Googong Neighbourhood 2
Flora and Fauna Assessment

March 2017

Prepared for Googong Township Pty Ltd

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Executive Summary

Googong Township Pty Ltd (GTPL) intends to submit a Development Application (DA) for the subdivision of Googong Township Neighbourhood 2 (the 'proposed development'), as part of the ongoing planning and development of the master-planned township in Googong, NSW. Capital Ecology Pty Ltd has been commissioned to undertake ecological surveys and prepare this Flora and Fauna Assessment (F&FA) to identify and assess the significance of the impacts that the proposed development may have upon the biodiversity values of the subject land (the 'study area') and surrounds.

The above has been completed in accordance with the:

- NSW *Environment Planning and Assessment Act 1979* (EP&A Act);
- NSW *Threatened Species Conservation Act 1995* (TSC Act); and
- NSW *Fisheries Management Act* (FM Act).

Scope

This F&FA included:

- a desktop database and literature review;
- thorough on-ground surveys including vegetation assessment and mapping, tree assessment, habitat assessment for threatened species, and targeted survey for the Golden Sun Moth *Synemon plana* and the Pink-tailed Worm-lizard *Aprasia parapulchella*;
- the preparation of a Likelihood of Occurrence Assessment which addresses all threatened ecological communities, threatened flora species and threatened fauna species with the potential to occur within the study area;
- an assessment of the potential impacts upon the listed significant biota identified as occurring or potentially occurring within the study area;
- advice and recommendations regarding impact avoidance, minimisation, mitigation, and/or offset measures; and
- An assessment of the likely significance of residual impacts under NSW legislation.

Methods and Results

Surveyed and mapped using the NSW Biobanking Assessment Methodology, with a further level of categorisation added to suitably recognise the substantial variation in groundstorey floristic diversity, the study area was assessed as supporting the following three Plant Community Types (PCTs).

- **PCT999** – Norton's Box - Broad-leaved Peppermint open forest on foot slopes, central and southern South Eastern Highlands Bioregion.
- **PCT 1330** – Yellow Box Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands.

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- **PCT 1298** – Wet tussock grasslands of cold air drainage areas of the tablelands.

Based on the structure, floristic composition and overall condition ('intactness') of the groundstorey, each of these PCTs was catergorised into discernable Vegetation Zones. The distribution of each Vegetation Zone of each PCT was ground-truthed, accurately mapped using a Geographic Information System, and quantified (i.e. total hectares).

Zone 1 of PCT1330 was determined to be consistent with the minimum definition of the Box-Gum Woodland threatened ecological community (TEC) as listed pursuant to the TSC Act.

An extensive targeted survey for the Pink-tailed Worm-lizard *Aprasia parapulchella* was undertaken during optimal survey conditions, covering all potential habitat within the study area and employing a level of survey effort sufficient to achieve an indication of the species' presence/absence to the 95% confidence interval. No Pink-tailed Worm-lizards were recorded, and the species is considered unlikely to occur within the study area.

A program of four targeted Golden Sun Moth *Synemon plana* surveys was undertaken in accordance with the Commonwealth Government survey guidelines, with no Golden Sun Moth individuals or other evidence of Golden Sun Moth occurrence recorded. Whilst the study area does occur within the broad distribution of the Golden Sun Moth and it does support an extensive area of characteristically suitable habitat, the absence of Golden Sun Moths recorded across the targeted surveys provides strong evidence for the absence of the species within the study area.

A total of only 43 native flora species were recorded within the study area, and none of the listed threatened flora species identified as potentially occurring within the study area were recorded. Given the considerable survey effort employed by experienced ecologists, covering the entire study area, it is considered unlikely that any threatened flora species occur within the study area.

Based on the habitat assessment and previous records of threatened species in the locality, three TSC Act vulnerable listed woodland birds were identified as likely to regularly forage within the study area: White-fronted Chat *Epthianura albifrons*, Scarlet Robin *Petroica boodang*, and Flame Robin *P. phoenica*. Although other listed species were considered to have a moderate or higher potential of occurrence within the study area, these were the only species considered likely to regularly forage within. No breeding habitat for any threatened or migratory fauna was identified within the study area, and no threatened or migratory species were recorded during the surveys.

A total of 41 exotic plant species were recorded within the study area, of which Serrated Tussock *Nassella trichotoma* and African Love Grass *Eragrostis curvula* currently pose a very high threat to the biodiversity values of the study area and adjoining land. Other significant weeds requiring control were also recorded.

The Red Fox *Vulpes vulpes*, Common Starling *Sturnus vulgaris* and Indian Myna *Acridotheres tristis* were the only exotic fauna species recorded during the field surveys, however the exotic pest species European Brown Hare *Lepus europaeus*, Feral Cat *Felis catus*, European Rabbit *Oryctolagus cuniculus*, and Feral Pig *Sus scrofa*, are also likely to occur within the study area and surrounds. The level of infestation of these species appears to be consistent with that present across much of the agricultural land in the locality.

Proposed Measures to Reduce Impacts on Biodiversity

Recommendations to minimise the impacts of the proposed development upon biodiversity are provided in Section 5. These include recommendations for retention of paddock trees, particularly

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hollow-bearing trees, requirements for weed management during and after development, and recommendations for landscaping (including use of local native species).

Summary of Assessment against Biodiversity Legislation and Policy

The following table provides a concise summary of the assessment of impacts under the relevant biodiversity legislation.

Legislation/Policy	Relevant Biodiversity Value/s	Assessment Results and Requirements
Environmental Planning & Assessment Act 1979	12.55 ha of White Box – Yellow Box – Blakely's Red Gum grassy woodland (NSW endangered ecological community) in a highly modified form, present as scattered remnant trees with no regeneration over highly modified low diversity native pasture. Potential habitat for threatened fauna species. The fauna habitat is predominantly low value potential foraging habitat only.	Assessments of Significance have been completed for this threatened ecological community and for the threatened fauna species with the potential to be impacted. These are included as Appendix 7. The proposed development is unlikely to significantly affect this threatened ecological community or any of the relevant listed threatened species. Accordingly, the preparation of Species Impact Statements or the provision of a formal offset is not considered warranted for the proposed development.
Threatened Species Conservation Act 1995	As above	As above. In addition, the study area does not contain declared critical habitat for any species, population or ecological community.
State Environmental Planning Policy 44 – Koala Habitat Protection	There is no koala habitat within the study area.	No further consideration of this SEPP is required.
Native Vegetation Act 2003	Native vegetation.	Not relevant to the proposed development as the study area has urban zoning.
Noxious Weeds Act 1993	Noxious weeds.	The occupier is required under the NW Act to implement all reasonable measures in accordance with the requirements of Weed Control Order No. 30. As detailed in Section 4.4 and Section 5, weed control and monitoring is required.
Fisheries Management Act 1994	None.	The study area does not support any community, species, or potential habitat for any species, listed pursuant to the FM Act.

Conclusion

Based on the assessment provided herein, it is concluded that, with the implementation of the proposed measures to avoid, minimise and mitigate impacts upon biodiversity values, the proposed development is unlikely to significantly affect any threatened species, population or ecological community listed pursuant to the NSW TSC Act. Accordingly, the preparation of Species Impact Statements, or the provision of a formal offset, is not considered warranted for the proposed development.

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1 Introduction

Googong Township Pty Ltd (GTPL) intends to submit a Development Application (DA) for the subdivision of Googong Township Neighbourhood 2 (the 'proposed development'), as part of the ongoing planning and development of the master-planned township in Googong, NSW.

Capital Ecology Pty Ltd has been commissioned to undertake ecological surveys and prepare this Flora and Fauna Assessment (F&FA) to identify and assess the significance of the impacts that the proposed development may have upon the biodiversity values of the subject land (the 'study area') and surrounds. As the development of the entirety of Googong Township was subject to a Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) referral (EPBC Act Ref:2011/5859) and corresponding EPBC Act Approval, this F&FA provides an assessment under NSW legislation only.

The location of the study area for this assessment is shown in Figure 1, and the study area is shown overlain on recent aerial imagery in Figure 2. Further details regarding the proposed development, the study area, and the context of this assessment, are provided in Section 2.

1.1 Objective of this Assessment

The primary objective of this F&FA is to provide a thorough investigation into the currently listed significant biodiversity values (i.e. threatened flora and fauna species, migratory fauna species, and threatened ecological communities) that occur or have the potential to occur within the study area. The results of this investigation have been used to inform a thorough assessment of the likely type and degree of any impacts that the proposed development may have upon the identified biodiversity values, as well as to provide recommendations for avoidance, minimisation and mitigation measures to reduce impacts. As well as significant/listed values, other more general (i.e. non-listed) biodiversity values have also been considered in the assessment of impacts where relevant.

The above has been completed in accordance with the:

- NSW *Environment Planning and Assessment Act 1979* (EP&A Act);
- NSW *Threatened Species Conservation Act 1995* (TSC Act); and
- NSW *Fisheries Management Act* (FM Act).

As the development of Googong Township has been referred to the Commonwealth Minister for the Environment and subsequently approved (EPBC Ref 2011/5829), further assessment under the EPBC Act is not required. Commonwealth listed species and ecological communities are included in this report primarily to provide context.

1.2 Scope of this Assessment

The scope of this F&FA has been developed to include all of the elements and matters for consideration in a standard F&FA in NSW. This includes the following.

1. A thorough desktop database and literature review to identify all of the currently EPBC Act, TSC Act or FM Act listed significant biota (i.e. threatened species, populations and ecological

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communities) known to occur, or considered to have the potential to occur, within the study area.

2. Thorough on-ground surveys including:
    - survey and Geographic Information System (GIS) mapping of the vegetation present within the study area, employing survey methods and classification currently recognised by the NSW Government;
    - survey and mapping of the habitat features present that are of specific relevance to one or more of the threatened species identified during the desktop review;
    - tree habitat assessment, involving mapping and recording of trees and their habitat values within the study area;
    - targeted survey for the Golden Sun Moth *Synemon plana*; and
    - targeted survey for the Pink-tailed Worm-lizard *Aprasia parapulchella*.
3. The preparation of a Likelihood of Occurrence Assessment which addresses all threatened ecological communities, threatened flora species, and threatened fauna species with the potential to occur within the study area.
4. An assessment of the potential impacts upon the listed significant biota identified as occurring or potentially occurring within the study area.
5. Advice and recommendations regarding impact avoidance, minimisation, mitigation, and/or offset measures.
6. An assessment of the likely significance of residual impacts under NSW legislation.

1.3 Structure of this Report

This F&FA report is structured in the following manner.

Section 2 – Describes the background to the assessment.

- Subsection 2.1 provides background to the proposed development.
- Subsection 2.2 details the extent and history of the study area.
- Subsection 2.3 details previous studies relevant to this assessment.

Section 3 – Describes the survey and assessment methodologies employed.

Section 4 – Provides the results of the surveys and assessment.

Section 5 – Details the recommended avoidance, minimisation, and mitigation measures.

Section 6 – Provides an assessment of the residual impact under NSW environmental legislation.

Section 7 – Provides the conclusions of this F&FA.

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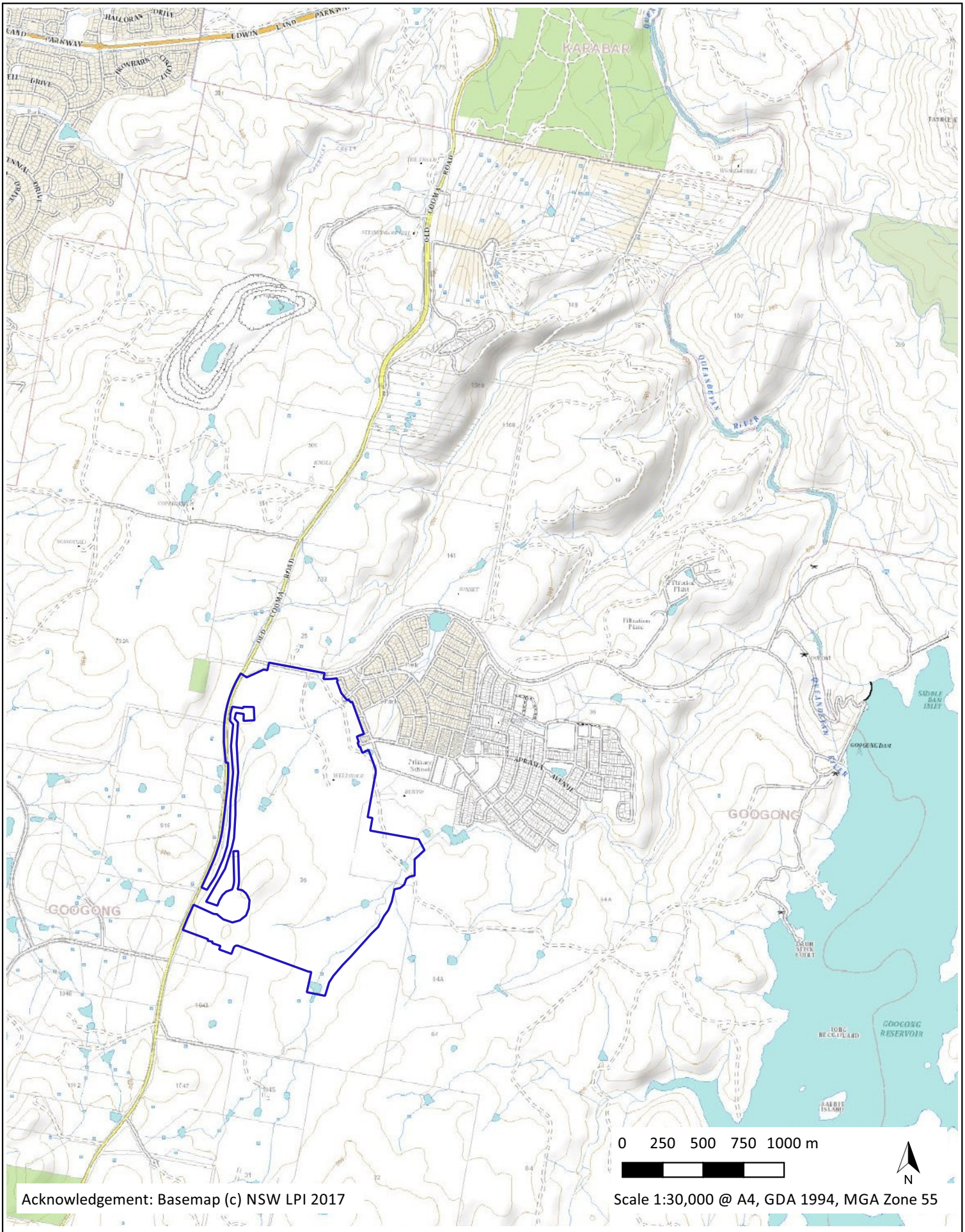

Acknowledgement: Basemap (c) NSW LPI 2017

Scale 1:30,000 @ A4, GDA 1994, MGA Zone 55

Figure 1. Locality Plan

Legend

Study Area

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Date: 8 March 2017

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Figure 2. Study Area on Aerial Image

Legend

Study Area

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Date: 8 March 2017

2 Background

2.1 Proposed Development

Googong Township is a master-planned country township being developed south of Queanbeyan NSW. The Googong master plan includes five neighbourhoods, each with a town centre, to a total of approximately 6,000 dwellings.

