The NSW populations of the Golden Sun Moth are found in the area between Queanbeyan, Gunning, Young and Tumut (DECC 2009) and have been reduced to 48 known sites (DEWHA 2009). They usually occur in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which the ground later is dominated by wallaby grasses (*Austrodanthonia spp*) (DECC 2009). The adults have no functioning mouthparts and so do not feed. The larvae of the Golden Sun Moth feed on the roots of the wallaby grass plant (DECC 2009; DEWHA 2009).

White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland)
Box-gum woodland is an open woodland community in which the most obvious species are one or more of the following: White Box (*Eucalyptus albens*), Yellow Box (*Eucalyptus melliodora*) and Blakely's Red Gum (*Eucalyptus blakelyi*) (DECC 2009). Shrubs are generally sparse or absent. This community is found on relatively fertile soils on the tablelands and western slopes of NSW and occurs within the NSW North Coast, New England Tablelands, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands and NSW South Western Slopes Bioregions (NSW Scientific Committee 2002).

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Appendix 6 Assessments of significance (7-part tests)

Assessments of significance are provided below for the following entities: Box-Gum Woodland**;** Pink-tailed Worm-lizard; Rosenberg's Goanna; Brown Treecreeper; Diamond Firetail; Flame Robin; Gang-gang Cockatoo; Hooded Robin; Scarlet Robin; Speckled Warbler; Turquoise Parrot; Varied Sittella; Eastern False Pipistrelle; Greater Long-eared Bat; Eastern Bent-wing Bat and Golden Sun Moth.

Box-Gum Woodland

Part a)

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

This factor does not apply to endangered ecological communities.

Part b)

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

This factor does not apply to endangered ecological communities.

Part c)

In the case of an endangered ecological community, whether the action proposed:

> *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

The study area supports approximately 17.6 ha of Box-Gum Woodland, approximately 17.4 ha of which is in moderate to good condition (after Gibbons *et. al*. 2005) and 0.2 ha of which is in low condition.

The local occurrence of the Box-Gum Woodland extends beyond the study area into contiguous vegetation particularly to the east and west of the central and southern parts of the study area in association with the relatively extensive areas of Box-Gum Woodland:

- to the north of Wickerslack Lane;

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- to the west through the Cooma Road Quarry and west to the Jerrabomberra area; and

- to the south, east and west of the study area in the catchments of Googong Reservoir, Jerrabomberra Creek, Four Mile Creek and south-west to the Queanbeyan LGA boundary.

The extent of the local occurrence of the Box-Gum Woodland is difficult to determine precisely, however validation of the vegetation mapping of Fallding (2002) by BES (2008) indicates that there are hundreds of hectares of Box-Gum Woodland in areas adjoining the study area, the vast bulk of which is in moderate to good condition using the Biometric condition class definition (Gibbons *et. al*. 2005). In addition, the properties to the immediate west of the southern parts of the study area, which were excluded from BES (2008), are known to support relatively extensive areas of Box-Gum Woodland that have not been heavily grazed in recent years and are subsequently in good condition with excellent recovery potential.

Under theses circumstances it would appear reasonable, given the relative proximity of known patches of Box-Gum Woodland, that exchange of genetic material is occurring and that the local occurrence of the community is at least several hundred hectares in extent. In fact the validation of the vegetation mapping of Fallding (2002) by BES (2008) indicates that there is more than 2800 ha of Box-Gum Woodland in the Queanbeyan LGA, the bulk of which is in moderate to good condition.

The action proposed involves the removal or modification of approximately 5.5 ha of Box-Gum Woodland, which is a relatively small proportion of the local occurrence of the community. Under these circumstances it is considered highly unlikely that the action proposed will reduce the extent of the Box-Gum Woodland such that its local occurrence is likely to be placed at risk of extinction.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

The local occurrence of the Box-Gum Woodland beyond the study area supports areas with a similar composition to that within the study area, and the study area is not expected to support a unique assemblage of characteristic species of the community that does not occur elsewhere within the local occurrence. The local occurrence of the Box-Gum Woodland varies in condition, with much of it likely to be relatively heavily disturbed as is the case with much of the Box-Gum Woodland within the study area. However, it is known that the lands to the north of Wickerslack Lane support occurrences of the community that are in very good condition as are areas to the immediate west of the southern parts of the study area. Furthermore, despite historic and ongoing disturbances, the bulk of the local occurrence of the Box-Gum Woodland is in

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moderate to good condition using the Biometric condition class definition (Gibbons *et. al*. 2005).

The fauna assemblage inhabiting the study area is likely to be distributed throughout the Box-Gum Woodland in the locality. Fauna species such as invertebrates, amphibians, reptiles, birds, arboreal mammals and microchiropteran bats utilising foraging substrates would not be restricted to the areas affected by the action proposed and would be highly likely to continue to utilise other habitats in the Box-Gum Woodland in the locality.

Under these circumstances the action proposed is unlikely to substantially and adversely modify the composition of Box-Gum Woodland such that its local occurrence is likely to be placed at risk of extinction.

Part d)

In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed.

The proposal is expected to remove or further modify approximately 5.5 ha of disturbed Box-Gum Woodland.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

The Box-Gum Woodland within and adjoining the study area has already been fragmented by the existing Old Cooma Road surface and adjoining roads and associated rural-residential development.

As such the action proposed will not isolate or fragment habitat for the Box-Gum Woodland, as the fragmentation has already occurred in association with historic disturbances, and the Box-Gum Woodland to be removed represents a relatively minor addition to the existing fragmentation.

Part e)

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The action proposed will not affect any critical habitat that has been declared under the *TSC Act*.

Part f)

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

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A draft national recovery plan for the Box-Gum Woodland has been produced by DECCW (2010). The objectives of the plan are to minimise the risk of extinction to the endangered ecological community through:

- achieving no net loss in extent and condition of the ecological community throughout its geographic distribution;
- increasing protection of sites in good condition;
- increasing landscape functionality of the ecological community through management and restoration of degraded sites;
- increasing transitional areas around remnants and linkages between remnants; and
- bringing about enduring changes in participating land manager attitudes and behaviours towards environmental protection and sustainable land management practices to increase extent, integrity and function of Box-Gum Grassy Woodland.

The draft recovery plan lists 34 recovery actions for the community, under five strategies: Improve baseline information; Increase protection of Box-Gum Grassy Woodland; Improve Community Engagement; Continue ecosystem function and management research; and Improve compliance and regulatory activities.

With the 129 ha offset site, the proposal is consistent with several of the objectives of the recovery plan, in relation to no net loss of the community; increased protection of sites in good condition and; increasing landscape functionality of the community through management and restoration of degraded sites.

No threat abatement plans have been prepared for the threatening process which applies to the action proposed: *Clearing of native vegetation.*

Part g)

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The action proposed constitutes the key threatening processes *Clearing of native vegetation*, *Loss of Hollow-bearing Trees* and *Removal of Dead Wood and Dead Trees*.

The extent of clearing or other native vegetation modification for the action proposed is approximately 17.2 ha.

The clearing associated with the action proposed includes the clearing of 5.5 ha of Box-Gum Woodland which has been much affected by the threatening process of *Clearing of native vegetation.* Indeed across its range it is estimated that between 96% and 99% of the pre 1750 extent of the Box-Gum Woodland

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has been cleared (NSW Scientific Committee 2002). In this context, the clearing of any more Box-Gum Woodland represents an increase in the key threatening process *Clearing of native vegetation*. However, in the context of the extent of the Box-Gum Woodland within the Queanbeyan LGA, which is estimated to be more than 2,800 ha in extent, the proposed clearing is relatively minor.

Similarly, whilst the 5.5 ha of Box-Gum Woodland clearing associated with the proposal will result in the loss of 15 hollow-bearing trees, including the removal of some dead wood and dead trees, these habitat resources are likely to be present in similar abundance throughout the rest of the local occurrence of the community. The hollow-bearing trees to be affected by the proposal do not include high quality hollows.

Notwithstanding the relatively extensive local occurrence of the Box-Gum Woodland, very little of it is protected within conservation reserves or otherwise managed for conservation. On the contrary the bulk of the local occurrence occurs within private property where existing permissible land-uses may lead to its local extinction in the long-term.

Under these circumstances considerable opportunities exist to offset the impacts of the key threatening processes of *Clearing of native vegetation*, *Loss of Hollow-bearing Trees* and *Removal of Dead Wood and Dead Trees,* which are associated with the action proposed. QCC intends to offset the impact of the proposal on these threatening processes by developing an offset strategy that results in the protection and recovery of up to 129 ha of Box-Gum Woodland. By resulting in the protection and recovery of Box-Gum Woodland, including habitat resources such as hollow-bearing trees, dead wood and dead trees, the offset strategy will mitigate the impacts of the proposal on these key threatening processes.

Given that the proposal includes an offset strategy that will protect and recover up to 129 ha of Box-Gum Woodland, the proposal will not increase the impact of the key threatening processes of *Clearing of native vegetation*, *Loss of Hollow-bearing Trees* and *Removal of Dead Wood and Dead Trees.*

Conclusion

Given the extent of the local occurrence of the Box-Gum Woodland relative to the area to be affected by the proposal, and that fact that the proposal includes an offset strategy that will protect and recover up to 129 ha of Box-Gum Woodland, the proposal is unlikely to have a significant effect on the Box-Gum Woodland.

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Pink-tailed Worm Lizard

Part a)

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The central and to a lesser extent southern parts of the study area contain potentially suitable habitat for this species as scattered rocks occur within areas of native grasses and a reduced tree density has occurred through clearing. However, no areas of habitat in the study area are considered to represent good quality habitat for the species, and most have been substantially disturbed through clearing, grazing, erosion, infrastructure construction and exotic grasses.

Targeted surveys for the species focussing on the central section immediately west of Stage 1 were undertaken in November 2006 and January 2007 by BES (2007a) and repeated in 2008 by ELA. Additional areas of potential habitat around Stage 1 and in the south of the study area (Stage 2) were also surveyed by ELA in 2008 during conditions favourable to the detection of the species. In total, 40 person hours involving rolling of more than 1,500 rocks and logs, were employed during surveys for the species in the study area.

No Pink-tailed Worm-lizards or sloughed skins of the species were found during any of the above surveys. No areas of good quality habitat occur in or adjacent to the study area.

The action proposed would remove up to 4 ha of low quality habitat in the central and southern parts of the study area and increase the existing disturbances near areas of remaining marginal habitat.

The lack of any evidence of the species (individuals or sloughed skins) and degraded, lower quality habitat suggests that the species is unlikely to occur within the areas surveyed. Thus, the proposal is unlikely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Part b)

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations listed in *Schedule 1 Part 2* of the *TSC Act*, are found in the study area.

Part c)

In the case of an endangered ecological community, whether the action proposed:

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(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

This question is not relevant to the Pink-tailed Worm-lizard.

Part d)

In relation to the habitat of a threatened species, population or ecological community:

a) the extent to which habitat is likely to be removed or modified as a result of the action proposed.

The proposal is expected to remove up to 4 ha of lower quality habitat for the Pink-tailed Worm Lizard.

b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

The proposed action will not fragment or isolate habitat for the Pink-tailed Worm Lizard, as this process has already occurred near Stage 1 and marginal habitat has already been fragmented by Old Cooma Road and other infrastructure construction and clearing. The proposal will increase the extent of fragmentation of marginal habitat in the central areas of the site, although the Pink-tailed Worm-lizard is considered unlikely to occur in the study area there or be affected by the proposal.

c) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Up to 4 ha of marginal habitat for the Pink-tailed Worm Lizard is expected to be removed by the proposed action. None of this habitat is considered to be of good quality, and much is highly degraded, particularly through grazing, erosion, infrastructure construction and weed invasion. Targeted surveys failed to find any evidence of the species within the areas to be affected by the proposal. As a result, the species is considered unlikely to use habitats to be affected by the proposal and they are not considered important to the long-term survival of the species in the locality.