Neighbourhood 2 is the second neighbourhood to be developed within the township. It is located in the western part of Googong and is bounded by Old Cooma Road to the west and Googong Road to the north. Googong Township Propriety Limited (GTPL) is seeking to submit a DA with Queanbeyan-Palerang Regional Council ('Council') to progress the development of Neighbourhood 2. The proposal seeks approval for the following.

- Torrens title subdivision of Neighbourhood 2 to create 1,113 total lots, including:
    - 941 residential lots;
    - 172 residual lots for future subdivision of higher density housing and other uses including the town centre sites, a State K-12 school, a sales and information centre and a community centre;
    - public reserves including Nangi Pimble (Hill 800), local parks, sports fields and Googong Common; and
    - public roads and drainage reserves.
- All subdivision works to prepare the land for the future development comprising site preparation and grading, stormwater and drainage works, road construction, tree removal, public domain landscaping and utilities provision.
- All landscaping works to create and embellish all open space and the public domain.

The subdivision of the super lots for higher density residential dwellings and the construction of all buildings (housing, recreational facilities and schools), as well as the town centre sites, will be subject of future applications.

The development of Neighbourhood 2 will result in the clearance of vegetation from most of the Neighbourhood 2 area. All open space areas and wetland areas are likely to be highly landscaped and thus may retain little of the current character of the landscape. Some of the mature trees may be retained, however the number has not yet been determined.

2.2 Study Area and History of Land Management

Shown on Figures 1 and 2, the study area comprises the entirety of Neighbourhood 2. However, the footprint of the Googong IWC Stage C Network West project has been excluded from the study area, this area having been addressed in the studies and assessments completed for that project, notably:

- Biosis (2015a). *Flora and Fauna Assessment – Integrated Water Cycle Project Stage C Network West, Googong township*; and

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- Capital Ecology (2016). *Googong IWC Stage C Network West – 2015 Golden Sun Moth Synemon plana surveys*.

The above studies are complementary to the surveys and mapping completed for this F&FA.

The study area and surrounding locality has been utilised for agriculture since the mid 1800s and the majority of the land has been cleared to 'open up' the area for grazing. Scattered paddock trees remain over a variable groundcover. Much of the study area is currently grazed by livestock including sheep, goats, and horses, and some of the study area has been cultivated. The cultivated paddocks can be seen on a current aerial image (Figure 2).

Much of the study area supports native vegetation in low to moderate condition, characterised by a degraded groundstorey with sparsely scattered mature trees. Some parts of the study area retain a high cover and diversity of native groundcover species and lower cover of exotic weeds. Continuous grazing has removed the midstrata and entirely prevented regeneration of the canopy species.

2.3 Previous Studies

Several ecological studies have been undertaken to inform the development and planning of Googong Township. Those most relevant to Neighbourhood 2 are summarised in Table 1.

Table 1. Previous studies relevant to the proposed development

Study author	Summary of study and findings
Johnstone Centre 2004	• Broad-scale ecological surveys and mapping completed across the locality to inform the revision of the Queanbeyan Local Environment Plan and the location of Googong Township. • The majority of the Googong development area was mapped as 'non-native grassland and agricultural' with a small area adjoining Old Cooma Road mapped as 'native grassland'. • Surveys for the Golden Sun Moth *Synemon plana* were completed with no moths recorded, but only part of the current study area was surveyed.
Biosis Research and Ecowise Environmental 2009	• Ecological surveys for Googong Integrated Water Cycle Project. • Pitfall trapping targeting Striped Legless Lizard *Delma impar* and Grassland Earless Dragon *Tympanocryptis pinguicolla*. Neither target species, nor other threatened species, was recorded.
Biosis Research 2010	• Golden Sun Moth surveys completed within part of the Googong township Urban Release Area (Biosis Research 2010a) in potential habitat identified by the Johnstone Centre (2004). No moths recorded, but only part of the current study area was surveyed.
Biosis Research 2011	• Spring 2010 intensive targeted surveys for the Pink-tailed Worm-lizard and associated habitat assessment and mapping. • No potential habitat was mapped or surveyed within the study area.

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Study author	Summary of study and findings
Biosis 2015b	• Ecological Values and Constraints Assessment (EVCA) for Neighbourhood 2-5. • Field survey totalling approximately 64 hours completed in May 2015 and three hours in October 2015 across the 404 ha area (comprising Neighbourhoods 2 to 5) to broadly map vegetation, species habitat and record and assess the ecological values of each of the remnant native trees within the study area. • Due to the potential for impacts upon significant ecological values, further survey and assessment was determined to be required.
Biosis 2015a	• Flora and Fauna Assessment for the Integrated Water Cycle Project - Stage C Network West. • Mapped approximately 2.04 ha of native pasture likely to constitute the TSC Act listed endangered ecological community Box-Gum Woodland in a highly modified form. Proposed impact assessed as not significant.
Capital Ecology 2016	• Program of four Golden Sun Moth surveys completed across the western portion of the study area for the Integrated Water Cycle Project - Stage C Network West. No moths were recorded.

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3 Methods

3.1 Taxonomy

The most current scientific and common names for plant species have been determined using recently published field guides on the native and/or exotic flora of the ACT and region (Cosgrove 2014, Eddy *et al.* 2011, Sharp *et al.* 2015, Richardson *et al.* 2011, Wood and Wood 2005).

The naming convention used for vertebrate fauna follows the Census of Australian Vertebrates (CAVs) maintained by the Commonwealth Department of the Environment.

In the body of this report flora and fauna species are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only.

3.2 Database and Literature Review

A database search and literature review was completed to inform likelihood of occurrence assessments and as useful background information for this assessment.

A list of threatened species (flora and fauna), threatened populations and threatened ecological communities (TECs) listed pursuant to the EPBC Act with the potential to occur within the study area was obtained using the Department of the Environment's online EPBC Act Protected Matters Search Tool (PMST) on 14 September 2016 and again on 26 January 2017.

Ecological point data from the NSW Wildlife Atlas (BioNet) were also obtained on 14 September 2016, providing a list of threatened species which have previously been recorded within the broad locality of the study area (i.e. up to approximately 5 km).

The References section of this report lists the literature referred to during the conduct of the surveys for this study and/or during the preparation of this report.

3.3 Definitions of Conservation Significance

The conservation significance of a species, population or community is determined by its current listing pursuant to Commonwealth and/or State legislation and associated policy, more specifically:

- National – Listed as threatened (critically endangered, endangered, vulnerable or conservation dependent) pursuant to the EPBC Act; and
- State (NSW) – Listed as threatened (endangered or vulnerable) pursuant to the TSC Act.

Species listed as 'migratory' under the EPBC Act and species listed under the FM Act are also considered where relevant.

3.4 Likelihood of Occurrence Assessment

The Likelihood of Occurrence Assessment for threatened flora and fauna species is a categorisation used to determine the likelihood that the subject species occur within the study area. The results of the Likelihood of Occurrence Assessment are based on the findings of desktop studies, field surveys, expert opinion, and consideration of the species' currently recognised distribution and preferred habitat.

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Threatened species and populations included in the Likelihood of Occurrence Assessment include all of those identified during the database and literature review as potentially occurring within approximately five kilometres of the study area. Some TSC Act listed threatened species have been included that have not been previously recorded near the study area, yet are considered by Capital Ecology to have the potential to occur.

The likelihood of a species occurring within the study area is categorised as either negligible, low, moderate or high. A species that has been identified within the study area during the surveys for this study or by other confirmed records is labelled as confirmed.

The completed Likelihood of Occurrence Assessment is provided as Appendix 5. Species assigned a moderate or higher likelihood of occurrence are considered in more detail in Section 4.3.2 of this F&FA.

3.5 Field Surveys

3.5.1 Tree Habitat Reassessment

A tree assessment for the study area was previously undertaken for the Ecological Values and Constraints Assessment (Biosis 2015). For this F&FA, Capital Ecology undertook a reassessment of the trees to record any use of trees by native species for breeding, to include trees which had not been part of the Biosis (2015) study area, and to ensure that tree species were identified correctly. The Biosis (2015) assessment was a rapid assessment only and, due to the potential for hybridisation of Yellow Box *Eucalyptus melliodora* and Red Box *E polyanthemos,* there was some uncertainty remaining regarding species identity.

During the tree reassessment, all trees over 20 cm in diameter at breast height (DBH) were assessed for their value to native fauna. Each tree was recorded via hand-held GPS. Data collected for each tree included:

- tree number;
- tree species (the colour of the heartwood was used to assign the species for trees atypical of either Yellow Box or Red Box, and the potential for the tree to be a hybrid between these species was noted);
- DBH (cm);
- approximate height (m);
- approximate crown diameter (m);
- age category (Juvenile, Mature, or Old); and
- presence of any hollows and other habitat values such as nests, mistletoe etc.

3.5.2 Vegetation Survey and Mapping

The vegetation across the entire study area was surveyed and mapped in accordance with the NSW Biobanking Assessment Methodology (BBAM) (OEH 2014). The BBAM was selected because it is a NSW Government supported method and metric (and therefore preferred by Council and the NSW Office of Environment and Heritage (OEH)), and is the most appropriate of the options for use on urban zoned land.

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The methodology involved the following.

- Mapping of the on-ground boundaries of the Plant Community Types (PCTs).
- Division and delineation of PCTs into Vegetation Zones based on condition and ancillary codes.
- The collection of site value data using a series of plots and transects.

These steps are summarised in more detail below. The full survey methodology can be found online via the OEH website (http://www.environment.nsw.gov.au/biobanking/assessmethodology.htm)

Plant Community Type (PCT) mapping

The on-ground boundaries of each of the Plant Community Types (PCTs) present within the study area were accurately mapped using either hand-held GPS or by marking boundaries directly onto high resolution orthorectified aerial photograph field maps. The PCTs and their characteristics are provided in the NSW Vegetation Information System (VIS).

The PCT boundaries were defined based on the:

- presence, species, growth form and density of remnant canopy trees and/or stags or stumps of these;
- presence and species of midstorey shrubs and trees;
- floristic composition of the groundstorey; and
- the landscape position and other geographical features (elevation, aspect, soils, apparent hydrology).

Vegetation Zone definition and mapping

The mapped PCTs were further divided into Vegetation Zones based on the structure, floristic composition and overall condition ('intactness') of the vegetation. The Vegetation Zones were mapped using GIS which allows for accurate calculations of the total area of each Vegetation Zone within the study area.

Survey Plots/Transects

A series of a vegetation assessment survey plot/transect sets were completed to adequately sample each Vegetation Zone. As illustrated in Diagram 1, each transect/plot set involved a 20 x 20 m (400 m^2) plot, a 20 x 50 m plot, and a 50 m transect. Floristic survey data were collected in the 20 x 20 m plot as per Table 1 of the BBAM, and the ten site attributes listed in Table 2 of the BBAM were collected either along the transect or within the 20 x 50 plot. All plot/transect locations were selected randomly within the vegetation zone, by marking on a map and walking to the location.

The number of survey plot/transect sets completed within each Vegetation Zone was determined in accordance with Table 3 of the BBAM and involved a total of 17 across the 6 zones as shown in Figure 3.

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Outer line forms 20 x 50 m plot

20 x 20 m	50 m transect (thick solid line)
plot (thin solid line)	

Diagram 1. Vegetation survey plot/transect set

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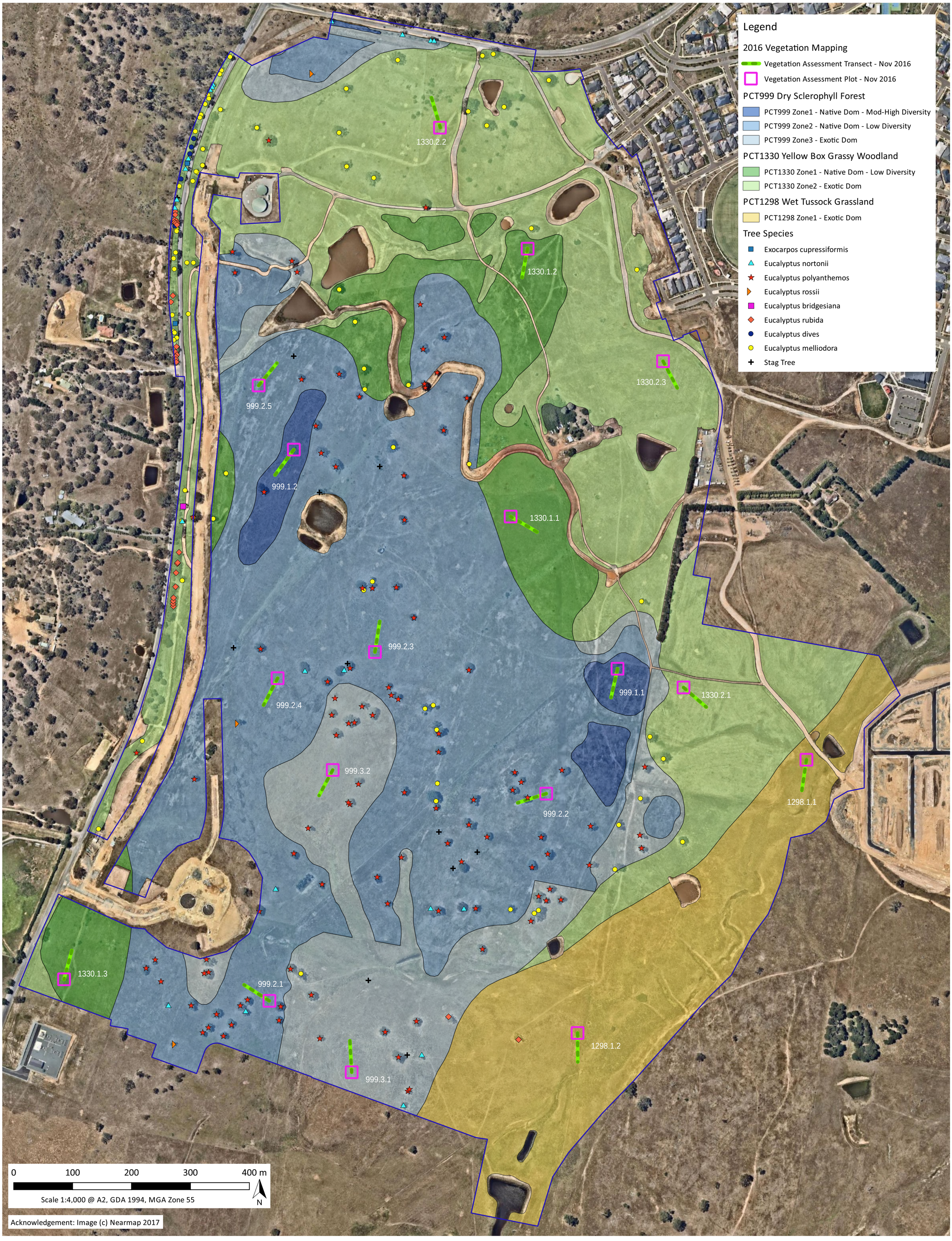

Figure 3. Vegetation Surveys

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Drawn by: R. Speirs
Date: 8 March 2017

3.5.3 Targeted Threatened Fauna Surveys

Pink-tailed Worm-lizard Targeted Rock Turning Survey

The Pink-tailed Worm-lizard *Aprasia parapulchella* is listed as vulnerable pursuant to the EPBC Act and the TSC Act. The species is known to occur at numerous sites in the ACT and surrounding areas of NSW, notably along the mid and upper slopes of the Murrumbidgee, Molonglo and Queanbeyan rivers, and nearby hills. Within this distribution, the occurrence of the Pink-tailed Worm-lizard is usually confined to sites which are characterised by a moderate to high scatter density of surface rock of volcanic origin, generally interspersed by Kangaroo Grass *Themeda triandra*, Red Grass *Bothriochloa macra* and Wattle Mat-rush *Lomandra filiformis* (Osborne and Jones 1995).

As described in detail in Section 2.2, the crest and slopes of Nangi Pimble (Hill 800) is characterised by moderate to high surface scatter density of rock. Whilst most of this rock is sedimentary (i.e. shale, metamorphised in places), patches of volcanic rocks (primarily dacite and granodiorite) are present. The degree of embedment of the rocks and the composition and structure of the groundcover vegetation are highly varied, however patches of this rock scatter appear superficially characteristic of Pink-tailed Worm-lizard habitat.

Given the above, a targeted rock-turning survey was undertaken across all rocky habitat within the study area. Prior to the rock-turning survey the rocky habitat within the study area (i.e. potential Pink-tailed Worm-lizard habitat) was mapped onto high resolution field maps, the extent of this rocky habitat is illustrated in Figure 4.

The targeted survey was undertaken during optimal survey conditions (sunny with maximum temperatures of 24 degrees) on the 23 September 2016 and resulted in a total of approximately ten hours of active survey effort (i.e. two ecologists for five hours).

Jones (1999) found that 750 suitable habitat rocks need to be turned within a given site to achieve an indication of Pink-tailed Worm-lizard presence/absence to the 95% confidence interval. Accordingly, where possible, the number of rocks turned per rocky patch was determined with the objective of achieving the 95% confidence interval of presence/absence within the patch. The total number of habitat rocks turned during the survey is estimated to be approximately 2,150 (based on extrapolation of the average of four fifteen minute counts).

Golden Sun Moth Targeted Survey

A program of four targeted Golden Sun Moth surveys was undertaken in accordance with the survey guidelines detailed in the *Background Paper to EPBC Act Policy Statement 3.12 - Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (Synemon plana)* (DEWHA 2009). As illustrated in Figure 5, each survey involved two ecologists walking broad belt transects (approx. 100 m apart) throughout the potential habitat (open areas supporting Wallaby Grasses *Rytidosperma* spp., the primary feed plants of the species) within the study area. Broad belt transects were chosen as the most suitable method for the surveys given the large area (approx. 72ha) of potential habitat requiring survey.

As recommended in DEWHA (2009), four surveys were undertaken with at least four days between each survey. On each survey day moths were confirmed to be flying at a site in the ACT region through a reference site check or through communication with other ecologists conducting surveys at other sites. The details of the four survey days and relevant survey conditions are provided in Appendix 4. In summary, each of the four targeted surveys was undertaken during good to optimal survey conditions on days when moderate to high Golden Sun Moth numbers were observed.

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A GPS track was recorded for each survey, these are illustrated in Figure 5. Whilst the surveys primarily focused on recording observed male flights, the ecologists also searched for female moths and pupal cases, particularly in the areas considered to have the highest potential for Golden Sun Moth occurrence.

3.5.4 Grassland Fauna Habitat Assessment Transects

Four Grassland Habitat Assessment Transects (OEH proforma) were completed on 14 December 2016 to accompany the Golden Sun Moth surveys. These transects were located with the aim of capturing the variation in grassland composition and condition across the portions of study area covered by the Golden Sun Moth surveys. Figure 5 shows the locations of the completed transects.

3.5.5 Opportunistic Observations

Due to the rigor of the vegetation survey methodology and the high number of plots/transects completed, incidental flora species observed were not recorded unless they are of known or potential conservation significance.

3.6 Study Limitations

3.6.1 Survey Limitations

Vegetation mapping has been completed based on on-ground survey, using high-quality aerial photography and GPS. However, owing to the vegetation clearing and long-term high intensity grazing that the study area has been subject to, in some areas little evidence remains of the original vegetation community. The boundaries drawn between PCTs are based on estimation of the pre-clearance occurrence of the vegetation communities, using remnant trees, stumps, groundcover species, soil, and topography. The mapping must therefore be considered to approximate the original community boundaries only.

No degree of survey effort can ensure that all species likely to utilise the study area are detected during a survey. Numerous factors can impact upon the detection of some species, including seasonal conditions, species dormancy, the impacts of grazing/herbivory, the ephemeral nature of waterbodies (i.e. creeks, farms dams etc.) and the breeding, migratory and other behaviours of some fauna.

Vegetation assessment was undertaken in November, which is optimal timing for detection of many of the threatened species which occur in the locality, including cryptic groundstorey flora species. Nevertheless, not all species present will have been detected in this survey. This is taken into account in the Likelihood of Occurrence Assessment.

The Pink-tailed Worm-lizard and Golden Sun Moth surveys completed were thorough and were timed to occur during the peak survey seasons of the species. The Golden Sun Moth surveys were completed on days when moths were known to be flying elsewhere in the region. The surveys are considered adequate to provide evidence for the presence/absence of these species within the study area.

3.6.2 Spatial Data Limitations

Conclusions on the likelihood of some species occurring within the study area are reliant, at least in part, upon external data sources and information managed by third parties.

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Vegetation community mapping data, tree survey data and threatened species point data, were collected using a hand-held (uncorrected) GPS unit and interpretation of high resolution aerial imagery. The accuracy of the mapping presented in the figures is therefore subject to the accuracy of the GPS unit (up to ± 3 metres) and the rectification limitations of Nearmap aerial imagery data. Electronic files (.shp) of all data presented in the figures can be provided for incorporation in third party plans and documents. These data may not be sufficiently precise for detailed survey or design purposes.

3.7 Authority to Undertake Surveys

All flora and fauna surveys were undertaken in accordance with the following.

- Capital Ecology's (Robert Speirs – Principal Investigator) Animal Research Authority (ARA) granted under the NSW *Animal Research Act 1985* by the NSW Department of Primary Industries Secretary's Animal Care and Ethics Committee (TRIM 15/2046).
- Capital Ecology's NSW Scientific Licence issued by the NSW OEH under s132C of the NSW *National Parks and Wildlife Act 1974* (SL101623).

All flora and fauna surveys were undertaken by and/or under the direct supervision Robert Speirs, Capital Ecology's Principal Ecologist who has over ten years of experience in ecological survey and assessment.

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Figure 4. Pink-tailed Worm-Lizard Surveys

Legend

- Study Area
- Surveyed Rocky Habitat

Capital Ecology Project No: 2713
Drawn by: R. Speirs
Date: 8 March 2017

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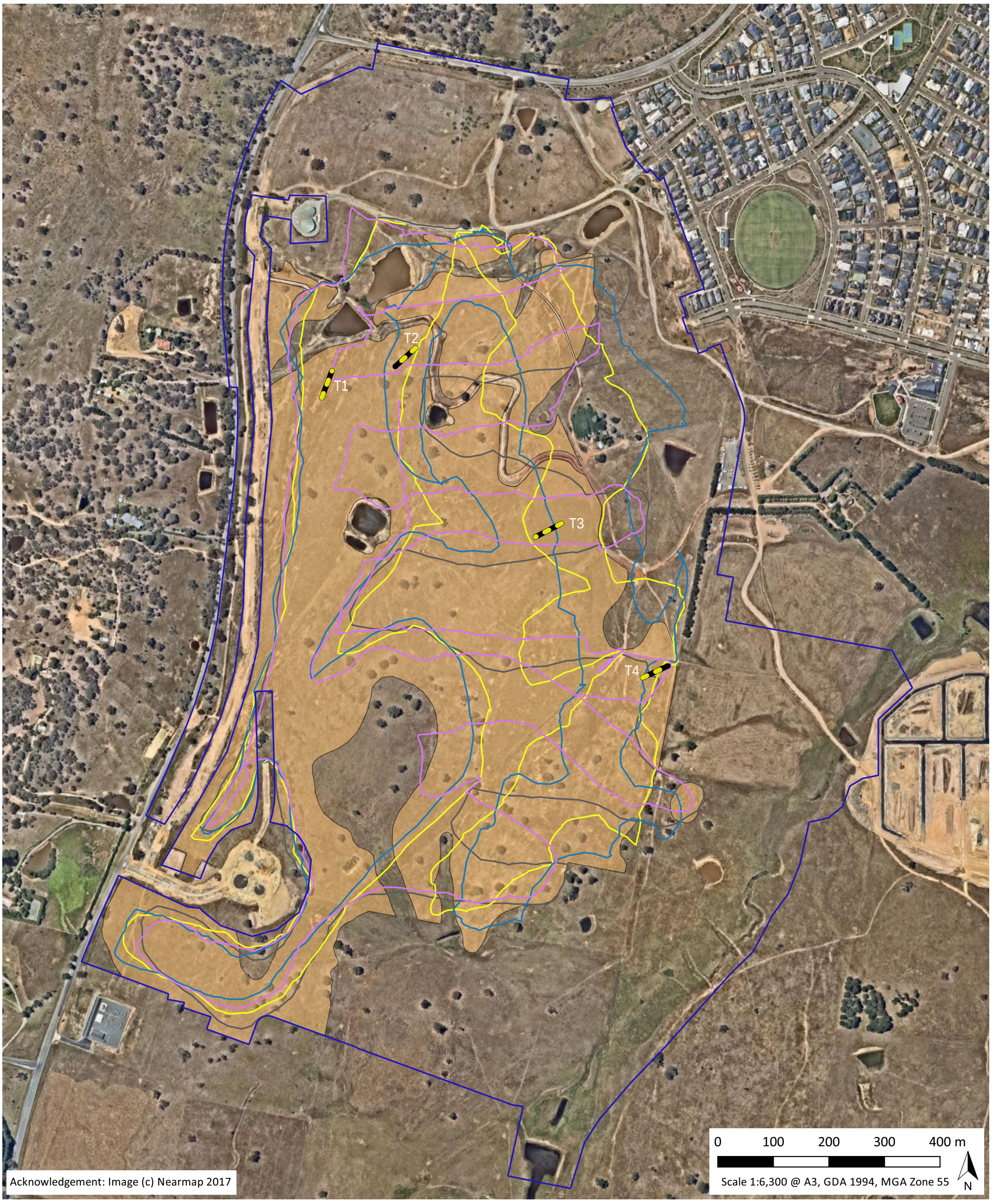

Figure 5. Golden Sun Moth Surveys

Legend

- Surveyed Potential Golden Sun Moth Habitat
- Grassland Fauna Habitat Transect 12-Dec-2016
- GSM Survey Track 1 - 22-Nov-2016
- GSM Survey Track 2 - 30-Nov-2016
- GSM Survey Track 3 - 13-Dec-2016
- GSM Survey Track 4 - 20-Dec-2016

Capital Ecology Project No: 2713
Drawn by: R. Speirs
Date: 8 March 2017

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4 Results

This section provides the results of the background review and surveys.