Part e)

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The action proposed will not affect any critical habitat that has been declared under the *TSC Act*.

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Part f)

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

There have been no approved or draft recovery plans prepared for the Pink-tailed Worm Lizard. However, 17 priority actions for the species have been listed by DECCW. These actions have been reviewed, and the proposal was considered consistent with these actions as the species is not expected to occur in the study area and no likely or good quality Pink-tailed Worm-lizard habitat will be affected.

No threat abatement plans have been prepared for the threatening processes which apply to the action proposed: *Clearing of native vegetation; Invasion of native plant communities by exotic perennial grasses; Loss of hollow-bearing trees* and *Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands.*

Considering that that the proposal will not remove or adversely affect any known, likely, or good quality habitat for the Pink-tailed Worm-lizard, the action proposed is generally consistent with the above.

Part g)

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The action proposed constitutes or may exacerbate the following key threatening processes:

- Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands;
- Bushrock removal;
- Clearing of native vegetation;
- Invasion of native plant communities by exotic perennial grasses;
- Removal of dead wood and dead trees; and
- Loss of hollow-bearing trees.

A range of mitigation measures and offsets will be employed to minimise the proposal's contribution to these key threatening processes and to limit the overall extent of impacts. In terms of the Pink-tailed Worm-lizard, up to 4 ha of low quality habitat will be removed, however the species has not been recorded during targeted surveys and is very unlikely to occur in the subject site. The key threatening processes associated with the proposal are unlikely to affect the Pink-tailed Worm-lizard.

Conclusion

The proposal is unlikely to have a significant affect on the Pink-tailed Worm-lizard.

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Rosenberg's Goanna

Part a)

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The species was not recorded during the survey period, but is known from adjoining woodland north of Wickerslack Lane and has been reported from near the Wickerslack Lane/Old Cooma Road intersection.

The northern section of the study area (i.e. north of Wickerslack Lane) is the primary area of habitat likely to be utilised by the species in the study area. This area (of approximately 100 ha) contains suitable foraging, sheltering and breeding habitat (at least 86 termite mounds). While the species may occasionally venture into adjacent rural areas, these parts of the study area are substantially compromised as habitat, due to the extent of broad scale clearing, removal of most key habitat resources, and the introduction of a range of other disturbances including barriers such as residential areas and fencing, and threats such as dogs and motor vehicles. A further 46 termite mounds were recorded in the remainder of the study area (south of Wickerslack Lane), although associated habitat for the Rosenberg's Goanna is relatively poor. The central section of the study area opposite the quarry and the southern section of the study area, which contains more intact woodland and forest, offer some marginal habitat for the species, although these areas are disturbed, too small to provide substantial habitat, and surrounded by extensive areas of unsuitable or less suitable habitat.

North of Wickerslack Lane, the proposal will remove approximately 3 ha of suitable habitat, including about five termite mounds that provide possible breeding sites. South of Wickerslack Lane, the proposal will remove about 14 ha of potential, although generally very disturbed habitat for the species, and about 20 termite mounds. The species is considered much less likely to use habitat south of Wickerslack Lane.

The primary habitat in the study area (north of Wickerslack Lane) is likely to be used, possibly as breeding habitat, by a low number of resident individuals given the relatively large home range requirement of the species (up to 500ha in this region). A number of transient individuals or dispersing juveniles are also likely to use the area as a corridor.

Habitat in the north of the study area is considered to be part of an important area for the movement of individuals within the local population, as the subject site occurs between 430 ha of suitable habitat near Jerrabomberra and more extensive areas of known habitat to the east of Old Cooma Road.

The amount of known habitat removed by the proposal (3 ha) is small relative to the extent available to the local population (580 ha west of the Queanbeyan River) and extends from an existing area of disturbance (Old Cooma Road)

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rather than impacting on undisturbed habitat. Direct impacts include the removal of 25 termite mounds (potential breeding resources), however only five of these are within primary habitat north of Wickerslack Lane. At least 81 further termite mounds were recorded within the 100 ha study area north of Wickerslack Lane and would not be affected by the proposal. In adjacent habitat to the west, more than 250 termite mounds were recorded by GHD (2009) over a 130 ha area.

One fauna underpass or modified culvert will be constructed under the road within the habitat corridor north of Wickerslack Lane, primarily to provide the Rosenberg's Goanna with a safe passage under the road. The similar Lace Monitor *Varanus varius* is known to use road underpasses and the Sand Goanna *V. gouldii* has been recorded using box culverts (1.2 x 1.2m and 1.2m x 0.45m in cross section and 20 - 45m in length) to move under roads (Harris *et al.* 2010), so it is expected that Rosenberg's Goanna would also use similar structures.

The vehicle speed limit north of Wickerslack Lane will be maintained at 70 km/h. Advisory signs for motorists are also proposed to help mitigate a possible increase in vehicle and Goanna collisions.

An offset site supporting 129 ha of Box-Gum Woodland south west of the Cooma Road Quarry is contiguous with suitable habitat to the west of the study area. The offset site contains some potential (although degraded) habitat which will be managed for conservation purposes. This would improve condition of habitat over time and effectively extend the area of habitat available to the population in the locality.

The direct impacts of the proposal (removal of habitat) are not considered likely to place the local population at risk, particularly considering the species large home range and extent of surrounding habitat. However, the eventual indirect impacts of increased traffic volume and road width through an area of known habitat would have greater impacts on the population through an increase in road mortalities from goanna and vehicle collisions. Mitigation measures are expected to help, but not prevent an increased impact on the species.

Approximately 580 ha of contiguous habitat west of the Queanbeyan River is available to the local population and is known to contain hundreds of breeding resources. This area is connected to a much larger extent of good quality habitat west of the Queanbeyan River where the species is known to occur.

However, the local population, as defined by the TSC Act and guidelines (DECC 2007b), consist of those individuals known or likely to use habitats within the study area. Given the above, it is possible that the eventual indirect impacts of the proposal may have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Part b)

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the

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endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations listed in *Schedule 1 Part 2* of the *TSC Act*, are found in the study area.

Part c)

In the case of an endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

This question is not relevant to the Rosenberg's Goanna.

Part d)

In relation to the habitat of a threatened species, population or ecological community:

a) the extent to which habitat is likely to be removed or modified as a result of the action proposed.

The proposal is expected to remove approximately 3 ha of suitable habitat and five termite mounds in the area to the north of Wickerslack Lane, which is known to be used by the species. A further 14 ha of native vegetation and about 20 termite mounds south of Wickerslack Lane would also be removed, but this habitat is heavily disturbed through clearing and fragmented by rural and residential development including fences and other barriers to movement, and much less likely to be used by the species.

b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

Habitat in the study area for the species is already fragmented by existing roads, together with rural and residential land uses. The proposal will not isolate any habitat or further fragment any areas of likely habitat. The proposal will increase the extent fragmentation of habitat to the north of Wickerslack lane by widening areas of existing disturbance (Old Cooma Road).

c) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The habitat to be affected south of Wickerslack Lane is substantially disturbed by clearing, roads, fences, and of marginal quality for the Rosenberg's Goanna. This area is not considered important to the long-term survival of the species in the locality. The 3 ha of habitat to be removed to the north of Wickerslack Lane is known to be used by the species (at least on occasions) and forms part of a

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regional biolink containing known habitat for the species. The direct impacts to this area of habitat, including the five termite mounds, are not likely to substantially disadvantage the species in the locality, considering the large areas of adjacent habitat containing hundreds of potential breeding resources. The indirect impacts of increased traffic volume are likely to increase the rate of goanna and vehicle collisions, despite mitigation measures including provision of at least one road underpass/culvert. While this is likely to have an adverse effect on the species in the locality, it is not likely to threaten the long-term survival of the species in the locality.

Part e)

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The action proposed will not affect any critical habitat that has been declared under the *TSC Act*.

Part f)

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

There have been no approved or draft recovery plans prepared for Rosenberg's Goanna. However seven recovery strategies have been identified (DECCW 2009), which include the following priority actions:

- Develop and undertake community education strategy that reduces demand for bush rock as landscaping material and provides/promotes alternatives.
- Develop habitat identification, management and enhancement guidelines.
- Implement management strategies that reduce the prevalence of bush rock removal, including surveillance.
- Identify key habitats or areas for protection and enhanced management on private land through management agreements and incentives.
- Undertake investigations into general biology and ecology of the species, particularly movement patterns and tree use, rock crevice use and termitaria use.
- Undertake investigations into taxonomic distinctions/genetic (DNA) differences between the various forms of the 'species'.
- Identify suitable habitat across the range of the species with reference to satellite imagery and vegetation surveys.
- Undertake surveys for the species within identified suitable habitat.

The proposal does not directly conflict with any of the above priority actions.

No threat abatement plans have been prepared for the threatening processes which apply to the action proposed.

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Part g)

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The action proposed involves the key threatening processes *Clearing of native vegetation, Loss of hollow-bearing trees, Removal of dead wood and dead trees,* and *Bushrock removal* and may exacerbate the key threatening processes *Invasion of native plant communities by exotic perennial grasses* and *Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands.*

In relation to the Rosenberg's Goanna, the *Clearing of native vegetation* would affect about 3 ha of suitable habitat in the northern biolink (north of Wickerslack Lane) that is likely to be used by the species, and may also involve *Removal of dead wood and dead trees,* and *Bushrock removal,* which are detrimental to the habitat of the species. Much of this vegetation and other habitat components to be removed is of relatively low quality as habitat, given its immediate proximity to the existing Old Cooma Road. A further 14.2 ha of vegetation will be cleared over the remainder of the subject site, but this is not likely to be regularly used by the species and for the most part is extensively disturbed by current land uses and does not constitute important habitat.

While the action proposed does constitute the key threatening processes above, the impacts of these processes on the Rosenberg's Goanna and its habitat is relatively minor.

Conclusion

While the direct impacts of habitat loss are relatively minor, the indirect impact of eventual increased traffic volume through an area of known habitat may have a significant affect on the local population of Rosenberg's Goanna.

Brown Treecreeper

Part a)

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Brown Treecreeper was not recorded during the targeted bird surveys for this study, which concentrated on better habitat within 50m of the road easement, or during previous surveys by BES (2007), which focused on the area around Stage 1 (the quarry bypass). However, Thompson & Mullins (2004) recorded the species in the south of the study area and a Wildcare record exists from the Wickerslack Lane/Old Cooma Road area. The species is still likely to occur in the north and south of the study area that contain more intact habitat within the

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regional and local biolinks. Survey results suggest that the species does not regularly use habitat within the subject site/close to the existing road.

Of the 17 ha of vegetation to be removed by the proposal, only about 4 ha in the north of the subject site and 2 ha in the south, is considered likely to be used by the Brown Treecreeper. The vegetation to be removed includes about 2 hollow-bearing trees in the north and 2 in the south. The species was not recorded near these hollow-bearing trees and they are unlikely to be used for nesting sites given their proximity to the existing road. No likely nesting habitat or other core habitat for the species will be removed by the proposal. The proposal will eventually result in an increased gap and traffic volume through both biolinks where the species may cross, and may result in an increased mortality from vehicle impacts. Mitigation measures include reduced vehicle speed through the northern biolink and maintenance of avian crossing points in the south. In both the northern and southern biolinks, the road passes through cuttings and close to small hills, which raises the height of the vegetation relative to the road and traffic and may encourage birds to pass over the road at a greater height than the traffic, thereby reducing the likelihood of bird and vehicle collisions.

The proposal is unlikely to have an adverse effect on the life cycle of the Brown Treecreeper such that a viable local population is likely to be placed at risk of extinction.

Part b)

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations listed in *Schedule 1 Part 2* of the *TSC Act*, are found in the study area.

Part c)

In the case of an endangered ecological community, whether the action proposed:

- *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*
- *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

This question is not relevant to the Brown Treecreeper.

Part d)

In relation to the habitat of a threatened species, population or ecological community:

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a) the extent to which habitat is likely to be removed or modified as a result of the action proposed.

The proposal will remove approximately 17 ha of vegetation, although only about 4 ha in the north of the subject site and 2.5 ha in the south, is considered likely to be used by the Brown Treecreeper. The vegetation to be removed includes about 15 hollow-bearing trees, although only four of these occur in areas likely to be used by the Brown Treecreeper, and none of these are considered likely nesting resources for the species.

b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

Habitat in the study area for the species is already fragmented by existing roads, together with rural and residential land uses. The proposal will not isolate any habitat or further fragment any areas of likely habitat. The proposal will increase the width of existing habitat fragmentation along Old Cooma Road.

c) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The habitat to be removed from the subject site is adjacent to the existing Old Cooma Road and is not considered to be particularly important to the species. The species is likely to cross Old Cooma Road and utilise habitat within the identified biolinks in the north and south of the study area. While the proposal would widen the current gap in these biolinks, efforts will be made to minimise impacts on these crossing points for birds, and the proposal would not prevent the Brown Treecreeper from crossing the road or persisting within the biolink areas. Habitat to be affected is not considered critical to the long-term survival of the Brown Treecreeper in the locality.

Part e)

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The action proposed will not affect any critical habitat that has been declared under the *TSC Act*.

Part f)

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan has been prepared for the Brown Treecreeper, although five recovery strategies have been defined (DECCW 2009), which include the following priority actions:

- Develop an Expression of Interest targeted towards private landowners to locate new sites and from this negotiate, develop and implement conservation management agreements for high priority sites.
- Increase understanding of woodland birds through promotion of the DEC website and other educational material.

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- Develop habitat identification, management and enhancement guidelines for woodland birds.
- Implement sympathetic habitat management in conservation reserves, council reserves and crown reserves where the species occurs.
- Identify key habitats or areas for protection and enhanced management through incentives.
- Conduct ecological research to determine habitat and resource requirements, threats and conservation issues.
- Undertake surveys for threatened woodland birds in new and existing conservation reserves containing suitable habitat to assess the species' conservation status and identify key breeding and foraging habitat.

The proposal does not conflict with any of these actions.

No threat abatement plans have been prepared for the threatening processes which apply to the action proposed.

Part g)

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The action proposed involves the key threatening processes *Clearing of native vegetation, Loss of hollow-bearing trees* and *Removal of dead wood and dead trees,* which have the potential to adversely affect the Brown Treecreeper. Given that these processes are restricted to considerably disturbed habitats adjacent to Old Cooma Road that are not considered important habitat for the Brown Treecreeper and that only about four hollow-bearing trees would be removed from the biolink areas most likely to be used by the species, the impacts of these key threatening processes on the Brown Treecreeper is considered to be minor.

Conclusion

The proposal is unlikely to result in a significant impact to the Brown Treecreeper.

Diamond Firetail

Part a)

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Diamond Firetail was not recorded during targeted surveys of the study area, although is known from the locality and has been recorded within 2km to the west of the subject site. Suitable habitat for the species in the study area is patchy and associated with grassy woodland, which mainly occurs in the

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southern and central sections. The species could potentially occur over much of the study area on occasions, although no habitat of particularly high quality was observed. The species is not expected to regularly use these habitats or breed within or close to the subject site.

The proposal will remove up to 10 ha of potentially suitable habitat, although none of which is considered important to the Diamond Firetail. Extensive areas of suitable habitat occur elsewhere in the locality. The species has some susceptibility to increased traffic volumes and potential vehicle impacts if crossing Old Cooma Road, as the species generally forages at ground level. However, given the lack of important or substantial habitat in the study area, road crossings in the subject site are likely to be infrequent.

The proposal is unlikely to have an adverse effect on the life cycle of the Diamond Firetail such that a viable local population is likely to be placed at risk of extinction.

Part b)

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations listed in Schedule 1 Part 2 of the TSC Act, are found in the study area.

Part c)

In the case of an endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

This question is not relevant to the Diamond Firetail.

Part d)

In relation to the habitat of a threatened species, population or ecological community:

a) the extent to which habitat is likely to be removed or modified as a result of the action proposed.

The proposal will remove approximately 10 ha of potential habitat, although the species is only likely to use these areas occasionally.

b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

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Habitat in the study area for the species is already fragmented by existing roads, together with rural and residential land uses. The proposal will not isolate any habitat or further fragment any areas of likely habitat. The proposal will increase the width of existing habitat fragmentation along Old Cooma Road, but this will not prevent the species from moving through the area.

c) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The habitat to be affected by the proposal is not considered important for the Diamond Firetail and extensive areas of suitable habitat occur in the locality. The proposal will not affect the long-term survival of the Diamond Firetail in the locality.

Part e)

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The action proposed will not affect any critical habitat that has been declared under the TSC Act.

Part f)

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan has been prepared for the Diamond Firetail, although five recovery strategies have been defined (DECCW 2009), which include the following priority actions:

- Increase understanding of woodland birds through promotion of the DEC website and other educational material.
- Develop habitat identification, management and enhancement guidelines for woodland birds.
- Implement habitat management guidelines in conservation reserves, council reserves and crown reserves containing suitable habitat.
- Identify key habitats or areas on a regional basis for protection and enhanced management through incentives.
- Conduct ecological research to determine habitat and resource requirements, threats and conservation issues.
- Undertake surveys for threatened woodland birds in new and existing conservation reserves containing suitable habitat to assess the species' conservation status and identify key breeding and foraging habitat.

The proposal does not conflict with any of the above actions.

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No threat abatement plans have been prepared for the threatening processes which apply to the proposal.

Part g)

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The action proposed involves the key threatening processes *Clearing of native vegetation,* which has the potential to adversely affect the Diamond Firetail. Given that this threatening process is generally restricted to disturbed habitats adjacent to Old Cooma Road that are not considered important habitat for the species, the impacts of this key threatening process on the Diamond Firetail is considered to be minor.

Conclusion

The proposal is unlikely to result in a significant impact to the Diamond Firetail.

Flame Robin

Part a)

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Flame Robin was not recorded during targeted surveys of the study area, but has been recorded from habitats near the north of Googong Dam.

Potential habitat for the species in the study area is mainly associated with the larger intact area of forest and woodland in the north, although the species may utilise more open and disturbed habitats in the non-breeding period, so could occur sporadically in other parts of the study area. However, none of the subject site contains particularly good quality or important habitat for the species, and no breeding habitat is expected to be disturbed by the proposal. Repeated bird surveys were undertaken during the breeding season and the species was not recorded.

The proposal would remove approximately 6 ha of potential habitat in the north and south of the subject site, and approximately 11 of heavily disturbed habitat over the remainder of the site. However, the species is not expected to regularly use any of the habitats to be affected by the proposal.

The proposal will also increase the gap between areas of potential habitat and eventually increase traffic volume. The species has some susceptibility to vehicle impacts if crossing Old Cooma Road, as the species generally utilises habitat close to ground level. However, given the lack of important or substantial habitat in the study area, road crossings in the subject site are likely to be infrequent.

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Mitigation measures include the maintenance of avian crossing points over road cuttings in the south.

Considering that the species is not known from the study area and not likely to occur regularly in affected habitats, the proposal is unlikely to have an adverse effect on the life cycle of the Flame Robin such that a viable local population is likely to be placed at risk of extinction.

Part b)

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations listed in Schedule 1 Part 2 of the TSC Act, are found in the study area.

Part c)

In the case of an endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

This question is not relevant to the Flame Robin.

Part d)

In relation to the habitat of a threatened species, population or ecological community:

a) the extent to which habitat is likely to be removed or modified as a result of the action proposed.

The proposal will remove up to about 6 ha of potential habitat, although the species is not known to use these areas and is not likely to use these areas regularly.

b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

Habitat in the study area for the species is already fragmented by existing roads, together with rural and residential land uses. The proposal will not isolate any habitat or further fragment any areas of likely habitat. The proposal will increase the width of existing habitat fragmentation along Old Cooma Road, but this will not prevent the species from moving through the area.

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c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

The habitat to be affected by the proposal is not considered important for the Flame Robin and extensive areas of suitable habitat occur in the locality. The proposal will not affect the long-term survival of the Flame Robin in the locality.

Part e)

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The action proposed will not affect any critical habitat that has been declared under the TSC Act.

Part f)

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan or recovery strategies have been prepared for the Flame Robin.

No threat abatement plans have been prepared for the threatening processes which apply to the proposal.

Part g)

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The action proposed involves the key threatening processes *Clearing of native vegetation* and *Removal of dead wood and dead trees,* which have the potential to adversely affect the Flame Robin. However, given that these threatening processes are generally restricted to disturbed habitats adjacent to Old Cooma Road that are not considered important habitat for the species, the impacts of these key threatening process on the Flame Robin are considered to be minor.

Conclusion

The proposal is unlikely to result in a significant impact to the Flame Robin.

Gang-gang Cockatoo

Part a)

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In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Gang-gang Cockatoo was not recorded during the targeted bird surveys for this study, which were undertaken during the breeding season for this species. Nesting in the subject site is considered unlikely. However, the Gang-gang Cockatoo is known from the area and is likely to forage in the study area on occasions as part of a much larger area. The species could occur anywhere in the study area, but is more likely to occur in the more intact woodland and forest within the regional biolink (north of Wickerslack Lane).

The removal of approximately 19 ha of forest and woodland habitat from the length of the subject site, including approximately 15 hollow-bearing trees that are very unlikely to provide nesting resources, is not likely to be detrimental to the local population given that those individuals would not rely on any resources in the study area. The Gang-gang Cockatoo is a strong, high flying species, most often utilising canopy and sub canopy foraging resources, and thus not susceptible to collisions with vehicles along Old Cooma Road.

The proposal is unlikely to have an adverse effect on the life cycle of the Gang-gang Cockatoo such that a viable local population is likely to be placed at risk of extinction.

Part b)

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations listed in Schedule 1 Part 2 of the TSC Act, are found in the study area.

Part c)

In the case of an endangered ecological community, whether the action proposed:

- *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*
- *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

This question is not relevant to the Gang-gang Cockatoo.

Part d)

In relation to the habitat of a threatened species, population or ecological community:

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a) the extent to which habitat is likely to be removed or modified as a result of the action proposed.

The proposal will remove approximately 17 ha of vegetation, although the 3 ha to be affected in the north of the subject site is considered most likely to be used by the Gang-gang Cockatoo. The vegetation to be removed includes about 15 hollow-bearing trees, although none of these are considered likely nesting resources for the species.

b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

Habitat in the study area for the species is already fragmented by existing roads, together with rural and residential land uses. The proposal will not isolate any habitat or further fragment any areas of likely habitat. The proposal will increase the width of existing habitat fragmentation along Old Cooma Road, but this will not affect habitat connectivity for the Gang-gang Cockatoo.

c) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The habitat to be removed from the subject site is adjacent to the existing Old Cooma Road and is not considered to be particularly important to the Gang-gang Cockatoo. The habitat affected is only likely to be used for foraging on occasions, and extensive areas of suitable habitat occur in the locality. The proposal will not affect habitat important to the long-term survival of the Gang-gang Cockatoo in the locality.

Part e)

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The action proposed will not affect any critical habitat that has been declared under the TSC Act.

Part f)

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan has been prepared for the Gang-gang Cockatoo, although nine recovery strategies have been defined (DECCW 2009), which include the following priority actions:

- Increase landholder and public awareness of status, threats and priority actions.
- Determine the disease status of selected populations.
- Negotiate management agreements and covenants over important areas of habitat.
- Provide input to National Park and local bushfire management plans to minimise impacts of fire on critical resources.