4.1 Vegetation Assessment

4.1.1 Plant Community Type (PCT) and Zones Mapping Overview

As discussed in Section 2.2, the study area and surrounding locality has been utilised for agriculture since the mid 1800s and the majority has been cleared, leaving the occasional mature paddock trees, no midstorey, and a variable groundlayer. Parts of the study area have been cultivated and the remainder is continuously grazed. No regeneration of overstorey trees is present within any of the vegetation zones occurring within paddocks, however there is some regeneration occurring along the verges of Old Cooma Road.

The study area supports the following three PCTs as shown in Figure 3. Potential limitations of this mapping are discussed in Section 3.6.

1. **PCT999** – Norton's Box - Broad-leaved Peppermint open forest on foot slopes, central and southern South Eastern Highlands Bioregion.

   This community tends to occur on rocky, shallow soil. In its unaltered form it is characterised by a semi open canopy of Norton's Box *E. nortonii* and Broad-leaved Peppermint *E. dives*, with other trees such as Red Box *E. polyanthemos* also present. It is likely to have been the dominant community across the study area, particularly the hills and rocky ridges. Within the study area it is present in a modified form, having undergone extensive tree clearance. The groundstorey of much of this PCT is predominantly native, with some patches of more diverse vegetation remaining despite the intensive grazing history of the study area.

   Three zones of this PCT were recorded within the study area, one with moderate-high diversity (Zone 1), one with low diversity (Zone 2), and one that is exotic-dominated (Zone 3).

2. **PCT 1330** – Yellow Box Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands.

   This community occurs on soils of moderate to high fertility and generally moderate depth. In its climax form this community would have been characterised by an open canopy dominated by Yellow Box and Blakely's Red Gum, sparse or absent mid and shrubstorey, together with a defined grassy groundcover supporting a high diversity of native forbs.

   As detailed below and illustrated in Figure 3, parts of the study area support PCT1330 in a highly modified form. Some patches support a predominantly native groundstorey with low forb diversity and a few scattered remnant trees. These patches were defined as 'Zone 1'. The remainder of the PCT is characterised by an exotic-dominated groundstorey with a few scattered remnant trees and was defined as 'Zone 2'.

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3. **PCT 1298** – Wet tussock grasslands of cold air drainage areas of the tablelands.

   This natural grassland community occurs on moist or periodically inundated soils, generally associated with the bottoms of broad valleys subject to extended periods of stagnant cold air and heavy, prolonged frost. Dominant species include Tall Sedge *Carex appressa*, Poa *Poa labillardierei* and other moisture tolerant species. Trees are usually absent, however Candlebark *Eucalyptus rubida* often occurs along the ecotone between the community and the woodland or forest communities which it usually adjoins.

   This PCT was mapped in the southeast of the study area, where cold air drainage is likely to have led to a naturally treeless community dominated by native grasses and forbs. This PCT is now dominated by exotic vegetation and thus only one zone (Zone 1) was mapped.

4.1.2 Vegetation Zones and Quadrat/Transect Results

The study area was found to support six discernible Vegetation Zones, as detailed in Table 2 and illustrated in Figure 3. Plates 1 to 8 provide representative photographs of each of the Vegetation Zones.

Seventeen floristic plot/transect sets were completed, and the results are provided in Appendix 1. The results provide clear confirmation of the distinction between the identified PCTs and Vegetation Zones. For example, Zones 999.1 and 999.2 are characterised by a native dominated groundstorey, however Zone 999.1 quadrats supported between 18 and 24 native species per plot, whereas Zone 999.2 supported between 7 and 15 native species per plot. The quantification of diversity is important as the accurate documentation of groundstorey diversity is of critical importance to the listing criteria for temperate threatened ecological communities (refer to Section 4.1.3).

Table 2. Vegetation Zones

PCT	Vegetation Zone ID	Photograph Plate	Groundstorey Dominance Native or Exotic	Diversity Low or Mod-high	Number of Plots/Transects Completed	Total Area Ha
PCT999	999.1	1	Native	Mod-high	2	3.37
	999.2	2	Native	Low	5	56.49
	999.3	3	Exotic	Low	2	19.20
PCT1330	1330.1	4	Native	Low	3	12.55
	1330.2	5	Exotic	Low	3	43.47
PCT1298	1298.1	6	Exotic	Low	2	19.01

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Plate 1. PCT 999 – Zone 1

Plate 2. PCT 999 – Zone 2

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Plate 3. PCT 999 – Zone 3

Plate 4. PCT 1330 – Zone 1

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Plate 5. PCT 1330 – Zone 2

Plate 6. PCT 1298 – Zone 1

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4.1.3 Threatened Ecological Communities

Commonwealth EPBC Act

As the development of the study area has already been approved under the EPBC Act, specific assessment of communities listed under this Act is not required. Nevertheless, it is important to provide context for the assessment of the development under NSW legislation.

Two threatened communities have the potential to occur in the area, both listed as critically endangered under the EPBC Act: 'Natural Temperate Grassland of the South Eastern Highlands', and 'White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland'. Although both communities would likely have occurred prior to clearance and modification from agriculture, the study area does not currently support either community. PCT 1330 Zone 1 does not support the tree cover or native diversity required to meet the criteria for the grassy woodland community, and PCT 1330 Zone 2 and PCT 1298 are both predominantly exotic (as well as being very low diversity), and thus do not meet the EPBC Act criteria for the grassy woodland and natural temperate grassland communities respectively.

NSW TSC Act

As Natural Temperate Grassland is not listed under the TSC Act, only one TSC Act listed community has been assessed for the potential to occur in the study area: 'White Box – Yellow Box – Blakely's Red Gum Woodland'. This community, listed as endangered in NSW, is described below, together with an assessment of its presence and condition within the study area.

White Box – Yellow Box – Blakely's Red Gum Woodland

The below description is extracted from the NSW *Final Determination for the TSC Act endangered listed ecological community White Box – Yellow Box – Blakely's Red Gum Woodland* (TSC Act Box-Gum Woodland) (the 'Final Determination') (NSW Scientific Committee 2002, gazetted 15 March 2002).

> *White Box Yellow Box Blakely's Red Gum Woodland is found on relatively fertile soils on the tablelands and western slopes of NSW and generally occurs between the 400 and 800 mm isohyets extending from the western slopes, at an altitude of c. 170m to c. 1200 m, on the northern tablelands (Beadle 1981). The community occurs within the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands and NSW South Western Slopes Bioregions.*
>
> *White Box Yellow Box Blakely's Red Gum Woodland includes those woodlands where the characteristic tree species include one or more of the following species in varying proportions and combinations - Eucalyptus albens (White Box), Eucalyptus melliodora (Yellow Box) or Eucalyptus blakelyi (Blakely's Red Gum). Grass and herbaceous species generally characterise the ground layer. In some locations, the tree overstorey may be absent as a result of past clearing or thinning and at these locations only an understorey may be present. Shrubs are generally sparse or absent, though they may be locally common.*

Although the Final Determination does not provide specific listing criteria against which to assess a patch of vegetation, a useful key is provided in *Identification Guidelines for Endangered Ecological Communities - White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland)* (NPWS 2002), which draws its information from the Final Determination. As described in the Final Determination and the associated key, the definition for the TSC Act Box-Gum Woodland TEC is

extremely broad. In effect, any land for which the climax community is Box-Gum Woodland that has not been cultivated, become a stock camp, or otherwise been entirely modified, is likely to meet the minimum definition of the TSC Act listed TEC. As such, PCT 1330 Zone 1 meets the criteria for this community under the TSC Act, albeit in a marginal form.

4.2 Habitat Values

4.2.1 Fauna Habitat Features

The fauna habitat features within the study area include scattered and outcropping rock, native grassland, remnant eucalypts, and scattered shrubs. The study area contains numerous farm dams, however no significant creek or wetland habitat is present. These fauna habitat features are detailed in Table 3.

Table 3. Fauna habitat features

Habitat Feature	Description	Relevant Native Fauna Species/Assemblages
Rock scatters and outcrops	Small outcrops of rocks of volcanic origin occur within the study area. The degree of embedment of the rocks varies however the rocks are predominantly deeply embedded.	Patches of the rock scatter with small to medium plate-like rocks surrounded by native grasses potential habitat for the Pink-tailed Worm-lizard *Aprasia parapulchella* (EPBC Act and TSC Act vulnerable listed). A survey for the species was undertaken and the results provided in Section 4.3.1. The rocky habitat within the study area may support several common reptiles and invertebrate species.
Grassland	As described in Section 4.1, the study area supports grassy vegetation communities in the form of grassy woodland and derived grassland. The value of these areas to native fauna, particularly threatened species, depends largely on the degree of modification.	The grassy woodland and derived grassland would provide foraging resources for the numerous woodland birds occurring in the study area. Grassy areas (the majority of the study area) would provide grazing resources for common herbivores such as the Eastern Grey Kangaroos *Macropus giganteus*, Swamp Wallaby *M. bicolor* and Common Wombat *Vombatus ursinus*. Open areas provide hunting resources for raptors and other predatory birds.
Remnant eucalypts	Few hollows were recorded in the trees located within the study area. The mature eucalypts support some Mistletoe *Amyema* spp. plants and the eucalypts, particularly the Yellow Box, provide a nectar resource when in flower.	The flowering eucalypts and Mistletoe are likely to provide feeding resources for a broad variety of birds. Hollows are likely to provide a nesting resource for common birds.
Scattered shrubs	The midstorey and shrubstorey strata are sparse within the study area, but some low shrubs are present within parts of the dry forest PCT.	The scattered native shrubs would provide limited nesting and refuge resources for the small native birds likely to occur within the study area and surrounds.

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Habitat Feature	Description	Relevant Native Fauna Species/Assemblages
Farm dams	The study area contains eleven farm dams. These dams are used to water stock and are therefore murky and support little fringing vegetation.	The dams provide limited foraging and/or breeding resources for common native fauna, include waterfowl, frogs, and Eastern Long-necked Turtles *Chelodina longicollis*. Their lack of fringing vegetation, disturbed condition and distance from tree cover would prevent the dams from providing important habitat for any listed fauna species.

4.2.2 Tree Habitat Re-assessment

During the survey a total of 252 trees present within the study area with a DBH ≥ 20 cm were assessed for their ecological values. For the 196 trees that had been previously surveyed by Biosis (2015), data was verified and, in some cases, updates were made. The tree assessment results are provided as Appendix 2 and the trees recorded are shown on Figure 3.

A total of 60 hollow-bearing trees, supporting 108 hollows, were recorded within the study area. Only three of these trees, each supporting only one hollow, were recorded within the 56 trees that had not been previously surveyed (i.e. located within roadside vegetation). Three new stick nests were recorded, one of these within the roadside vegetation, all likely to have belonged to a Magpie *Cracticus tibicen*, Australian Raven *Corvus coronoides* or similar species. In addition, Sulfur-crested Cockatoos *Cacatua galerita* were observed utilising a tree hollow, and Crimson Rosellas *Platycercus elegans*, Tree Martins *Petrochelidon nigricans*, and Galahs *Eolophus roseicapilla* were also observed in hollow-bearing trees.

Two trees in the southeast of the study area, previously recorded as Red Box, were confirmed as being Candlebark. Candlebark are often associated with the ecotone between temperate woodland and natural grassland communities, and as such, the recording of these trees supports the presence of PCT1298 in the southeast of the study area in the current PCT mapping.

4.2.3 Grassland Fauna Habitat Assessment Transects

The results of the four completed OEH Grassland Habitat Assessment Transects are provided in Appendix 3). As detailed in Appendix 3, the native dominated portions of the open grassland within the study area are primarily comprised of species of the grass genera *Rytidosperma* (Wallaby Grasses) and *Austrostipa* (Spear Grasses) with Wheat Grass *Elymus scaber* and Hairy Panic *Panicum effusum* also subdominant.

As discussed in Section 4.1 and detailed in Appendix 3, the open derived grasslands within the study area have been highly modified and simplified by extended high intensity grazing. Whilst this modification has greatly depleted the habitat value of this land for a diversity of native flora and fauna, it has likely encouraged the dominance of the most grazing tolerate native grasses, namely Wallaby Grasses and Spear Grasses. The dominance of Wallaby Grasses is particularly noteworthy given that the genus is the primary natural food plant of the Golden Sun Moth.

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4.3 Significant Species

4.3.1 Survey results

Vegetation Assessment and Incidental Records

A total of 84 flora species were recorded within the study area during the completed plot/transect surveys, comprising 43 native species and 41 exotic species. The full species lists are included in Appendix 1.