- Prepare and distribute information to decision makers.
- Determine the status of representative local populations distributed across the species range.
- Model the impact of global warming and develop mitigation strategies.
- Investigate the breeding biology of selected populations to improve understanding of threatening processes.
- Investigate the impacts of wildfire and hazard reduction burns on foraging and nesting resources.
- Investigate movement patterns of selected populations.
- Identify important nesting habitat on public lands.

The proposal does not conflict with any of these actions, as it is likely to affect only occasional foraging habitat for the Gang-gang Cockatoo.

No threat abatement plans have been prepared for the threatening processes which apply to the proposal.

Part g)

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The action proposed involves the key threatening processes Clearing of native vegetation, Loss of hollow-bearing trees and Removal of dead wood and dead trees, which have the potential to adversely affect the Gang-gang Cockatoo. Given that these processes are restricted to considerably disturbed habitats adjacent to Old Cooma Road that are not considered important habitat for the species, the impacts of these key threatening processes on the Gang-gang Cockatoo is considered to be minor.

Conclusion

The proposal is unlikely to result in a significant impact to the Gang-gang Cockatoo.

Hooded Robin

Part a)

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Hooded Robin was not recorded during targeted surveys of the study area, although is known from the locality and has been recorded within 2km of the subject site, to the west, north east and south east.

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Suitable habitat for the species in the study area is mainly associated with the larger intact areas in the north and south that comprise part of the regional and local biolinks. The species is not expected to occur elsewhere in the study area given the highly disturbed condition of this and adjacent habitat. The proposal would remove approximately 6 ha of potential habitat in the north and south of the subject site, although the species does not appear to use these areas regularly. Extensive areas of suitable habitat occur elsewhere in the locality. The proposal will also increase the gap between areas of potential habitat and eventually increase traffic volume. The species has some susceptibility to potential vehicle impacts if crossing Old Cooma Road, as the species generally utilises habitat close to ground level. However, given the lack of important or substantial habitat in the study area, road crossings in the subject site are likely to be infrequent. Mitigation measures include the maintenance of avian crossing points over road cuttings in the south.

Considering that the species is not known from the study area and not likely to occur regularly in affected habitats, the proposal is unlikely to have an adverse effect on the life cycle of the Hooded Robin such that a viable local population is likely to be placed at risk of extinction.

Part b)

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations listed in Schedule 1 Part 2 of the TSC Act, are found in the study area.

Part c)

In the case of an endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

This question is not relevant to the Hooded Robin.

Part d)

In relation to the habitat of a threatened species, population or ecological community:

a) the extent to which habitat is likely to be removed or modified as a result of the action proposed.

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The proposal will remove approximately 6 ha of potential habitat, although the Hooded Robin is not known to use these areas and is not likely to use these areas regularly.

b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

Habitat in the study area for the species is already fragmented by existing roads, together with rural and residential land uses. The proposal will not isolate any habitat or further fragment any areas of likely habitat. The proposal will increase the width of existing habitat fragmentation along Old Cooma Road, but this will not prevent the species from moving through the area.

c) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The habitat to be affected by the proposal is not considered important for the Hooded Robin and extensive areas of suitable habitat occur in the locality. The proposal will not affect the long-term survival of the Hooded Robin in the locality.

Part e)

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The action proposed will not affect any critical habitat that has been declared under the TSC Act.

Part f)

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan has been prepared for the Hooded Robin, although five recovery strategies have been defined (DECCW 2009), which include the following priority actions:

- Increase understanding of woodland birds through promotion of the DEC website and other educational material.
- Develop habitat identification, management and enhancement guidelines for woodland birds.
- Implement habitat management guidelines in conservation reserves, council reserves and crown reserves containing suitable habitat.
- Identify key habitats or areas on a regional basis for protection and enhanced management through incentives.
- Conduct ecological research to determine habitat and resource requirements, threats and conservation issues.

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- Undertake surveys for threatened woodland birds in new and existing conservation reserves containing suitable habitat to assess the species' conservation status and identify key breeding and foraging habitat.

The proposal does not conflict with any of the above actions.

No threat abatement plans have been prepared for the threatening processes which apply to the proposal.

Part g)

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The action proposed involves the key threatening processes *Clearing of native vegetation* and *Removal of dead wood and dead trees,* which have the potential to adversely affect the Hooded Robin. Given that these threatening processes are generally restricted to disturbed habitats adjacent to Old Cooma Road that are not considered important habitat for the species, the impact of these key threatening process on the Hooded Robin is considered to be minor.

Conclusion

The proposal is unlikely to result in a significant impact to the Hooded Robin.

Scarlet Robin

Part a)

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Scarlet Robin is known from the locality and has been recorded from several areas within 5km of the subject site, but was not recorded during targeted surveys of the study area. The lack of detection during repeated surveys within the breeding period suggests that the species does not breed in or permanently occupy the subject site or immediately adjoining areas.

Most of the subject site contains marginal habitat for the Scarlet Robin. The species could potentially occur in any vegetated parts of the study area, with habitat more suitable in the intact northern biolink and to a lesser extent the southern biolink. However, even these areas generally lack the abundance of fallen timber that is associated with good quality habitat for this species.

The proposal would remove approximately 6 ha of potential habitat in the north and south of the subject site, although the species is not expected to use these areas regularly. The proposal will also increase the gap between areas of potential habitat and eventually facilitate an increase in traffic volume. The

species has some susceptibility to potential vehicle impacts if crossing Old Cooma Road, as it often utilises habitat close to ground level. However, given the lack of records and lack of important or substantial habitat close to the subject site, road crossings in the subject site are likely to be infrequent.

Considering that the species is not known from the study area and not likely to breed or regularly occupy affected habitats, the proposal is unlikely to have an adverse effect on the life cycle of the Scarlet Robin such that a viable local population is likely to be placed at risk of extinction.

Part b)

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations listed in Schedule 1 Part 2 of the TSC Act, are found in the study area.

Part c)

In the case of an endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

This question is not relevant to the Scarlet Robin.

Part d)

In relation to the habitat of a threatened species, population or ecological community:

a) the extent to which habitat is likely to be removed or modified as a result of the action proposed.

The proposal will remove approximately 6 ha of more intact habitat in the north and south of the subject site, although the Scarlet Robin is not known to use these areas and is not expected to use these areas regularly. Otherwise the proposal will remove heavily disturbed and more marginal habitat from the central portions of the study area.

b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

Habitat in the study area for the species is already fragmented by existing roads, together with rural and residential land uses. The proposal will not isolate any habitat or further fragment any areas of likely habitat. The proposal will increase

the width of existing habitat fragmentation along Old Cooma Road, but this will not prevent the species from moving through the area.

c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

The habitat to be affected by the proposal is not of high quality or considered important for the Scarlet Robin and extensive areas of suitable habitat occur in the locality. The proposal will not affect the long-term survival of the Scarlet Robin in the locality.

Part e)

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The action proposed will not affect any critical habitat that has been declared under the TSC Act.

Part f)

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan or recovery strategies have been prepared for the Scarlet Robin.

No threat abatement plans have been prepared for the threatening processes which apply to the proposal.

Part g)

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The action proposed involves the key threatening processes *Clearing of native vegetation* and *Removal of dead wood and dead trees,* which have the potential to adversely affect the Scarlet Robin. Given that these threatening processes are generally restricted to disturbed habitats adjacent to Old Cooma Road that are not considered important habitat for the species, the impacts of these key threatening process on the Scarlet Robin are considered to be minor.

Conclusion

The proposal is unlikely to result in a significant impact to the Scarlet Robin.

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Speckled Warbler

Part a)

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

In the north of the study area (within the subject site), at least one Speckled Warbler was recorded from the same general area on two separate occasions during the breeding season (Figure 6a). The observations were made in a well-defined gully within dry forest immediately to the east of Old Cooma Road, which may represent breeding habitat. This area is expected to form part of a permanent home range, extending into surrounding areas of suitable habitat. The species has been recorded from contiguous forest habitat to the east and from contiguous habitat to the west near Barracks Creek (GHD 2009).

One Speckled Warbler was also recorded on one occasion in the south of the study area, within an area of relatively disturbed dry forest close to Old Cooma Road (Figure 6c). The individual observed appeared to be moving through the area, and while some suitable habitat occurs in the surrounding area (up to about 35 ha), this habitat is more disturbed, less structurally diverse and of lower quality than known habitat for the species in the north of the study area. The general area around this record may form part of a home range for the species, but the habitat where the individual was observed appears unlikely to represent breeding habitat.

The removal of known Speckled Warbler habitat for the proposal is limited to linear sections of forest and woodland adjacent to the existing Old Cooma Road. In the south this is up to 2.5 ha, and does not appear to involve important or high quality habitat. Up to 3.4 ha of suitable habitat is likely to be removed in the north of the study area, which includes good quality and potentially breeding habitat. The species is unlikely to regularly utilise other parts of the study area given the much higher levels of vegetation removal and other disturbances, and lack of adjoining suitable habitat. The northern area of habitat is contiguous with similar habitat to the east and west and forms part of a substantial corridor likely to be important for movement of the species in the locality.

Speckled Warblers were found to be occupying habitat corridors close the existing road, and are likely to cross Old Cooma Road in both the northern and southern biolinks. The proposal would extend the current disturbance through these corridors by up to 70 m. The proposal will also indirectly involve an eventual increase in traffic volume, with the potential for the species to incur a greater mortality rate at these road crossing points.

Birds are often less affected by the impacts associated with roads than other species because of their greater mobility. The Speckled Warbler is mobile, but

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tends to utilise habitats close to the ground, which may render it more susceptible to vehicle impacts when moving across roads. One factor of the proposal that may mitigate potential road mortality for this species is the topography and height of the trees above the road, which allows birds in general to pass over the road at a higher level than the vehicles. In the southern biolink, the road currently passes through a cutting that lowers the height of traffic relative to vegetation on either side. Where possible, the proposal will enhance this attribute to keep the road level low while minimising the removal of vegetation on either side to facilitate bird crossings over the cutting.

The proposal also includes an offset site of 129 ha that may protect and improve some habitat for the species. However, the local population as defined in this assessment constitutes those (relatively few) Speckled Warblers known or likely to use the study area.

In this context, the removal of 6 ha of suitable habitat (including one likely nesting gully) and an eventual increase in traffic volume through areas of known habitat may have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Part b)

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations listed in *Schedule 1 Part 2* of the *TSC Act*, are found in the study area.

Part c)

In the case of an endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

This question is not relevant to the Speckled Warbler.

Part d)

In relation to the habitat of a threatened species, population or ecological community:

a) the extent to which habitat is likely to be removed or modified as a result of the action proposed.

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The proposal is expected to remove approximately 6 ha of suitable habitat, comprising up to 3.4 ha of suitable habitat in the north of the subject site and 2.5 ha of more marginal habitat in the south.

b) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.*

The proposal will extend the area of existing fragmentation of habitat caused by Old Cooma Road, but will not fragment intact areas of habitat or isolate any habitat for the Speckled Warbler. Habitat to be removed in the north and south of the subject site is immediately adjacent to the existing disturbances of Old Cooma Road.

c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

The 3.4 ha of habitat to be removed in the north of the subject site includes potential breeding habitat and is likely to be part of permanent home range. The 2.5 ha of habitat to be removed in the south of the subject site is considered to be more marginal for the species. While the proposal will not isolate any habitat, it will eventually increase the width of fragmentation and traffic volume passing through one regional and one local biolink (habitat corridor) where the species has been recorded. However, given the number of other Speckled Warbler records in the locality and extent of suitable habitat, the loss of up to 6 ha of habitat is not considered critical or particularly important to the term survival of the species in the locality.

Part e)

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The action proposed will not affect any critical habitat that has been declared under the *TSC Act*.