No threatened flora or fauna species were recorded during the surveys completed for this assessment. In addition to the sheep, horses and cattle grazing the study area, the only exotic fauna species recorded within the study area were the Red Fox *Vulpes vulpes*, Common Starling *Sturnus tristis* and Indian Myna *Sturnus vulgaris*.

Pink-tailed Worm-lizard Targeted Survey

As described in Section 3.5.3, two ecologists spent five hours (ten hours of survey effort) turning rocks across the study area on 23 September 2016. No Pink-tailed Worm-lizards were recorded and the species is considered unlikely to occur within the study area.

Golden Sun Moth Targeted Survey

As described in Section 3.5.3, four targeted surveys were completed for this species. No Golden Sun Moths were recorded.

To date the only confirmed records of the Golden Sun Moth in the Googong locality are located approximately 5.5 kilometres northwest of the study area (Johnstone Centre in 2004). Those records occur in a patch of remnant Natural Temperate Grassland (the primary habitat of the Golden Sun Moth) located on land with a history of considerably lighter grazing than the study area. Furthermore, no Golden Sun Moths have been recorded at Googong during any of the targeted surveys completed in recent years (Johnstone Centre in 2004, Biosis Research 2009, Capital Ecology 2016).

In light of the above, whilst the study area does occur within the broad distribution of the Golden Sun Moth and it does support an extensive area of characteristically suitable habitat, based on the results of this survey program and those of previous surveys completed within the study area and nearby, it is now reasonable to assert that the species is highly unlikely to occur within the study area.

4.3.2 Likelihood of Occurrence and Potential for Impact

A likelihood of occurrence assessment for threatened flora and fauna species was undertaken as described in Section 3.4. The full likelihood of occurrence assessment is provided as Appendix 5. Eleven EPBC Act and/or TSC Act listed threatened flora species and 43 EPBC Act and/or TSC Act listed threatened fauna species were assessed for their potential to occur within the study area.

As discussed in Section 6.1.1, the preparation of an Assessment of Significance (seven-part-test) is required pursuant to EP&A Act for each threatened species or population that may be adversely impacted by the proposed development.

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Table 4 lists those threatened species assigned a moderate or higher likelihood of occurrence within the study area and determines whether further assessment is required according to the Assessment of Significance Guidelines (DECC 2007).

As per Table 4, additional assessment is required for White-fronted Chat *Epthianura albifrons*, Scarlet Robin *Petroica boodang*, and Flame Robin *Petroica phoenica*.

As the study area does not support any marine areas or substantial wetlands, marine and wetland migratory species will not be impacted by the proposed development and thus they have not been specifically considered in this F&FA. Similarly, although terrestrial migratory species may pass through the study area, the habitat is highly unlikely to be important to any migratory species.

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Table 4. Potential for adverse impacts to species with moderate or higher likelihood of occurrence

Key for below table

EPBC Act:	**TSC Act:**
CE - critically endangered	CE1 - critically endangered (Part 1, Schedule 1A)
E - endangered	E1 - endangered species (Schedule 1, Part 1)
V - vulnerable	E2 - endangered population (Schedule 1, Part 2)
CD - conservation dependent	E4 - presumed extinct (Schedule 1, Part 4)
	V1 - vulnerable species (Schedule 2, Part 1)

Note: Golden Sun Moth and Pink-tailed Worm-lizard included in the table to provide clarity for Council, as they are known to be species of focus in the locality, despite the likelihood of occurrence being considered low.

Species Name	**Status**		**Habitat Values Present**	**Potential for Adverse Impact on Threatened Species or Population[1] Does the proposed development have the potential to:**			**Is Impact Assessment Required?[2]**
	EPBC Act	**TSC Act**		**cause the loss or disturbance of limiting foraging or breeding resources?**	**fragment limiting habitat?**	**adversely affect stages of the lifecycle of the species?**	
Birds							
Artamus cyanopterus cyanopterus Dusky Woodswallow	-	V1	Likely foraging habitat	No	No	No	No
Callocephalon fimbriatum Gang-gang Cockatoo	-	V1	Likely foraging habitat	No	No	No	No
Chthonicola sagittata Speckled Warbler	-	V1	Potential foraging habitat	No	No	No	No
Circus assimilis Spotted Harrier	-	V	Potential foraging habitat	No	No	No	No

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Species Name	Status		Habitat Values Present	Potential for Adverse Impact on Threatened Species or Population[1] Does the proposed development have the potential to:			Is Impact Assessment Required?[2]
	EPBC Act	TSC Act		cause the loss or disturbance of limiting foraging or breeding resources?	fragment limiting habitat?	adversely affect stages of the lifecycle of the species?	
Epthianura albifrons White-fronted Chat	-	V1	Likely foraging habitat	**Yes**	No	No	**Yes**
Glossopsitta pusilla Little Lorikeet	-	V1	Potential foraging habitat	No	No	No	No
Grantiella picta Painted Honeyeater	-	V1	Potential foraging habitat	No	No	No	No
Hieraaetus morphnoides Little Eagle	-	V1	Likely foraging habitat	No	No	No	No
Lathamus discolor Swift Parrot	E	E1	Potential foraging habitat	No	No	No	No
Melanodryas cucullata cucullata Hooded Robin (southeastern form)	-	V1	Likely foraging habitat	No	No	No	No
Petroica boodang Scarlet Robin	-	V1	Likely foraging habitat	**Yes**	No	**Yes**	**Yes**
Petroica phoenica Flame Robin	-	V1	Likely winter foraging habitat	**Yes**	No	No	**Yes**
Stagonopleura guttata Diamond Firetail	-	V1	Potential foraging habitat	No	No	No	No

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Species Name	Status		Habitat Values Present	Potential for Adverse Impact on Threatened Species or Population[1] Does the proposed development have the potential to:			Is Impact Assessment Required?[2]
	EPBC Act	TSC Act		cause the loss or disturbance of limiting foraging or breeding resources?	fragment limiting habitat?	adversely affect stages of the lifecycle of the species?	
Insects							
Synemon plana Golden Sun Moth	CE	E1	Potential habitat was surveyed for this assessment and the species was not recorded.	No	No	No	No
Mammals							
Falsistrellus tasmaniensis Eastern False Pipistrelle	-	V1	Potential foraging habitat	No	No	No	No
Miniopterus schreibersii oceanensis Eastern Bentwing Bat	-	V1	Potential foraging habitat	No	No	No	No
Reptiles							
Aprasia parapulchella Pink-tailed Worm-lizard	V	V1	Potential habitat was surveyed for this assessment and the species was not recorded.	No	No	No	No

[1]Table adapted from the *Threatened Species Assessment Guidelines – The Assessment of Significance* (DECC 2007).

[2] EP&A Act Assessment of Significance (seven-part-test) (refer Section 0).

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4.4 Noxious Weeds

As detailed in Appendix 1, 41 exotic plant species were recorded within the study area. Whilst the majority of these are common weeds across the agricultural land throughout the region, each species detailed in Table 5 is listed as a Weed or National Significance (Commonwealth) and/or as a noxious species for the Queanbeyan-Palerang Local Control Area (LCA).

Table 5. Noxious weed occurrence

Key for below table

- WoNS - (Commonwealth) Weed of National Significance
- Noxious weed status under the NSW *Noxious Weeds Act 1993* (Queanbeyan-Palerang LCA)

Class 1	State prohibited species
Class 2	Regionally prohibited species
Class 3	Regionally controlled species
Class 4	Regionally restricted species
Class 5	Restricted plant

Name	Growth Form	Status	Description of Occurrence	Threat Level
Echium plantagineum Paterson's Curse	Forb <1.2m	Class 4	Few scattered plants.	Low
Eragrostis curvula African Love Grass	Tussock <1.2m	Class 4	Scattered small infestations across the study area.	Very High – In the absence of control this infestation will rapidly proliferate throughout the study area. Control should also occur after development, as this species can take over landscape plantings.
Hypericum perforatum St John's Wort	Forb <1m	Class 4	Recorded in patches across the study area.	Moderate.
Nassella trichotoma Serrated Tussock	Tussock <0.6m	WoNS, Class 4	Scattered tussocks across the study area, particularly around the slopes of Nangi Pimble (Hill 800).	High – control should occur following works to ensure the species does not colonise bare ground. Control should also occur after development, as this species can establish in landscape plantings.
Rosa rubiginosa Briar Rose	Shrub <3m		Scattered plants occur.	Moderate – Control of this species is recommended.
Rubus fruticosis Blackberry	Shrub/bramble <3m	WoNS, Class 4	A few small brambles within the study area, predominantly associated with drainage lines.	Moderate – The infestation is currently at low levels.

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4.5 Pest Animals

The Red Fox, Common Starling and Indian Myna were the only exotic fauna species recorded during the field surveys, however the exotic pest species European Brown Hare *Lepus europaeus*, Feral Cat *Felis catus*, European Rabbit *Oryctolagus cuniculus*, and Feral Pig *Sus scrofa*, are also likely to occur within the study area and surrounds. The Red Fox, European Rabbit and Feral Pig are species which are the cause of or key contributor toward a Key Threatening Process declared under the EPBC Act. Pest fauna do not currently appear to be having a significant negative impact upon the study area – the level of infestation of these species appears to be consistent with that present across much of the agricultural land in the locality.

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5 Proposed Measures to Reduce Impacts on Biodiversity

In order to reduce potential impacts upon the ecological values within the study area, a number of measures will be implemented during and following the proposed development. These are described below.

Retention of Paddock Trees

Subdivision design will retain remnant trees where practicable, having regard to the habitat values, amenity values, structural integrity of the tree (as described in the tree assessment, SpaceLab 2016), urban design, service requirements, and the general grading required by the subdivision. The trees to be retained, and those to removed, will be identified on the engineering drawings and within the Statement of Environmental Effects (SEE) (Elton Consulting 2017) for the subdivision application.

Weed Management

The weed management measures that will be implemented to prevent the introduction and/or spread of weeds include the following.

- Appropriate vehicle hygiene will be maintained. Vehicles and machinery entering the study area will be clean of weed seed or propagules.
- Only soils sourced on site will be used to fill excavations within open space, landscaping, or conservation areas. No top-soil or other potentially weed seed laden organic material will be imported from elsewhere.
- Only sterile materials such as hessian/jute or rice straw will be used for soil stabilisation or similar purposes.

A weed control program will be developed to prevent the establishment and spread of significant weeds and control other less significant exotic species (lawn/pasture grasses etc.) within road verges, landscaped areas, and other open space.

Recommendations for Landscaping

Open space areas will be established, including the top and upper slopes of Nangi Pimble (Hill 800), wetland areas, and other woodland/forest patches.

The following principles will be followed in all landscaping.

- Local native species will be used for landscaping to the fullest extent practicable. A list of recommended species for the applicable original PCTs is provided as Appendix 6.
- Where practicable within open space areas, all strata will be re-established (i.e. groundcover, midstorey shrubs, and canopy trees) to create habitat complexity. This will discourage urban adapted species and encourage small woodland birds to visit the neighbourhood. Open space plantings will comprise only species appropriate for the applicable original PCT.

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- Wetland areas will be of a large size, be located within a buffer of restored woodland (with planted Yellow Box and Blakely's Red Gum) or grassland, and contain island habitat inaccessible to cats and foxes. Such design features will encourage visitation, and potentially breeding, by waterbirds.
- Signs will be erected educating the public on the valuable native flora and fauna being conserved within the Googong open space network.

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6 Assessment against Biodiversity Conservation Legislation and Policy

This section provides an assessment of the proposed development against the current biodiversity conservation legislation and government policy. As the proposed development has been approved under the EPBC Act, only NSW legislation and policy is addressed.

6.1 New South Wales (State)

6.1.1 Environmental Planning and Assessment Act 1979

The EP&A Act was enacted to ensure that the impacts of proposed development or land-use changes on the environment (including biodiversity) are properly considered and controlled. The EP&A Act is administered by the NSW Department of Planning and Infrastructure.

The part of the EP&A Act of key relevance to the protection and conservation of biodiversity is discussed below.

Assessment of Significance (Section 5A)

Section 5A of the EP&A Act (and Section 94 of the TSC Act) outlines seven factors that must be taken into account in an Assessment of Significance (AoS) (known as a seven-part-test). If an AoS deems the development likely to significantly affect a threatened species, population, ecological communities or its habitat, a Species Impact Statement (SIS) must be prepared as outlined in Section 110 of the TSC Act.

As described in Section 4.1.3, the portions of the study area mapped as PCT 1330 Zone 1 support the NSW listed TEC 'White Box – Yellow Box – Blakely's Red Gum grassy woodland', albeit in a marginal form. An AoS was prepared for this community and is provided in Appendix 7, the results of which indicate that the proposed development is unlikely to significantly affect this TEC.

As indicated in Table 4, three TSC Act listed species were considered to warrant the preparation of AoS. These have been completed and are provided in Appendix 7, the results of which indicate that the proposed development is unlikely to have a significant impact upon any TSC Act listed species.

Given the above, no SISs are required for the proposed development.

State Environmental Planning Policies

State Environmental Planning Policies (SEPPs) outline policy objectives relevant to state wide issues. One SEPP of a biodiversity conservation focus, *State Environmental Planning Policy No 44 – Koala Habitat Protection*, is of relevance to the study area. SEPP 44 –

Aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline:

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(a) by requiring the preparation of plans of management before development consent can be granted in relation to areas of core koala habitat, and

(b) by encouraging the identification of areas of core koala habitat, and

(c) by encouraging the inclusion of areas of core koala habitat in environment protection zones.