Part f)

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No draft or approved recovery plans have been prepared for the Speckled Warbler. Seven priority actions have been identified (DECCW 2009) to help recover the species:

- Develop an Expression of Interest targeted towards private landowners to locate new sites and from this negotiate, develop and implement conservation management agreements.
- Increase understanding of woodland birds through promotion of the DEC website and other educational material.

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- Develop habitat identification, management and enhancement guidelines for woodland birds.
- Implement sympathetic habitat management in conservation reserves, council reserves and crown reserves where the species occurs.
- Identify key habitats or areas for protection and enhanced management through incentives.
- Conduct ecological research to determine habitat and resource requirements, threats and conservation issues.
- Undertake surveys for threatened woodland birds in new and existing conservation reserves containing suitable habitat to assess the species' conservation status and identify key breeding and foraging habitat.

While the proposal will remove known habitat for the Speckled Warbler, it does not conflict with the priority recovery actions listed above.

No threat abatement plans have been prepared for the threatening process *Clearing of native vegetation,* which will result from the proposal and affect the Speckled Warbler.

Part g)

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The action proposed constitutes or may exacerbate the following key threatening processes:

- Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands;
- Bushrock removal;
- Clearing of native vegetation;
- Invasion of native plant communities by exotic perennial grasses;
- Removal of dead wood and dead trees; and
- Loss of hollow-bearing trees.

The Speckled Warbler would be directly affected by the key threatening process *Clearing of native vegetation,* resulting in the removal of up to 6 ha of suitable habitat including possible breeding habitat. Speckled Warbler habitat will only be removed in areas immediately adjacent to the existing Old Cooma Road that are necessary for construction of the proposal. A range of mitigation measures and offsets will be employed to minimise the proposal's contribution to these key threatening processes and to limit the extent of impacts. The 129 ha offset may provide habitat for the Speckled Warbler.

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Conclusion

The removal of 6 ha of suitable habitat (including one likely nesting gully) and an eventual increase in traffic volume through areas of known habitat may have a significant affect on the local population of the Speckled Warbler.

Turquoise Parrot

Part a)

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Turquoise Parrot was recorded in the south of the study area, however the species' status in the area is unclear, with apparently no other records known from the locality. It is possible the individual sighted had escaped from an aviary. The occurrence of the species in the area appears to be intermittent, rather than regular or permanent. The Canberra Ornithologists Group (2003) considers the species to be a rare vagrant in the ACT.

While the proposal will remove up to 10 ha of potentially suitable habitat for the species, including up to 15 hollow-bearing trees, the species is not expected to regularly use these habitats or breed in the area. Extensive areas of suitable habitat occur elsewhere in the locality.

The proposal is unlikely to have an adverse effect on the life cycle of the Turquoise Parrot such that a viable local population is likely to be placed at risk of extinction.

Part b)

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations listed in Schedule 1 Part 2 of the TSC Act, are found in the study area.

Part c)

In the case of an endangered ecological community, whether the action proposed:

- *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*
- *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

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This question is not relevant to the Turquoise Parrot.

Part d)

In relation to the habitat of a threatened species, population or ecological community:

a) the extent to which habitat is likely to be removed or modified as a result of the action proposed.

The proposal will remove approximately 10 ha of potential habitat including 15 hollow-bearing trees, although the species is not likely to be a regular or breeding inhabitant of the area.

b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

Habitat in the study area for the species is already fragmented by existing roads, together with rural and residential land uses. The proposal will not isolate any habitat or further fragment any areas of likely habitat. The proposal will increase the width of existing habitat fragmentation along Old Cooma Road, but this will not affect habitat connectivity for the Turquoise Parrot.

c) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The Turquoise Parrot is not considered to be a regular or breeding inhabitant of the locality. The habitat affected is only likely to be used for foraging on occasions, and extensive areas of suitable habitat occur in the locality. The proposal will not affect habitat important to the long-term survival of the Turquoise Parrot in the locality.

Part e)

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The action proposed will not affect any critical habitat that has been declared under the TSC Act.

Part f)

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan has been prepared for the Turquoise Parrot, although seven recovery strategies have been defined (DECCW 2009), which include the following priority actions:

- Select targeted areas where large populations occur and liaise with landholders to protect hollow-bearing trees.
- Develop an Expression of interest targeted towards private landowners to locate new sites and from this negotiate, develop and implement conservation management agreements for high priority sites.

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- Identify sites where the species is commonly observed and target for incentives and habitat management.
- Control feral cats and foxes near high density populations (best practice: locally efficient and effective).
- Control feral goats and pigs on known or potential habitat.
- Encourage management of livestock grazing so as to improve understorey (foraging) habitat at priority sites.
- Implement sympathetic habitat management in conservation reserves, council reserves and crown reserves where the species occurs.
- Control weeds at priority sites.
- Encourage bird observer groups to undertake spot monitoring surveys at previously recorded locations. Enter data collected into Wildlife Atlas.
- Identify three targeted populations (per year over initial three years); focus recovery actions and adaptive management at these sites

The proposal does not conflict with any of these actions, as it is likely to affect only occasional foraging habitat for the Turquoise Parrot.

No threat abatement plans have been prepared for the threatening processes which apply to the proposal.

Part g)

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The action proposed involves the key threatening processes *Clearing of native vegetation, Loss of hollow-bearing trees* and *Removal of dead wood and dead trees,* which have the potential to adversely affect the Turquoise Parrot. Given that these processes are restricted to considerably disturbed habitats adjacent to Old Cooma Road that are not considered important habitat for the species, the impacts of these key threatening processes on the Turquoise Parrot is considered to be minor.

Conclusion

The proposal is unlikely to result in a significant impact to the Turquoise Parrot.

Varied Sittella

Part a)

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

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The Varied Sittella was not recorded during targeted surveys of the study area, although is known from the locality and has been recorded from several areas within 5km of the subject site.

Suitable habitat for the species occurs mainly to the north of Wickerslack Lane and to a lesser extent in the south of the study area. The species may occur in these areas on occasions, although the absence of the species during repeated bird surveys suggests that the subject site and adjacent areas do not comprise breeding habitat and are not particularly important to the species.

The proposal would remove approximately 6 ha of potential habitat in the north and south of the subject site, along with more disturbed and less suitable habitat from the remainder of the site. This does not appear to be important habitat for the species. The proposal will also increase the gap between areas of potential habitat and eventually facilitate an increase in traffic volume, although would not form a barrier to movement of individuals. Mitigation measures include the maintenance of avian crossing points over road cuttings in the south.

Given that the species is not known from the study area and not likely to breed or occur regularly in affected habitats, the proposal is unlikely to have an adverse effect on the life cycle of the Varied Sittella such that a viable local population is likely to be placed at risk of extinction.

Part b)

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations listed in Schedule 1 Part 2 of the TSC Act, are found in the study area.

Part c)

In the case of an endangered ecological community, whether the action proposed:

(iii) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

(iv) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

This question is not relevant to the Varied Sittella.

Part d)

In relation to the habitat of a threatened species, population or ecological community:

d) the extent to which habitat is likely to be removed or modified as a result of the action proposed.

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The proposal will remove approximately 6 ha of more intact habitat in the north and south of the subject site, although the Varied Sittella was not recorded in these areas and is not likely to use these areas regularly.

e) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

Habitat in the study area for the species is already fragmented by existing roads, together with rural and residential land uses. The proposal will not isolate any habitat or further fragment any areas of likely habitat. The proposal will increase the width of existing habitat fragmentation along Old Cooma Road, but this will not prevent the species from moving through the area.

f) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The habitat to be affected by the proposal does not appear to contain any nesting areas and is not otherwise of high quality or considered important for the Varied Sittella, which was not recorded during surveys. Extensive areas of suitable habitat occur in the locality. The proposal will not affect the long-term survival of the Varied Sittella in the locality.

Part e)

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The action proposed will not affect any critical habitat that has been declared under the TSC Act.

Part f)

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan or recovery strategies have been prepared for the Varied Sittella.

No threat abatement plans have been prepared for the threatening processes which apply to the proposal.

Part g)

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The action proposed involves the key threatening processes *Clearing of native vegetation* and *Removal of dead wood and dead trees,* which have the potential to adversely affect the Varied Sittella. Given that these threatening processes are generally restricted to disturbed habitats adjacent to Old Cooma

Road that are not considered important habitat for the species, the impacts of these key threatening process on the Varied Sittella are considered to be minor.

Conclusion

The proposal is unlikely to result in a significant impact to the Varied Sittella.

Eastern False Pipistrelle

Part a)

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Eastern False Pipistrelle has not been recorded in the study area, however the species is known from the locality, including one record within 2km to the east of the subject site (Thompson & Mullins 2004). The study area contains suitable, although not optimal, habitat for the species in the form of forest and woodland foraging and roosting resources. The species is likely to forage in the area on occasions, and may roost in the area within tree hollows or under bark of trees.

The proposal will remove approximately 17 ha of potential habitat along the Old Cooma Road easement, including 15 hollow-bearing trees that may provide suitable short-term roosting resources. The majority of hollow-bearing trees to be affected are located close to the existing Old Cooma Road and associated traffic disturbances. None of the hollow-bearing trees to be affected are likely to provide important, large or maternity roosting resources given their characteristics and context. At least another 23 hollow-bearing trees will be retained in the study area, with many more known to be scattered through adjoining areas. The eventual increase in road width, traffic volume and street lighting resulting from the proposal is not likely to adversely affect habitat connectivity or access to foraging or roosting resources.

Given the large home range of the species, the lower quality of resources to be affected and the extent of foraging and roosting resources in surrounding areas that would be available to any individuals using the study area, the proposal is unlikely to have an adverse effect on the life cycle of the Eastern False Pipistrelle such that a viable local population is likely to be placed at risk of extinction.

Part b)

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations listed in Schedule 1 Part 2 of the TSC Act, are found in the study area.

Part c)

In the case of an endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

This question is not relevant to the Eastern False Pipistrelle.

Part d)

In relation to the habitat of a threatened species, population or ecological community:

a) the extent to which habitat is likely to be removed or modified as a result of the action proposed.

The proposal will remove approximately 17 ha of potential habitat, including 15 hollow-bearing trees, which may be used by the species occasionally for foraging and potentially roosting. No habitat to be affected is considered of high quality for the species.

b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

Habitat in the study area for the species is already fragmented by existing roads, together with rural and residential land uses. The proposal will not isolate any habitat or further fragment any areas of likely habitat. The proposal will increase the width of existing habitat fragmentation along Old Cooma Road, but this will not disrupt connectivity for this species.

c) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The habitat to be affected by the proposal is not considered to be of particularly good quality or otherwise important to the species in the locality. Extensive areas of less disturbed habitat occur in the locality and would be available to the species. Habitat to be affected is not considered important to the long-term survival of the Eastern False Pipistrelle in the locality.

Part e)

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The action proposed will not affect any critical habitat that has been declared under the TSC Act.

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Part f)

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan has been prepared for the Eastern False Pipistrelle, although six recovery strategies have been defined (DECCW 2009), which include the following priority actions:

- Develop and promote State-wide bat awareness programs for schools, CMAs, landholders and industry groups etc.
- Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity, structural diversity. Give priority to largest hollow bearing trees.
- Ensure the Code of Practice for private native forestry includes adequate measures to protect large, hollow-bearing trees and viable numbers of recruit trees.
- Ensure the largest hollow bearing trees (including dead trees) are given highest priority for retention in PVP assessments or other land assessment tools.
- Promote the conservation of these HCV private land areas using measures such as incentive funding to landholders, off-setting and biobanking, acquisition for reserve establishment or other means.
- Investigate the effectiveness of logging prescriptions.
- Research the degree of long-term fidelity to roost trees and roosting areas in order to assess their importance and the effects of their removal.
- Research the roosting ecology of tree-roosting bats. For example identifying the attributes of key roosts. .
- Study the ecology, habitat requirements and susceptibility to logging and other forestry practices of this little-known species.
- Identify important foraging range and key habitat components for this species.
- Identify the effects of fragmentation in a range of fragmented landscapes e.g. cleared Tableland landscapes. For example genetic isolation, movement and persistence across a range of fragment sizes.
- Research the effect of different burning regimes.
- Quantify any benefits to local bat populations from reducing the impact of insect pests on commercial crops.
- Research the effectiveness of rehabilitation measures intended to increase bat populations in degraded landscapes, such as revegetating and installing bat boxes.
- Undertake long-term monitoring of populations cross tenure in conjunction with other bat species to document changes.
- Identify areas of private land that contain high densities of large hollow-bearing trees as areas of high conservation value (HCV) planning instruments and land management negotiations e.g. LEP, CAPs, PVPs.

The proposal is consistent with the above actions.

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No threat abatement plans have been prepared for the threatening processes which apply to the action proposed.

Part g)

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The action proposed involves the key threatening processes *Clearing of native vegetation, Loss of hollow-bearing trees* and *Removal of dead wood and dead trees,* which have the potential to adversely affect the Eastern False Pipistrelle.

Given that these processes are restricted to considerably disturbed habitats mostly adjacent to Old Cooma Road that are not considered important habitat for the Eastern False Pipistrelle, and that extensive areas of these resources exist in the locality, the impacts of these key threatening processes on the Eastern False Pipistrelle is relatively minor.

Conclusion

The proposal is unlikely significantly impact the Eastern False Pipistrelle.

Greater Long-eared Bat

Part a)

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Greater Long-eared Bat has not been recorded in the study area, however was recently recorded during surveys near Edwin Land Parkway to the northwest (GHD 2009). The species has not otherwise been recorded in the locality and does not regularly occur in the region. The study area contains suitable, although not optimal, habitat for the species in the form of forest and woodland foraging and roosting resources. The species may forage in the area on rare occasions, and could conceivably roost in the area within tree hollows or under bark of trees. Given the lack of records in the locality and distance from the usual distribution of the species, the use of the study area for breeding is considered unlikely.

The proposal will remove approximately 17 ha of potential habitat along the Old Cooma Road easement, including 15 hollow-bearing trees that may provide suitable short-term roosting resources. The majority of hollow-bearing trees to be affected are located close to the existing Old Cooma Road and associated traffic disturbances. None of the hollow-bearing trees to be affected are likely to provide breeding or otherwise important roosting resources given their characteristics and context. At least another 23 hollow-bearing trees will be

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retained in the study area, with many more known to be scattered through adjoining areas. The eventual increase in road width, traffic volume and street lighting resulting from the proposal is not likely to adversely affect habitat connectivity or access to foraging or roosting resources.

Given the large home range of the species, the lower quality of resources to be affected and the extent of foraging and roosting resources in surrounding areas that would be available to any individuals using the study area, the proposal is unlikely to have an adverse effect on the life cycle of the Greater Long-eared Bat such that a viable local population is likely to be placed at risk of extinction.

Part b)

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations listed in Schedule 1 Part 2 of the TSC Act, are found in the study area.

Part c)

In the case of an endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

This question is not relevant to the Greater Long-eared Bat.

Part d)

In relation to the habitat of a threatened species, population or ecological community:

a) the extent to which habitat is likely to be removed or modified as a result of the action proposed.

The proposal will remove approximately 17 ha of potential habitat, including 15 hollow-bearing trees, which may be used by the species occasionally for foraging and potentially roosting. No habitat to be affected is considered of high quality or important to the species.

b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

Habitat in the study area for the species is already fragmented by existing roads, together with rural and residential land uses. The proposal will not isolate any habitat or further fragment any areas of likely habitat. The proposal will increase

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the width of existing habitat fragmentation along Old Cooma Road, but this will not disrupt connectivity for this species.

> *c) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

The habitat to be affected by the proposal is not considered to be of particularly good quality or otherwise important to the species in the locality. Extensive areas of less disturbed habitat occur in the locality and would be available to the species. Habitat to be affected is not considered important to the long-term survival of the Greater Long-eared Bat in the locality.

Part e)

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The action proposed will not affect any critical habitat that has been declared under the TSC Act.

Part f)

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan has been prepared for the Greater Long-eared Bat, although eight recovery strategies have been defined (DECCW 2009), which include the following priority actions:

- Develop and promote a State-wide bat awareness programs for schools, CMAs, landholders and industry groups etc.
- Develop hazard reduction fire management regimes to protect foraging habitat.
- Develop 'interim' minimum fire regime recommendations based on best available knowledge.
- Prepare EIA guidelines addressing key habitat requirements, including retention of adequate densities of hollow-bearing trees and undisturbed understorey vegetation.
- Encourage retention of the largest hollow bearing trees.
- In cypress-ironbark forest subject to logging and other timber extraction activities (e.g.. firewood collection), ensure the retention of all large eucalypt trees (including standing dead trees).
- Review current logging prescriptions. If insufficient, modify to ensure adequate retention of hollow-bearing trees, recruit trees and undisturbed foraging habitat.
- Encourage the protection and enhancement of understorey vegetation.
- Maintain or improve the value of identified HCAs using measures such as incentive funding to landholders, off-setting and biobanking, acquisition for reserve establishment or other relevant options.
- Undertake long-term monitoring of populations across tenures.

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- Research the degree of long-term fidelity to roost trees and roosting areas in order to assess their importance and the effects of their removal.
- Research the effects of fragmentation, including genetic isolation, movement among fragments and persistence in fragments that vary in size and connectivity.
- Research the impacts of different fire regimes.
- Research the roosting ecology of this species. For example, to identify the attributes of key roosts.
- Research using radio-tracking the foraging range and habitat, and other key habitat components.
- Research the effects of grazing on this species, such as changes to understorey structure and recruitment of roost trees.
- Study the biology, ecology and habitat requirements of the species in different western environments, such as mallee and ironbark-cypress forest.
- Quantify any benefits of local bat populations to reducing the impact of insect pests on commercial crops. .
- Research the effectiveness of rehabilitation measures such as revegetating and installing bat boxes in degraded landscapes to increasing local bat populations.
- Conduct surveys in preferred and potential habitat throughout the species range.
- Identify vegetation in a wide strip bordering creek and rivers on the Western Slope and Plains of NSW as high conservation value for this species.
- Identify areas of private land containing high densities of large, hollow-bearing trees (i.e. near to natural densities) as areas of high conservation value for this species.
- Identify large remnants (i.e. > 100 ha) on private property as high conservation value for this species

The proposal is generally consistent with the above actions.

No threat abatement plans have been prepared for the threatening processes which apply to the action proposed.

Part g)

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The action proposed involves the key threatening processes *Clearing of native vegetation, Loss of hollow-bearing trees* and *Removal of dead wood and dead trees,* which have the potential to adversely affect the Greater Long-eared Bat.

Given that these processes are restricted to considerably disturbed habitats mostly adjacent to Old Cooma Road that are not considered important habitat for the Greater Long-eared Bat, and that extensive areas of these resources exist

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in the locality, the impacts of these key threatening processes on the Greater Long-eared Bat is relatively minor.

Conclusion

The proposal is unlikely to result in a significant impact to the Greater Long-eared Bat.

Eastern Bent-wing Bat

Part a)

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Eastern Bent-wing Bat has not been recorded in the study area, however is known from a number of records in the locality. The study area contains suitable foraging resources, although no typical roosting resources are present, as caves and abandoned mines are preferred. The species may forage in the area on occasions, although roosting is not expected, apart from possible short-term opportunistic sheltering.

The proposal will remove approximately 17 ha of potential foraging habitat through the subject site. Habitat to be affected is relatively common and widespread in the locality. The eventual increase in road width, traffic volume and street lighting resulting from the proposal is not likely to adversely affect habitat connectivity or access to foraging or roosting resources for the Eastern Bent-wing Bat.

Given the large home range of the species and the small amount of foraging habitat to be affected relative to the extent of foraging resources in surrounding areas that would be available to any individuals occurring in the study area, the proposal is unlikely to have an adverse effect on the life cycle of the Eastern Bent-wing Bat such that a viable local population is likely to be placed at risk of extinction.

Part b)

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations listed in Schedule 1 Part 2 of the TSC Act, are found in the study area.

Part c)

In the case of an endangered ecological community, whether the action proposed:

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(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

This question is not relevant to the Eastern Bent-wing Bat.

Part d)

In relation to the habitat of a threatened species, population or ecological community:

a) the extent to which habitat is likely to be removed or modified as a result of the action proposed.

The proposal will remove approximately 17 ha of potential foraging habitat and potentially short term opportunistic roosting habitat. No habitat to be affected is considered of high quality or important to the species.

b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

Habitat in the study area for the species is already fragmented by existing roads, together with rural and residential land uses. The proposal will not isolate any habitat or further fragment any areas of likely habitat. The proposal will increase the width of existing habitat fragmentation along Old Cooma Road, but this will not disrupt connectivity for this wide ranging species.

c) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The habitat to be affected by the proposal is not considered to be of particularly good quality or otherwise important to the species in the locality. Extensive areas of less disturbed habitat occur in the locality and would be available to the species. Habitat to be affected is not considered important to the long-term survival of the Eastern Bent-wing Bat in the locality.

Part e)

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The action proposed will not affect any critical habitat that has been declared under the TSC Act.

Part f)

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

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No recovery plan has been prepared for the Eastern Bent-wing Bat, although 10 recovery strategies have been defined (DECCW 2009), which include the following priority actions:

- Promote bats throughout the rural community as ecologically interesting and important, but sensitive to disturbance at caves/disused mine tunnels.
- Compile register of all known roost sites in natural and artificial structures including current and historical data and identify significance of roost, e.g. maternity, hibernation, transient roost.
- Control foxes and feral cats around roosting sites, particularly maternity caves and hibernation sites.
- Exclude prescription burns from 100m from cave entrance, ensure smoke/flames of fires do not enter caves/roosts in artificial structures.
- Prepare fire management plans for significant roost caves, disused mines, culverts, especially maternity and winter roosts.
- Ensure protection of known roosts and forest within 10 km of roosts in PVP assessments (offsets should include nearby remnants in high productivity) and other environmental planning instruments.
- Prepare management plans for significant bat roosts especially all known maternity colonies and winter colonies.
- Search for significant roost sites and restrict access where possible (e.g. gating of caves). Significant includes maternity, hibernation and transient sites including in artificial structures.
- Identify and protect significant roost habitat in artificial structures (eg culverts, old buildings and derelict mines).
- Restrict access where possible to known maternity sites. (e.g.: signs; bat-friendly, preferably external gates at caves).
- Restrict caving activities at significant roosts during important stages of the annual bat life cycle (eg winter hibernation, summer maternity season).
- Restrict caving activity during critical times of year in important roosts used by species, particularly maternity and hibernation roosts.
- Undertake non-chemical removal of weeds (e.g. lantana, blackberry) to prevent obstruction of cave entrances.
- Promote the conservation of these key roost areas using measures such as incentive funding to landholders, offsetting and biobanking, acquisition for reserve establishment or other means.
- Monitor the breeding success of a representative sample of maternity colonies in cave roosts over a number of years to determine the viability of regional populations.
- Regular censuses of maternity colonies (Wee Jasper, Bungonia, Willi-Willi, Riverton) and other key roosts in network, especially where there are population estimates from banding in the 1960s.
- For roost caves vulnerable to human disturbance, monitor their visitation by people, particularly during winter and spring/summer maternity season and in school holidays.
- Confirm species taxonomy of NSW populations, relative to other Australian populations.

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- Determine the effectiveness of PVP assessment, offsets and actions for bats.
- Establish a gating design for disused mines across species range that will not adversely impact species. Consultation with cave bat specialist prior to any gating operations.
- Identify the susceptibility of the species to pesticides.
- Research the effect of different burning regimes on cave disturbance and surrounding foraging habitat.
- Research to identify important foraging range and key habitat components around significant roosts.
- Study the ecological requirements of maternity colonies and their environs and migratory patterns.
- Measure genetic population structure among cave roosts of maternity colonies to estimate dispersal and genetic isolation, and vulnerability to regional population extinction.