With regard to the current application of SEPP 44 for the study area, the following points are noted.

1. The study area is located within the former Yarrowlumla shire, a local government area to which SEPP 44 applies, as listed in Schedule 1.

2. *Potential koala habitat means areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.*

   None of the eucalypt species listed in Schedule 2 occur within the study area or nearby. Accordingly, the study area does not support 'potential koala habitat'.

3. There are no records of koalas in the locality and the species is not known to occur in the lowland areas of the ACT and surrounding areas of NSW.

It is noted that an amendment of SEPP 44 has been proposed, as outlined in the *State Environmental Planning Policy No 44 – Koala Habitat Protection Explanation of Intended Effect (EIE)* November 2016 (NSW Department of Planning and Environment 2016). The elements of this amendment of relevance to the study are as follows.

1. The list of local government areas to which SEPP 44 applies will be updated to recognise recent council amalgamations, therefore Queanbeyan-Palerang will be listed. However, as noted above, the study area occurs within the former Yarrowlumla shire and thus is already subject to SEPP 44.

2. The current list of 10 recognised koala food tree species will be updated to include 65 species. The eucalypt species present within the study area are included in this updated list, and therefore, the study area will be considered as supporting 'potential koala habitat'.

Notwithstanding this above, as there are no records of koalas in the locality and the species is not known to occur in the lowland areas of the ACT and surrounding areas of NSW, the study area does not support 'koala habitat'.

In light of the above, Council can be satisfied that the land is not koala habitat, and it is therefore not prevented, because of this SEPP 44, from granting consent to the development application for Neighbourhood 2.

6.1.2 Threatened Species Conservation Act 1995

The TSC Act provides for the protection and conservation of biodiversity in NSW through the listing of threatened species, populations and communities, together with the listing of critical habitat and key threatening processes for these.

Critical habitat for an endangered or critically endangered species, population or ecological community is described on the Register of Critical Habitat maintained by OEH. The study area does not contain declared critical habitat for a species, population or ecological community.

6.1.3 Native Vegetation Act 2003

The NV Act provides the framework for the management of native vegetation in NSW, preventing broad-scale clearing unless it improves or maintains environmental outcomes. Native vegetation is classified as any species of vegetation that existed in NSW before pastoral settlement, including trees, saplings, shrubs, scrub, understorey, groundcover or wetland plants.

Under the NV Act, clearing of native vegetation is prohibited unless it is permitted for a routine agricultural management activities (RAMAs), is in accordance with development consent from the relevant Council or other authority or under a Property Vegetation Plan (PVP) approved by NSW Local Land Service.

Schedule 1 of the NV Act lists land excluded from operation of the Act. As the study area is considered an 'urban area' (comprising various 'urban' zones as listed under Part 3 of Schedule 1), it is excluded from the operation of the NV Act.

6.1.4 Noxious Weeds Act 1993

The NW Act was enacted to provide for the identification, classification and control of declared noxious weeds. The *Noxious Weeds (Weed Control) Order 2014* (known as Weed Control Order No. 30) (DPI 2014) details the weeds declared noxious in New South Wales under the NV Act. Weed Control Order No 30 lists the weed name, control class and legal control requirements for each species declared in a Local Control Authority area (generally aligning with a Local Government Area).

The following website provides further information regarding the NW Act and its application: http://www.dpi.nsw.gov.au/aboutus/about/legislation-acts/noxious-weeds

The declared noxious weeds recorded within the new easement component of the study area are detailed in Table 5. An occupier (other than a public authority or a Local Control Authority) is required under the NW Act to implement all reasonable measures to eradicate state prohibited weeds and comply with the stated requirements for notifiable weeds and restricted plants. Weed control measures should be followed for the proposed development (refer to recommendations in Section 5).

6.1.5 Fisheries Management Act 1994

The objective of the FM Act is to conserve, develop and share the fishery resources of NSW for the benefit of present and future generations. The study area does not support any community, species or potential habitat for any species listed pursuant to the FM Act, and therefore, the proposed development is unlikely to significantly affect any such species or population thereof. Accordingly, no further consideration of aquatic species and their habitat is required.

6.2 Summary of Assessment Results and Requirements

This F&FA provides a thorough investigation into the currently listed significant biodiversity values (i.e. threatened flora and fauna species and threatened ecological communities) that occur or have the

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potential to occur within the study area. A detailed assessment has then been undertaken to assess the likely type and degree of any impacts that the proposed development may have upon the identified biodiversity values, as required in accordance with the EP&A Act and TSC Act. Table 6 provides a summary of the results of this assessment and any corresponding approvals or requirements applicable to the proposed development, pursuant to the current relevant biodiversity conservation legislation.

Table 6. Summary of assessment results and corresponding requirements

Legislation/Policy	Relevant Biodiversity Value/s	Assessment Results and Requirements
New South Wales (State)		
Environmental Planning & Assessment Act 1979	White Box – Yellow Box – Blakely's Red Gum grassy woodland (TSC Act Box-Gum Woodland). Potential habitat for threatened fauna species.	The proposed development is unlikely to significantly affect this TSC Act listed TEC or any of the relevant TSC Act listed threatened species. Accordingly, the preparation of Species Impact Statements or the provision of a formal offset is not considered warranted for the proposed development.
Threatened Species Conservation Act 1995	White Box – Yellow Box – Blakely's Red Gum grassy woodland (TSC Act Box-Gum Woodland). Potential habitat for threatened fauna species.	Refer above. The study area does not contain declared critical habitat for any species, population or ecological community.
State Environmental Planning Policy 44 – Koala Habitat Protection	There is no koala habitat within the study area.	No further consideration of this SEPP is required.
Native Vegetation Act 2003	Native vegetation.	Not relevant to the proposed development as the study area has urban zoning.
Noxious Weeds Act 1993	Noxious weeds.	The occupier is required under the NW Act to implement all reasonable measures in accordance with the requirements of Weed Control Order No. 30. As detailed in Section 4.4 and Section 5, weed control and monitoring is required.
Fisheries Management Act 1994	None.	The study area does not support any community, species, or potential habitat for any species, listed pursuant to the FM Act.

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7 Conclusion

This F&FA presents the results of a thorough investigation undertaken by Capital Ecology into the currently listed significant biodiversity values that occur or have the potential to occur within the study area. The results of field surveys, together with information obtained from a review of relevant databases and literature, have informed the assessment of the significance of the impacts that the proposed development is likely to have upon the identified biodiversity values.

Based on the assessment provided herein, it is concluded that, with the implementation of the proposed measures to avoid, minimise and mitigate impacts upon biodiversity values (as detailed in Section 5), the proposed development is unlikely to significantly affect any threatened species, population or ecological community listed pursuant to the NSW TSC Act. Accordingly, the preparation of Species Impact Statements, or the provision of a formal offset, is not considered warranted for the proposed development.

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Appendices

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Appendix 1. Vegetation Assessment Results

Key for below table

EPBC Act:
CE - critically endangered
E - endangered
V - vulnerable
CD - conservation dependent

TSC Act:
CE1 - critically endangered (Part 1, Schedule 1A)
E1 - endangered species (Schedule 1, Part 1)
E2 - endangered population (Schedule 1, Part 2)
E4 - presumed extinct (Schedule 1, Part 4)
V1 - vulnerable species (Schedule 2, Part 1)

\# - Native species outside of its natural distribution
WoNS - (Commonwealth) Weed of National Significance
Noxious weed status under the NSW *Noxious Weeds Act 1993* (Queanbeyan LGA)
Class 1 State prohibited species
Class 2 Regionally prohibited species
Class 3 Regionally controlled species
Class 4 Regionally restricted species
Class 5 Restricted plant

Note: For **Error! Reference source not found.**, the groundcover stratum adds to 100%. This includes Native groundcover (shrubs) %, Native groundcover (grasses) %, Native groundcover (other) %, Exotic groundcover %, and the remainder (not shown in t able – includes bare ground, rock, litter/dead vegetation etc.). Native overstorey cover % and Native midstorey cover %, are measures of the percentage cover of each stratum, each a separate percentage.

Vegetation survey data – species recorded during transect/plot surveys

Vegetation Surveys Plots and Transects - Data summary

Survey Dates	22/11/2016, 30/11/2016
Surveyors	Robert Speirs and Samantha Vertucci

Plant Community Type (PCT) Code			**999**									**1330**						**1298**	
Vegetation Zone			1		2					3		1			2			1	
Transect/Plot Number			1	2	1	2	3	4	5	1	2	1	2	3	1	2	3	1	2
Transect/Plot Identifier			**999.1.1**	**999.1.2**	**999.2.1**	**999.2.2**	**999.2.3**	**999.2.4**	**999.2.5**	**999.3.1**	**999.3.2**	**1330.1.1**	**1330.1.2**	**1330.1.3**	**1330.2.1**	**1330.2.2**	**1330.2.3**	**1298.1.1**	**1298.1.2**
ID for data entry			**1**	**2**	**7**	**6**	**4**	**5**	**3**	**9**	**8**	**11**	**10**	**12**	**15**	**13**	**14**	**16**	**17**
Native overstorey cover %			0	0	0	11.5	0	0	0	0	0	0	0	0	0	0	0	0	0
Native midstorey cover %			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Native groundcover (shrubs) %			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Native groundcover (grasses) %			44	62	44	30	58	68	40	0	4	46	64	30	0	10	22	0	0
Native groundcover (other) %			14	10	0	0	0	0	8	0	0	0	0	0	0	2	0	10	20
Exotic groundcover %			18	4	40	48	20	20	19	66	80	50	24	52	95	78	72	90	80
Total length of fallen logs (m)			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of trees with hollows			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
					High exotic annual %	High exotic annual %						High exotic annual %	High exotic annual %	High exotic annual %	Sown to oats, sown-out to Lolium		Sown to mixed native / exotic		
Species Name	**Common Name**	**Status**																	
Groundcover																			
Native																			
Asperula conferta	Common Woodruff								X										
Austrostipa bigeniculata	Tall Speargrass				X	X		X	X			X	X	X			X		
Austrostipa scabra	Corkscrew		X		X	X		X	X	X	X	X	X	X		X			

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Bossiaea buxifolia	Matted Bossiaea																	
Bothriochloa macra	Red-leg Grass			X	X								X					
Carex appressa	Tall Sedge																X	X
Cheilanthes sieberi	Rock Fern			X			X											
Chrysocephalum apiculatum	Common Everlasting		X															
Convolvulus angustissimus	Austral Bindweed								X						X			
Cymbonotus lawsonianus	Austral Bears-ear		X	X					X									
Dichelachne sp.	Plume Grass			X					X									
Elymus scaber	Wheat Grass				X				X					X		X	X		X
Euchiton sp.	Native Cudweed		X			X		X					X						
Geranium solanderi	Native Geranium			X	X								X						X
Gonocarpus tetragynus	Raspwort						X												
Goodenia hederacea	Ivy Goodenia			X			X												
Hydrocotyle laxiflora	Stinking Pennywort						X												
Hypericum gramineum	Small St John's Wort			X															
Juncus australis	Austral Rush				X				X		X		X	X		X		X	X
Juncus filicaulis	Finger Rush		X	X	X	X	X	X	X				X						X
Leptorhynchos squamatus	Scaly Buttons		X	X															
Lissanthe strigosa	Peach Heath			X															
Lomandra filiformis subsp. coriacea	Wattle Mat-rush		X	X	X	X	X		X			X	X			X			
Melichrus urceolatus	Urn Heath			X															
Microlaena stipoides	Weeping Grass				X	X	X					X		X					
Oxalis perennans	Perennial Oxalis												X						
Panicum effusum	Hairy Panic		X	X			X	X											
Pimelia curviflora	Creamy Candles		X																
Poa sieberiana	Snow Grass				X				X			X		X		X			
Rumex brownii	Swamp Dock		X		X					X	X			X					X
Rytidosperma pallidum	Red-anther Wallaby Grass			X	X		X	X											
Rytidosperma sp.	Wallaby Grass		X	X	X		X	X				X	X	X		X	X		
Schoenus apogon	Common Bog Sedge			X															
Solenogyne dominii	Smooth Solenogyne		X	X			X	X											
Themeda triandra	Kangaroo Grass		X	X			X					X				X			
Thysanotus tuberosus	Common Fringe-lily			X															
Tricoryne elatior	Yellow Rush-lily		X	X								X							
Triptilodiscus pygmaeus	Common Sunray		X	X			X	X											
Vittadinia cuneata	Fuzzweed		X																
Vittadinia muelleri	Narrow-leaf New Holland Daisy			X															
Wahlenbergia communis	Tufted Bluebell		X	X		X		X					X	X					X
Wahlenbergia sp.	Blue Bell						X	X	X							X			
Wurmbea dioica	Early Nancy		X	X			X												
Total Native Groundcover Species	**43**		**18**	**24**	**13**	**7**	**15**	**11**	**12**	**2**	**3**	**8**	**10**	**10**	**0**	**9**	**3**	**2**	**7**