The proposal is consistent with the above actions.

No threat abatement plans have been prepared for the threatening processes which apply to the action proposed.

Part g)

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The action proposed involves the key threatening process *Clearing of native vegetation,* which has the potential to adversely affect the Eastern Bent-wing Bat.

Given that the removal of vegetation (foraging habitat) is restricted to linear and disturbed habitats mostly adjacent to Old Cooma Road that are not considered important for the Eastern Bent-wing Bat, and that extensive areas of these resources exist in the locality, the impact of this key threatening process on the Eastern Bent-wing Bat is negligible.

Conclusion

The proposal is unlikely to result in a significant impact to the Eastern Bent-wing Bat.

Golden Sun Moth

Part a)

In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

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The Golden Sun Moth was not recorded during the survey period and only the south west of the study area contains potential habitat for the species. Elsewhere in the study area habitat for the species is unsuitable or marginal, or occurring only as small, isolated patches. A linear strip of about 1.7 ha of marginal and unlikely habitat will be removed from the south west of the study area. No good quality or likely habitat for the species will be affected by the proposal.

The species has been recorded in better quality habitat between approximately 500-1,200m to the south west of Old Cooma Road by Thompson & Mullins (2004). Suitable habitat connected to this area does not occur within about 100m of the subject site. To the east, suitable habitat does not occur within approximately 1km of the subject site (Thompson & Mullins 2004). Between known habitat to the south west of the study area and potential habitat to the east of the study area is an area of generally unsuitable habitat almost 1.5km wide. The species is very unlikely to move across the subject site between these areas of potential habitat as its dispersal ability through unfavourable habitat is limited to about 100m (DEWHA 2009).

The species is unlikely to be directly or indirectly affected by the proposal as only small areas of marginal and unlikely habitat will be affected.

The proposal is unlikely to have an adverse effect on the life cycle of the Golden Sun Moth such that a viable local population is likely to be placed at risk of extinction.

Part b)

In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations listed in Schedule 1 Part 2 of the TSC Act, are found in the study area.

Part c)

In the case of an endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

This question is not relevant to the Golden Sun Moth.

Part d)

In relation to the habitat of a threatened species, population or ecological community:

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a) the extent to which habitat is likely to be removed or modified as a result of the action proposed.

The proposal will not remove any known or likely habitat for the Golden Sun Moth. Approximately 1.7 ha of marginal and unlikely habitat will be removed in the south west of the subject site, as well as very small, isolated patches of habitat will from the central sections of the subject site. The proposal will reduce the size of the vegetated 'buffer' that currently exists between Old Cooma Road and suitable habitat in the south east of the study area.

b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action.

No areas of known or potential habitat for the species will become isolated or fragmented as a result of the proposal.

c) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Only marginal habitat on the edge of existing disturbances will be affected by the proposal. The species was not found in these areas during surveys and is not expected to occur in areas to be affected. No habitat of importance to the survival of the species in the locality will be affected by the proposal.

Part e)

Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

The action proposed will not affect any critical habitat that has been declared under the TSC Act.

Part f)

Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan has been finalised for the Golden Sun Moth, although eight recovery strategies have been defined (DECCW 2009), which include the following priority actions:

- Increase understanding of the species through promotion of the DEC website and other educational material.
- Encourage landowners to join the Grassy Box Woodlands and Southern Tablelands Grassy Ecosystems CMN's.
- Develop habitat identification, management and enhancement guidelines.
- Prepare and implement PoM for Queanbeyan NR.
- Local government to record sites on section 149 notices.
- Produce and disseminate EIA guidelines for local government.
- Provide incentive payments for protection and enhanced management of identified sites on private land (see DEC for details).

- Develop and implement a conservation management plan for Gocup TSR.
- Develop and implement a roadside management plan for populations at Bowning, Gounyan Rd, Grace's Flat Rd, Jeir Ck, Kia Ora and Tallagandra Ln.
- Develop and implement a roadside management plan for populations at Springvale and Valrosa.
- Develop and implement conservation management plans for Davis, Eady's New, Lagoon, Wargeila, Warroo, Blackburn, Coolalie, Deringullen, Lambs, McInerneys, Merriville and Nanima TSR's.
- Develop and implement conservation management plans for Tarengo, Pudman and Wolverhampton TSR's.
- Undertake biennial monitoring at Queanbeyan NR.
- Undertake regular monitoring of priority populations using survey and monitoring guidelines.
- Finalise recovery plan for the Golden Sun Moth by 2007.
- Undertake genetic analysis of newly discovered populations.
- Undertake research into biology and ecology.
- Undertake targeted surveys in areas of suitable habitat within predicted range.
- Survey newly discovered populations to determine their extent.
- Undertake distribution modelling.

The proposal is consistent with the above actions.

No threat abatement plans have been prepared for the threatening processes which apply to the action proposed.

Part g)

Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The action proposed involves the key threatening process *Clearing of native vegetation,* which has the potential to adversely affect the Golden Sun Moth. However, given that the removal of vegetation does not involve good quality or likely habitat for the Golden Sun Moth, the impact of this key threatening process on the species is negligible.

Conclusion

The proposal is unlikely to result in a significant impact to the Golden Sun Moth.

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Appendix 7 Survey proformas

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DIURNAL BIRD CENSUS SURVEY PROFORMA

Survey Details

Name of surveyor	DC	Contact number	4443 5555
Number of surveyors	1.	Date of survey	17/12/08
Total effort expressed in person hours		Number of hectares covered or transect or point dimensions	

Location Details

Location description	NE Old Cooma Rd, Nth of Wickerslack Ln.		
Map number	8727 3S.	Map name	Tuggeranong
Full AMG reference(s) for survey site or transect		AMG Zone	55
Start details		Finish details	
Easting (6 digits)		Easting (6 digits)	
Northing (7 digits)		Northing (7 digits)	
Start time (24hr)	11 ~~30~~	End time (24 hr)	1230

Weather Details

At start of survey, record:		Cloud cover*	6/8
Wind direction and speed*	1 - Nth.	Rain*	0
Temperature (°C)	18	Moon*	n/a
At end of survey record:			
Temperature (°C)	20		
Comments			

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
Grey Fantail	O		~~701785 6078776~~	100m
Pied Currawong	O		703168, 6082058	
Weebill	O			
Australian Raven	O			
Yellow Thornbill	O			
Striated Pardalote	O			

* See Attachment 3: Standard reporting codes

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
Brown Thornbill	O		〃	
Striated Thornbill	O		〃	
White-browed Scrubwren	O		〃	
Grey Currawong	W		〃	
Superb Fairy-wren	O		〃	
Magpie lark	W		〃	
Black-faced Cuckoo Shrike	O		〃	
Red Wattlebird	O		〃	
# Speckled Warbler	O		703131 6058964	10m.

* See Attachment 3: Standard reporting codes

DIURNAL BIRD CENSUS SURVEY PROFORMA

Survey Details

Name of surveyor	DC.	Contact number	4443 5555
Number of surveyors	1	Date of survey	17/12/08
Total effort expressed in person hours		Number of hectares covered or transect or point dimensions	

Location Details

Location description	SW Old Cooma Road.		
Map number	8727 3 s	Map name	Tuggeranong
Full AMG reference(s) for survey site or transect		AMG Zone	55
Start details		Finish details	
Easting (6 digits)		Easting (6 digits)	
Northing (7 digits)		Northing (7 digits)	
Start time (24hr)	1050	End time (24 hr)	1140

Weather Details

At start of survey, record:		Cloud cover*	8/8
Wind direction and speed*	1 - NW.	Rain*	0
Temperature (°C)	17.	Moon*	n/a.
At end of survey record:			
Temperature (°C)	20		
Comments			

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
Magpie	O		701785 6078776	100m
Crested Pardalote	H		"	
Striated Pardalote	H		"	
Grey Fantail	O		"	
Aust. Raven	H		"	
Brown Hooded Honeyeater	O		"	

* See Attachment 3: Standard reporting codes

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
Noisy Miner	O		"	
Noisy Friarbird	O		"	
Grey Currawong	O		"	
White-winged Chough	O		"	
Kookaburra	W		"	
Red Wattlebird	O		"	
Black-faced cuckoo shrike	O		"	

* See Attachment 3: Standard reporting codes

DIURNAL BIRD CENSUS SURVEY PROFORMA

Survey Details

Name of surveyor	DC.	Contact number	4443 5555
Number of surveyors	1	Date of survey	7/11/08.
Total effort expressed in person hours	1	Number of hectares covered or transect or point dimensions	

Location Details

Location description: NE Old Coomа Road, north of Wichersdach La

Map number	87273 S	Map name	Tuggeranong
Full AMG reference(s) for survey site or transect		AMG Zone	55
Start details		Finish details	
Easting (6 digits)		Easting (6 digits)	
Northing (7 digits)		Northing (7 digits)	
Start time (24hr)	0805	End time (24 hr)	0905

Weather Details

At start of survey, record:		Cloud cover*	8/8
Wind direction and speed*	0	Rain*	0
Temperature (°C)	12	Moon*	–

At end of survey record:

Temperature (°C) 15

Comments

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
Spotted Pardalote	W		703168 6082055	100m
Golden Whistler	W		"	
Grey Fantail	O		"	
Striated Thornbill	O		"	
Leaden Flycatcher	O		"	
Superb Fairy-wren	O		"	

* See Attachment 3: Standard reporting codes

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
Galah	O		〃	
Buff-rumped Thornbill	O		〃	
Olive-backed Oriole	W		〃	
Brown-headed Honeyeater	O		〃	
Noisy Friarbird	O		〃	
Red Wattlebird	O		〃	
Rufous whistler	W/O		〃	
Yellow-faced Honeyeater	O		〃	
Crimson Rosella	O		〃	
Magpie-lark	O		〃	
Yellow Thornbill	O		〃	

* See Attachment 3: Standard reporting codes

DIURNAL BIRD CENSUS SURVEY PROFORMA

Survey Details

Name of surveyor	DC	Contact number	4447 5555
Number of surveyors	1	Date of survey	7/11/08
Total effort expressed in person hours	0.83 hr	Number of hectares covered or transect or point dimensions	

Location Details

Location description	SW Old Cooma Road.		
Map number	8727 3s	Map name	Tuggeranong
Full AMG reference(s) for survey site or transect		AMG Zone	55
Start details		Finish details	
Easting (6 digits)		Easting (6 digits)	
Northing (7 digits)		Northing (7 digits)	
Start time (24hr)	1008	End time (24 hr)	1050

Weather Details

At start of survey, record:		Cloud cover*	8/8
Wind direction and speed*	0	Rain*	0
Temperature (°C)	16°	Moon*	n/a.
At end of survey record:			
Temperature (°C)	16°		
Comments			

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
Rufous Whistler	w		701785 6078776	100m
Leaden Flycatcher	o		"	
Striated Pardalote	w		"	
Grey Fantail	o		"	
Black-faced Cuckoo-shrike	o		"	
Aust. Magpie	o		"	

* See Attachment 3: Standard reporting codes

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
White-throated Gerygone	W		"	
Pied Currawong	O		"	
Yellow-faced Honeyeater	O		"	
Brown-headed Honeyeater	O		"	
White-winged Chough	O		"	
Crimson Rosella	O		"	
Grey Shrike-thrush	O		"	
Sulphur-crested Cockatoo	W		"	

* See Attachment 3: Standard reporting codes

DIURNAL BIRD CENSUS SURVEY PROFORMA

Survey Details

Name of surveyor	DC	Contact number	4997 5555
Number of surveyors	1	Date of survey	7/11/08
Total effort expressed in person hours		Number of hectares covered or transect or point dimensions	

Location Details

Location description	Tempe Cres. - Heights Rd.		
Map number	8727 3	Map name	Tuggerawong
Full AMG reference(s) for survey site or transect		AMG Zone	55
Start details		Finish details	
Easting (6 digits)		Easting (6 digits)	
Northing (7 digits)		Northing (7 digits)	
Start time (24hr)	09.10	End time (24 hr)	0950

Weather Details

At start of survey, record:		Cloud cover*	8/8
Wind direction and speed*	0	Rain	0
Temperature (°C)	16	Moon*	n/a
At end of survey record:			
Temperature (°C)	16		
Comments			

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
Red Currawong	O		702759 6080856	100m
Spotted Pardalote	W		"	
Red wattlebird	O		"	
Magpie-lark	O		"	
Sulphur-crested Cockatoo	O		"	
Grey Fantail	O		"	

* See Attachment 3: Standard reporting codes

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
Dusk. Magpie	O		〃	
Willie Wagtail	O		〃	
Crimson Rosella	O		〃	
Superb Fairy-wren	O		〃	
Noisy Friarbird	O		〃	
Brown Thornbill	O		〃	
Striated Thornbill	W		〃	
Yellow-rumped Thornbill	W O		〃	
Common Bronzewing	O		〃	
White-winged Chough	O		〃	
Noisy Miner	W		〃	

* See Attachment 3: Standard reporting codes

DIURNAL BIRD CENSUS SURVEY PROFORMA

Survey Details

Name of surveyor	DC	Contact number	4493 5555
Number of surveyors	1	Date of survey	17/10/08
Total effort expressed in person hours		Number of hectares covered or transect or point dimensions	

Location Details

Location description	NE Old Cooma Rd, North from Wickersiack Lane		
Map number	8727 3s	Map name	Tuggeranong
Full AMG reference(s) for survey site or transect		AMG Zone	55
Start details		Finish details	
Easting (6 digits)		Easting (6 digits)	
Northing (7 digits)		Northing (7 digits)	
Start time (24hr)	0825	End time (24 hr)	0925

Weather Details

At start of survey, record:		Cloud cover*	
Wind direction and speed*	1 - NE	Rain*	0
Temperature (°C)	11	Moon*	n/a
At end of survey record:			
Temperature (°C)	18		
Comments			

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
Aust Magpie	O		703168, 6082058	100m
White-throated Gerygone	W		"	
Red Wattlebird	O		"	
Magpie-lark	O		"	
Pied Currawong	O		"	
Crimson Rosella	O		"	

* See Attachment 3: Standard reporting codes

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
Aust. Raven.	W.		〃	
Black-faced Cuckoo-shrike	O		〃	
Noisy Friarbird	O		〃	
Grey Currawong	O		〃	
Grey Fantail	O		〃	
Brown-hooded kingfisher	O		〃	
Grey Butcherbird	O		〃	
Superb-fairy wren	O		〃	
Puff. rumped Thornbill	O		〃	
Galah	O		〃	
Striated Pardalote	O		〃	
Olive-backed Oriole	W		〃	
Striated Thornbill	O		〃	
Spotted Pardalote	W		〃	
Silvereye	O		〃	
* Speckled Warbler.	O		in creekline.	
			703158 6082011	100m

* See Attachment 3: Standard reporting codes

DIURNAL BIRD CENSUS SURVEY PROFORMA

Survey Details

Name of surveyor	DC	Contact number	4447 5555
Number of surveyors	1	Date of survey	16/10/08
Total effort expressed in person hours		Number of hectares covered or transect or point dimensions	

Location Details

Location description	SW Old Cooma Rd		
Map number	8727 3s	Map name	Tuggeranong
Full AMG reference(s) for survey site or transect		AMG Zone	55
Start details		Finish details	
Easting (6 digits)		Easting (6 digits)	
Northing (7 digits)		Northing (7 digits)	
Start time (24hr)	0730	End time (24 hr)	0820

Weather Details

At start of survey, record:		Cloud cover*	0/8
Wind direction and speed*	0	Rain	0
Temperature (°C)	5	Moon*	n/a
At end of survey record:			
Temperature (°C)	13		
Comments			

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
Aust. Magpie	O		701785 6078776	100m
Eastern Rosella	O		"	
Striated Pardalote	W		"	
Common Bronzewing	O		"	
Wood Duck	O		"	
Red Wattlebird	O		"	

* See Attachment 3: Standard reporting codes

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
Kookaburra	W			
Red Cammaroo	O			
Eastern Rosella	O			
Aust. Raven	W			
Noisy Miner	G			
Sulphur-crested Cockatoo	O			
Spotted Pardalote	W			
Magpie Lark	W/O			
White-throated Gerygone	W			
Jacky Winter	W/O			
Leaden Flycatcher	O			
Buff-rumped Thornbill	O			
Golden Whistler	O			
Fan-tailed Cuckoo	W			
Striated Thornbill	W			

* See Attachment 3: Standard reporting codes

DIURNAL BIRD CENSUS SURVEY PROFORMA

Survey Details

Name of surveyor	ROB KELLY	Contact number	4993 5555
Number of surveyors	1	Date of survey	17/10/08
Total effort expressed in person hours	1	Number of hectares covered or transect or point dimensions	

Location Details

Location description	WICKERSLACK LANE, ALONG REALIGNMENT TO OLD COOMA RD.		
Map number		Map name	
Full AMG reference(s) for survey site or transect		AMG Zone	
Start details	8.20AM	Finish details	9.20AM
Easting (6 digits)		Easting (6 digits)	
Northing (7 digits)		Northing (7 digits)	
Start time (24hr)		End time (24 hr)	

Weather Details

At start of survey, record:		Cloud cover*	
Wind direction and speed*	0	Rain	0
Temperature (°C)	11	Moon*	n/a.
At end of survey record:			
Temperature (°C)	18		
Comments			

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
SULPHUR CRESTED COCKATOO	O		~~701607 6078525~~	100 m
RED WATTLEBIRD	O		702759, 6080858	
CURRAWONG (GREY)	O		"	
MAGPIE	O		"	
STRIATED PARDALOTE	W		"	
COMMON BRONZEWING	O		"	

* See Attachment 3: Standard reporting codes

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
EASTERN ROSELLA	W			
GREY FANTAIL	O			
MAGPIE LARK	O			
STARLING	O			
WILLY WAGTAIL	O			
WHITE WINGED CHOUGH	O			
CRIMSON ROSELLA	O			
NOISY MINER	O			
GALAH	O			
CRESTED PIGEON	O			
BLACK FACED CUCKOO SHRIKE	O			
NOISY FRIARBIRD	O			
SUPERB BLUE WREN	O			
GOLDEN WHISTLER	W/O			
FANTAIL CUCKOO	W			
WHITE FACED HERON	O			
YELLOW FACED HONEYEATER	O			
WOOD DUCK	O			

* See Attachment 3: Standard reporting codes

DIURNAL BIRD CENSUS SURVEY PROFORMA

Survey Details

Name of surveyor	ROB KELLY	Contact number	4443 5555
Number of surveyors	1	Date of survey	16/10/08
Total effort expressed in person hours	0.75	Number of hectares covered or transect or point dimensions	

Location Details

Location description	OLD COOMA RD: NEAR STH END OF STUDY AREA, EAST SIDE OF ROAD.		
Map number		Map name	
Full AMG reference(s) for survey site or transect		AMG Zone	
Start details	7-30 AM	Finish details	8-15 AM.
Easting (6 digits)		Easting (6 digits)	
Northing (7 digits)		Northing (7 digits)	
Start time (24hr)		End time (24 hr)	

Weather Details

At start of survey, record:		Cloud cover*	0/8
Wind direction and speed*	0	Rain*	0
Temperature (°C)	5	Moon*	n/a.
At end of survey record:			
Temperature (°C)	13		
Comments			

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
MAGPIE	O		701807 - 6078525	100m
CRIMSON ROSELLA	O		"	
AUSTRALIAN RAVEN	O		"	
SULPHUR CRESTED COCKATOO	O		"	
STRIATED PARDALOTE	O		"	
BLACK FACED CUCKOO SHRIKE	O		"	

* See Attachment 3: Standard reporting codes

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
YELLOW ROBIN	O			
FANTAIL CUCKOO	W			
RED WATTLEBIRD	O			
GREY BUTCHERBIRD	OW			
WOOD DUCK	O			
NOISY MINER	O			
GALAH	O			
NOISY FRIARBIRD	W			
YELLOW FACED HONEYEATER	O			
SPECKLED WARBLER	O		701835, 6078633	10m.

* See Attachment 3: Standard reporting codes

DIURNAL BIRD CENSUS SURVEY PROFORMA

Survey Details

Name of surveyor	ROB KELLY	Contact number	4443 5555
Number of surveyors	1	Date of survey	17/12/08
Total effort expressed in person hours	0.5	Number of hectares covered or transect or point dimensions	

Location Details

Location description	OLD COOMA RD · SE.		
Map number	8727 3 S	Map name	Tuggeranong
Full AMG reference(s) for survey site or transect		AMG Zone	55
Start details		Finish details	
Easting (6 digits)		Easting (6 digits)	
Northing (7 digits)		Northing (7 digits)	
Start time (24hr)		End time (24 hr)	

Weather Details

At start of survey, record:		Cloud cover*	6/8
Wind direction and speed*	1 - N	Rain*	0
Temperature (°C)	18	Moon*	—
At end of survey record:			
Temperature (°C)	20		
Comments			

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
MAGPIE	O		701807, 6078525	500m
CRIMSON ROSELLA	O		"	
NOISY FRIARBIRD	O		"	
RED WATTLE BIRD	O		"	
AUSTRALIAN RAVEN	O		"	
OLIVE BACKED ORIOLE	O		"	

* See Attachment 3: Standard reporting codes

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
BLACK FACED CUCKOO SHRIKE	W		–	
TURQUOISE PARROT	O		701887 6078817	10m
GOLDEN WHISTLER	O		–	

* See Attachment 3: Standard reporting codes

DIURNAL BIRD CENSUS SURVEY PROFORMA

Survey Details

Name of surveyor	ROB KIELLY	Contact number	4443 5555
Number of surveyors	1	Date of survey	17/12/08
Total effort expressed in person hours	1.	Number of hectares covered or transect or point dimensions	

Location Details

Location description	OLD COOMA RD / TEMPLE CRES.		
Map number	8727 3s	Map name	Tuggeranong
Full AMG reference(s) for survey site or transect		AMG Zone	55
Start details		Finish details	
Easting (6 digits)		Easting (6 digits)	
Northing (7 digits)		Northing (7 digits)	
Start time (24hr)		End time (24 hr)	

Weather Details

At start of survey, record:		Cloud cover*	6/8
Wind direction and speed*	0	Rain*	0
Temperature (°C)	15	Moon*	—
At end of survey record:			
Temperature (°C)	18		
Comments			

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
MAGPIE	O		702759, 6080856	500m
~~GLA~~ GALAH	O		"	
AUSTRALIAN RAVEN	H		"	
CRIMSON ROSELLA	O		"	
RED WATTLEBIRD	O		"	
WHITE-WINGED CHOUGH	O		"	

* See Attachment 3: Standard reporting codes

Species name	Ob. type*	MH type*	Grid reference (full AMGs)	Accuracy
EASTERN ROSELLA	O		〃	
WHITE FACED HERON	O		〃	
CRESTED PIGEON	O		〃	
PALLID CUCKOO	H		〃	
YELLOW TAILED BLACK COCKATOO	H		〃	
KOOKABURRA	O		〃	
SULPHUR CRESTED COCKATOO	O		〃	
INDIAN MYNA	O		〃	
PIED CURRAWONG	O		〃	
BLACK FACED CUCKOO SHRIKE	O		〃	

* See Attachment 3: Standard reporting codes