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Exotic																			
Acetosella vulgaris	Sorrel		X	X	X	X	X	X	X		X	X		X		X			X
Aira sp.	Air Grass		X	X	X		X	X	X				X			X	X		
Avena sp.	Oats					X					X	X		X	X	X	X		
Briza minor	Shivery Grass			X															
Bromus sp.	Brome Grass						X	X	X	X	X	X	X	X					X
Carthamus lanatus	Saffron Thistle		X	X				X	X	X	X	X	X			X	X		
Capsella bursa-pastoris	Shepherd's Purse									X	X								
Centaurium erythraea	Common Centaury			X		X			X										
Cirsium vulgare	Spear Thistle					X			X			X	X			X		X	X
Conyza sp.	Fleabane		X			X													
Echium plantagineum	Paterson's Curse	Class 4												X					
Eragrostis curvula	African Love Grass	Class 4						X	X		X	X							
Erodium sp.	Storksbill									X									
Festuca arundinacea	Tall Fescue																	X	
Gamochaeta sp.	Spiked Cudweed		X																
Hirschfeldia incana	Hoary Mustard								X							X			
Holcus lanatus	Yorkshire Fog													X		X	X	X	X
Hordeum sp.	Barley Grass									X	X							X	X
Hypericum perforatum	St John's Wort	Class 4		X					X					X					
Hypochaeris glabra	Smoot Cat's Ear				X			X											
Hypochaeris radicata	Flatweed		X	X	X	X	X	X	X			X	X	X		X	X		X
Lolium perenne	Perennial Ryegrass		X		X				X	X	X		X	X	X	X	X		X
Malva sp.	Mallow									X									
Marrubium vulgare	Horehound										X								
Nassella trichotoma	Serrated Tussock	WoNS, Class 4				X	X		X		X						X		
Onopordum acanthium	Scotch Thistle									X	X		X				X		
Paronychia brasiliana	Brazilian Whitlow											X							
Paspalum dilatatum	Paspalum													X					
Petrorhagia nanteuilii	Proliferous Pink			X	X		X		X				X			X			
Phalaris aquatica	Phalaris										X						X	X	X
Plantago lanceolata	Ribwort Plantain		X									X				X	X	X	X
Poa bulbosa	Bulbous Bluegrass								X							X	X	X	
Rosa rubiginosa	Briar Rose	Class 4										X				X			
Rubus fruticosus	Blackberry	Class 4			X														X
Rumex crispus	Curly Dock																	X	
Salvia verbenaca	Wild Sage															X	X		
Solanum linnaeanum	Apple of Sodom									X									
Tolpis barbata	Umbrella Milkwort			X										X					
Trifolium sp.	Clover		X	X			X	X	X		X		X	X		X	X	X	X
Verbascum thapsus	Great Mullein			X					X			X				X			
Vulpia myuros	Rat's Tail Fescue		X	X	X	X	X	X	X	X	X	X	X			X	X		X
Total Exotic Groundcover Species	**41**		**10**	**12**	**8**	**8**	**8**	**9**	**17**	**10**	**14**	**12**	**10**	**11**	**2**	**17**	**14**	**9**	**12**

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Appendix 2. Tree Habitat Assessment Data

Tree ID	Biosis (2015) Tree ID	Biosis (2015) Tree Label	Species	DBH	Height	Hollows				Notes	Number of hollows	HBT	Easting	Northing	Dead / Alive
				cm	m	S	M	L	XL						
1	N/A	N/A	*E. melliodora*	102	18		1				1	1	702100.9	6078353	A
2	N/A	N/A	*E. melliodora*	72	17						0	0	702119.3	6078356	A
27	N/A	N/A	*E. melliodora*	46	7						0	0	701672.5	6078352	A
28	N/A	N/A	*E. melliodora*	23	4						0	0	701657.9	6078328	A
29	N/A	N/A	*E. melliodora*	25	6						0	0	701655	6078322	A
30	N/A	N/A	*E. nortonii*	26	8						0	0	701643.6	6078303	A
31	N/A	N/A	*E. nortonii*	21	9						0	0	701642.2	6078299	A
32	N/A	N/A	*E. nortonii*	22	9						0	0	701638.7	6078295	A
33	N/A	N/A	*E. melliodora*	32	9						0	0	701635.2	6078286	A
34	N/A	N/A	*E. melliodora*	41	11						0	0	701636.7	6078281	A
35	N/A	N/A	*E. melliodora*	42	10						0	0	701630.2	6078271	A
36	N/A	N/A	*E. melliodora*	28	6						0	0	701623.2	6078253	A
37	N/A	N/A	*E. melliodora*	22	7						0	0	701621.2	6078249	A
38	N/A	N/A	*E. melliodora*	27	10						0	0	701613.5	6078225	A
39	N/A	N/A	*E. dives*	30	6						0	0	701610.9	6078213	A
40	N/A	N/A	*E. dives*	21	5						0	0	701606.9	6078198	A
41	N/A	N/A	*E. dives*	39	11						0	0	701604.3	6078187	A
42	N/A	N/A	*E. nortonii*	59	13						0	0	701601.7	6078178	A
43	N/A	N/A	*Exocarpus cupressiformis*	22	5						0	0	701599.9	6078171	A
44	N/A	N/A	*E. nortonii*	110	13						0	0	701596.9	6078161	A
45	N/A	N/A	*E. dives*	25	6						0	0	701589.2	6078144	A
46	N/A	N/A	*E. melliodora*	28	6						0	0	701586.4	6078132	A

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Tree ID	Biosis (2015) Tree ID	Biosis (2015) Tree Label	Species	DBH	Height	Hollows				Notes	Number of hollows	HBT	Easting	Northing	Dead / Alive
				cm	m	S	M	L	XL						
47	N/A	N/A	Unknown - dead	60	3			1		Dead tree	1	1	701582.8	6078112	D
48	N/A	N/A	*E. nortonii*	36	7						0	0	701582.1	6078108	A
49	N/A	N/A	*E. nortonii*	25	6						0	0	701578.6	6078095	A
50	N/A	N/A	*E. rubida*	90	12						0	0	701579.5	6078089	A
51	N/A	N/A	*E. rubida*	27	7						0	0	701579.5	6078083	A
52	N/A	N/A	*E. rubida*	21	9					Clump 52-57	0	0	701578.5	6078075	A
53	N/A	N/A	*E. rubida*	20	9						0	0	701581.4	6078073	A
54	N/A	N/A	*E. rubida*	44	9						0	0	701578.5	6078070	A
55	N/A	N/A	*E. rubida*	30	9						0	0	701582.6	6078070	A
56	N/A	N/A	*E. rubida*	26	9						0	0	701580.5	6078069	A
57	N/A	N/A	*E. rubida*	48	9						0	0	701582.4	6078066	A
58	N/A	N/A	*E. dives*	65	13						0	0	701579	6078064	A
59	N/A	N/A	*E. melliodora*	28	5						0	0	701581.6	6078060	A
60	N/A	N/A	*E. melliodora*	25	5						0	0	701581.8	6078056	A
61	N/A	N/A	*E. melliodora*	100	15					Small stick nest	0	0	701580	6078019	A
62	N/A	N/A	*E. melliodora*	43	10						0	0	701576.7	6078009	A
63	N/A	N/A	*E. melliodora*	103	16						0	0	701577.8	6077991	A
64	N/A	N/A	*E. rubida*	50	11						0	0	701575.4	6077946	A
65	N/A	N/A	*E. rubida*	45	10						0	0	701572.2	6077935	A
66	N/A	N/A	*E. melliodora*	95	13		1				1	1	701574.4	6077913	A
67	N/A	N/A	*Exocarpus cupressiformis*	30	5						0	0	701579.4	6077899	A
68	N/A	N/A	*E. melliodora*	66	13						0	0	701575.8	6077885	A
69	N/A	N/A	*E. melliodora*	24	6						0	0	701578.3	6077883	A
70	N/A	N/A	*E. melliodora*	35	6						0	0	701582	6077875	A

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				cm	m	S	M	L	XL						
71	N/A	N/A	*E. melliodora*	90	11						0	0	701576.9	6077871	A
72	N/A	N/A	*E. rubida*	30	7						0	0	701581.6	6077859	A
73	N/A	N/A	*E. rubida*	31	9					Clump 73-77	0	0	701579.8	6077850	A
74	N/A	N/A	*E. rubida*	31	9						0	0	701582.3	6077846	A
75	N/A	N/A	*E. rubida*	25	9						0	0	701579.8	6077842	A
76	N/A	N/A	*E. rubida*	26	9						0	0	701580.5	6077838	A
77	N/A	N/A	*E. rubida*	42	9						0	0	701581.2	6077833	A
79	N/A	N/A	*E. nortonii*	35	8						0	0	701845	6078411	A
80	N/A	N/A	*E. nortonii*	35	6						0	0	701965.2	6078388	A
81	N/A	N/A	*E. nortonii*	38	6						0	0	702013.1	6078378	A
82	N/A	N/A	*E. nortonii*	38	7						0	0	702018.8	6078378	A
83	216	1431	*E. melliodora*	120	15	1	0	0	1	2016 - Crimson rosellas perhaps nesting	2	1	702325.8	6076972	A
84	217	1432	*E. polyanthemos*	50	8	0	0	0	0		0	0	702372.4	6077012	A
85	218	1433	*E. melliodora*	70	8	0	0	0	0		0	0	702440.7	6077019	A
86	219	1434	*E. polyanthemos*	70	10	2	2	0	0	2015 Starling seen exiting 1 medium hollow	4	1	702368.3	6077030	A
87	220	1435	*E. melliodora*	70	9	0	2	0	0	Plus basal hollow	2	1	702338.1	6077049	A
88	221	1436	*E. melliodora*	70	15	1	0	0	0		1	1	702369	6077093	A
89	222	1437	*E. polyanthemos*	60	8	0	0	0	0		0	0	702376.6	6077146	A
90	223	1438	*E. melliodora*	80	13	0	0	0	0		0	0	702408.1	6077160	A
91	224	1439	*E. melliodora*	70	12	0	0	0	0		0	0	702384.3	6077202	A
92	225	1440	*E. melliodora*	110	16	0	0	0	0		0	0	702076.7	6078259	A
93	226	1441	*E. melliodora*	90	13	0	0	0	0		0	0	702108.2	6078235	A
94	227	1442	*E. melliodora*	120	14	0	0	0	0	1 large stick nest	0	0	702137.7	6078266	A

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				cm	m	S	M	L	XL						
95	228	1443	*E. melliodora*	100	14	0	0	0	0		0	0	701853.6	6078222	A
96	229	1444	*E. melliodora*	90	15	1	1	0	0		2	1	701864.8	6078299	A
97	230	1445	*E. melliodora*	90	14	0	0	0	0		0	0	701950.6	6078347	A
99	232	1447	*E. rossii*	50	4	2	2	0	0		4	1	701814	6078323	A
100	233	1448	*E. melliodora*	80	14	0	0	0	0		0	0	701870.4	6078165	A
101	234	1449	*E. melliodora*	100	13	0	0	0	0	1 stick nest	0	0	701916.5	6078146	A
102	235	1450	*E. polyanthemos*	100	17	0	0	0	0		0	0	701735	6078212	A
103	236	1451	*E. melliodora*	90	15	0	0	0	0		0	0	701719.6	6078232	A
105	238	1453	*E. polyanthemos*	80	13	0	0	0	0		0	0	702004.8	6078096	A
106	239	1454	*E. polyanthemos*	100	15	0	0	0	0		0	0	701784	6077986	A
107	240	1455	*E. polyanthemos*	110	15	0	0	0	0	Chew marks in joints, no visible entrance	0	0	701777.7	6077997	A
108	241	1456	*E. polyanthemos*	100	15	0	0	0	0	Chew marks in joints, no visible entrance	0	0	701680.8	6077985	A
109	242	1457	*E. polyanthemos*	150	18	0	2	1	0	Some chew marks	3	1	701676.5	6078013	A
110	243	1458	*E. melliodora*	70	14	0	0	0	0		0	0	701613.3	6077999	A
112	245	1460	*E. melliodora*	20	3	0	0	0	0		0	0	701605.1	6077913	A
115	248	1463	*E. melliodora*	80	14	1	0	0	0	1 mistletoe	1	1	701669.6	6077634	A
116	249	1464	*E. melliodora*	70	15	0	0	0	0		0	0	701649.2	6077564	A
118	251	1466	*E. polyanthemos*	80	11	0	0	0	0	Several mistletoe	0	0	701609.8	6077570	A
119	252	1467	*E. melliodora*	60	12	0	0	0	0		0	0	701609.8	6077569	A
120	253	1468	*E. melliodora*	90	14	0	0	0	0		0	0	701591.3	6077463	A
121	254	1469	*E. polyanthemos*	90	15	1	0	0	0		1	1	701730.2	6077610	A
122	255	1470	*E. polyanthemos*	90	16	0	0	0	0		0	0	701832.8	6077678	A
123	256	1471	*E. polyanthemos*	100	17	0	0	1	0		1	1	701847.1	6077654	A

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				cm	m	S	M	L	XL						
124	257	1472	Unknown - dead	110	3	0	1	1	0	Plus hollow dead wood on ground	2	1	701824.3	6077612	D
125	258	1473	*E. polyanthemos*	70	15	0	0	0	0		0	0	701824	6077725	A
126	259	1474	*E. polyanthemos*	70	10	0	0	0	0		0	0	701795.8	6077802	A
127	260	1475	Unknown - dead	100	3	0	0	0	0	Burnt out	0	0	701780.5	6077843	D
128	261	1476	*E. melliodora*	80	15	0	0	0	0		0	0	701888	6077898	A
129	262	1477	*E. melliodora*	80	16	0	0	0	0		0	0	701858.5	6077944	A
130	263	1478	*E. melliodora*	110	17	0	0	0	0		0	0	701895.7	6077817	A
131	264	1479	*E. melliodora*	90	17	0	0	0	0		0	0	701904.5	6077782	A
132	265	1480	*E. polyanthemos*	70	13	0	0	0	0		0	0	701889.9	6077772	A
133	266	1481	*E. polyanthemos*	100	17	0	1	0	0	Chewed	1	1	701855.7	6077809	A
134	267	1482	Unknown - dead	90	16	1	1	0	0		2	1	701926.6	6077656	D
135	268	1483	*E. melliodora*	90	16	0	1	0	0	2015 - Chewed. 1 stick nest. 2016 - trees may be hybrid	1	1	701952.2	6077685	A
136	269	1484	*E. polyanthemos*	70	14	0	0	0	0		0	0	701968.7	6077635	A
137	270	1485	*E. polyanthemos*	60	14	0	0	0	0		0	0	701963.3	6077560	A
138	271	1486	*E. melliodora*	40	7	0	0	0	0	2016 - unusual tree - long leaves. Perhaps hybrid	0	0	701914.1	6077461	A
139	272	1487	*E. polyanthemos*	80	15	0	0	0	0		0	0	701910.8	6077451	A
140	273	1488	*E. melliodora*	70	14	0	0	0	0	2016 - stick nest	0	0	701899.4	6077446	A
141	274	1489	*E. polyanthemos*	80	14	0	0	0	0		0	0	701897.2	6077449	A
142	275	1490	*E. polyanthemos*	80	15	4	4	0	0	Chew marks on two of the medium hollows	8	1	701949.2	6077448	A
143	276	1491	*E. polyanthemos*	50	11	0	0	0	0		0	0	701984.6	6077399	A
144	277	1492	*E. polyanthemos*	100	10	1	0	0	0		1	1	702081.9	6077308	A

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				cm	m	S	M	L	XL						
145	278	1493	*E. melliodora*	90	3	0	0	0	0		0	0	702024.4	6077118	A
146	279	1494	*E. melliodora*	120	15	0	0	0	0		0	0	702022.2	6077088	A
147	280	1495	*E. polyanthemos*	90	14	1	0	0	0		1	1	701968.4	6077102	A
148	281	1496	*E. polyanthemos*	70	15	0	0	0	0		0	0	701875.6	6077082	A
149	282	1497	*E. polyanthemos*	60	15	0	0	0	0		0	0	701873.2	6077086	A
150	283	1498	*E. polyanthemos*	80	14	0	0	0	0		0	0	701890.4	6077117	A
151	284	1499	*E. polyanthemos*	70	14	0	0	0	0		0	0	701849.5	6077197	A
152	285	1500	*E. polyanthemos*	100	17	1	1	0	0		2	1	701871.3	6077220	A
153	286	1501	*E. polyanthemos*	70	14	0	0	0	0		0	0	701880.6	6077221	A
154	287	1502	*E. polyanthemos*	100	15	0	1	1	0		2	1	701845.1	6077234	A
155	288	1503	*E. polyanthemos*	60	12	0	0	0	0		0	0	701850.6	6077262	D
156	289	1504	*E. polyanthemos*	70	14	0	0	0	0		0	0	701837.7	6077285	A
157	290	1505	*E. nortonii*	70	11	0	0	0	0		0	0	701866.3	6077309	A
158	291	1506	Unknown - dead	60	12	0	0	0	0		0	0	701871.9	6077321	D
159	292	1507	*E. polyanthemos*	80	10	0	0	0	0		0	0	701875.8	6077312	A
160	293	1508	*E. polyanthemos*	80	15	0	0	0	0	Basal hollow only	0	0	701896.4	6077248	A
161	294	1509	*E. polyanthemos*	70	14	0	0	0	0		0	0	701911.2	6077232	A
162	295	1510	*E. polyanthemos*	60	10	0	0	0	0		0	0	701941.9	6077281	A
163	296	1511	*E. polyanthemos*	60	14	0	0	0	0		0	0	701946.2	6077268	A
164	297	1512	*E. polyanthemos*	60	10	0	0	0	0		0	0	701958	6077261	A
165	298	1513	*E. melliodora*	70	14	0	0	0	0		0	0	702003.5	6077245	A
166	299	1514	*E. melliodora*	90	14	0	0	0	0		0	0	702017.4	6077251	A
167	300	1515	*E. melliodora*	60	14	0	0	0	0		0	0	702023.3	6077209	A
168	301	1516	*E. polyanthemos*	120	18	0	1	0	0		1	1	702026.8	6077202	A
169	302	1517	*E. polyanthemos*	100	14	1	0	0	0	1 stick nest	1	1	702025.2	6077168	A

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				cm	m	S	M	L	XL						
170	303	1518	*E. nortonii*	100	13	0	0	0	0		0	0	701799.7	6077308	A
171	304	1519	*E. polyanthemos*	90	15	0	0	0	0		0	0	701722.6	6077341	A
172	305	1520	Unknown - dead	80	13	1	0	0	0		1	1	701678.4	6077348	D
174	307	1522	*E. rossii*	120	18	1	1	0	0	Starling seen emerging from medium hollow	2	1	701687.7	6077219	A
175	308	1523	*E. polyanthemos*	100	11	0	0	0	0		0	0	701611.9	6077125	A
177	310	1525	*E. polyanthemos*	60	8	0	0	1	0		1	1	701517.7	6077170	A
178	311	1526	*E. melliodora*	100	12	0	0	0	0	2 stick nests	0	0	701449.2	6077041	A
180	313	1528	*E. polyanthemos*	70	14	0	0	0	0		0	0	701800.4	6077047	A
181	314	1529	*E. polyanthemos*	70	15	0	0	0	0		0	0	701777.5	6076999	A
182	315	1530	*E. polyanthemos*	50	12	0	0	0	0		0	0	701822.5	6076947	A
183	316	1531	*E. nortonii*	50	6	1	0	0	0		1	1	701749.9	6076938	A
185	318	1533	*E. polyanthemos*	40	9	0	0	0	0		0	0	701722.1	6076901	A
189	334	1549	*E. rossii*	70	11	0	1	0	0		1	1	701580.8	6076675	A
190	338	1553	*E. polyanthemos*	70	13	0	0	0	0		0	0	701658.7	6076691	A
191	339	1554	*E. polyanthemos*	70	12	0	0	0	0		0	0	701635	6076701	A
192	340	1555	*E. polyanthemos*	60	12	0	0	0	0		0	0	701624.5	6076695	A
193	341	1556	*E. polyanthemos*	70	12	0	0	0	0		0	0	701603.1	6076745	A
194	342	1557	*E. nortonii*	40	7	0	0	0	0		0	0	701568	6076740	A
195	343	1558	*E. polyanthemos*	50	12	1	0	0	0		1	1	701555.2	6076782	D
196	344	1559	*E. polyanthemos*	80	15	0	3	1	0	Large hollow with worn/chewed edges	4	1	701530	6076804	A
197	345	1560	*E. polyanthemos*	50	9	0	0	0	0		0	0	701545.5	6076819	A
200	348	1563	*E. polyanthemos*	80	13	0	2	0	0	1 stick nest	2	1	701632.5	6076819	A
201	349	1564	*E. polyanthemos*	60	13	0	0	0	0		0	0	701636	6076797	A

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				cm	m	S	M	L	XL						
202	350	1565	*E. polyanthemos*	80	15	1	0	0	0		1	1	701628.6	6076796	A
203	351	1566	*E. polyanthemos*	110	13	0	0	0	0		0	0	701652.2	6076730	A
204	352	1567	*E. polyanthemos*	60	11	0	0	0	0	1 stick nest	0	0	701678.2	6076708	A
205	353	1568	*E. nortonii*	70	11	0	0	0	0		0	0	701699.1	6076730	A
206	354	1569	*E. polyanthemos*	70	11	0	0	0	0		0	0	701689.9	6076741	A
207	355	1570	*E. polyanthemos*	70	13	0	0	0	0		0	0	701701.9	6076753	A
208	356	1571	*E. polyanthemos*	70	12	0	0	0	0		0	0	701772.5	6076804	A
209	357	1572	*E. melliodora*	70	15	0	0	0	0		0	0	701781.6	6076794	A
210	358	1573	*E. polyanthemos*	90	15	0	0	0	0		0	0	701761.9	6076738	A
211	359	1574	*E. polyanthemos*	70	13	0	0	0	0		0	0	701759.6	6076714	A
212	395	1610	*E. nortonii*	50	8	0	0	0	0		0	0	701962.9	6076573	A
213	397	1612	*E. polyanthemos*	40	10	0	0	0	0		0	0	701977	6076599	A
214	398	1612	*E. polyanthemos*	110	14	0	3	0	0	Worn/chewed hollow	3	1	701977	6076599	A
215	399	1613	*E. polyanthemos*	80	13	0	0	0	0		0	0	701951.3	6076657	A
216	400	1614	*E. polyanthemos*	70	12	0	1	0	0		1	1	701930.6	6076702	A
217	401	1615	*E. polyanthemos*	70	16	0	1	0	0		1	1	701820.9	6076686	A
218	402	1616	*E. polyanthemos*	70	12	0	0	0	0		0	0	701805.8	6076763	A
219	403	1617	Unknown - dead	130	11	0	0	0	0		0	0	701907.2	6076784	D
220	404	1618	*E. polyanthemos*	60	16	0	0	0	0		0	0	701986.9	6076718	A
221	405	1619	*E. rubida*	110	14	0	0	1	0	2016 - tree species updated	1	1	702041.5	6076726	A
222	406	1620	*E. nortonii*	80	11	0	0	0	0		0	0	701998	6076656	A
223	407	1621	Unknown - dead	50	3	0	0	1	0	Open hollow, not great quality	1	1	701973.2	6076657	D
224	408	1622	*E. rubida*	120	13	2	0	0	0	2016 - tree species updated	2	1	702162.3	6076683	A

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				cm	m	S	M	L	XL						
225	410	1624	*E. polyanthemos*	60	10	0	0	0	0		0	0	702183.8	6076891	A
226	411	1625	*E. melliodora*	70	15	0	1	0	0	2016 - Galahs seen, perhaps nesting	1	1	702187.3	6076900	A
227	412	1626	*E. melliodora*	70	15	0	1	0	0		1	1	702194.1	6076907	A
228	413	1627	*E. polyanthemos*	50	12	0	0	0	0		0	0	702207.2	6076922	A
229	414	1628	*E. polyanthemos*	100	10	2	1	0	0	2016 - potentially a hybrid with *E. melliodora*	3	1	702205.2	6076928	A
230	415	1629	*E. polyanthemos*	70	12	0	0	0	0		0	0	702214.1	6076945	A
231	416	1630	*E. polyanthemos*	80	14	0	1	0	0		1	1	702239.4	6076930	A
232	417	1631	*E. polyanthemos*	70	12	0	0	0	0		0	0	702283.4	6076987	A
233	418	1632	*E. polyanthemos*	70	14	1	0	0	0		1	1	702289	6077048	A
234	419	1633	*E. polyanthemos*	70	14	0	0	0	0		0	0	702235.8	6077140	A
235	420	1634	*E. polyanthemos*	50	15	0	1	0	0		1	1	702155.8	6077137	A
236	421	1635	*E. polyanthemos*	50	14	0	0	0	0		0	0	702166.8	6077120	A
237	422	1636	*E. polyanthemos*	70	14	0	0	0	0		0	0	702177.7	6077094	A
238	423	1637	*E. polyanthemos*	70	13	0	0	0	0		0	0	702152.2	6077107	A
239	424	1638	*E. polyanthemos*	70	14	0	1	0	0		1	1	702081.2	6077098	A
240	425	1639	*E. polyanthemos*	50	7	0	0	0	0		0	0	702020.4	6077080	A
241	426	1640	Unknown - dead	90	16	0	1	0	0		1	1	702027	6077036	D
242	427	1641	*E. polyanthemos*	80	15	0	2	0	0	2016 - tree martins probably nesting	2	1	702039.9	6077018	A
243	428	1642	*E. polyanthemos*	100	15	1	0	0	0		1	1	702075.3	6077048	A
244	429	1643	*E. polyanthemos*	70	10	0	0	0	0		0	0	702108.7	6077027	A
245	430	1644	Unknown - dead	50	3	0	0	0	0		0	0	702092.2	6077001	D
246	431	1645	*E. polyanthemos*	70	14	0	0	0	0		0	0	702065.4	6076985	A
247	432	1646		60	14	3	1	0	0		4	1	702051	6076974	D

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Tree ID	Biosis (2015) Tree ID	Biosis (2015) Tree Label	Species	DBH	Height	Hollows				Notes	Number of hollows	HBT	Easting	Northing	Dead / Alive
				cm	m	S	M	L	XL						
248	433	1647	*E. polyanthemos*	70	15	1	0	0	0		1	1	701960.3	6076994	A
249	434	1648	*E. polyanthemos*	90	16	0	0	0	0	Chewed joints but not visible entrance	0	0	701920.9	6076960	A
250	435	1649	*E. polyanthemos*	70	13	0	0	0	0		0	0	701940	6076914	A
251	436	1650	*E. nortonii*	40	7	0	0	0	0		0	0	702013	6076905	A
252	437	1651	*E. polyanthemos*	70	16	0	0	0	0		0	0	702023	6076903	A
253	438	1652	*E. nortonii*	60	7	0	0	0	0		0	0	702069.5	6076904	A
254	439	1653	*E. polyanthemos*	70	13	0	0	0	0		0	0	702088.5	6076909	A
255	440	1654	*E. polyanthemos*	100	14	1	2	0	0		3	1	702102	6076846	A
256	441	1655	*E. melliodora*	60	11	1	1	0	0	2016 - Stick nest	2	1	702145.3	6076906	A
257	442	1656	*E. polyanthemos*	60	10	0	0	0	0		0	0	702189.1	6076979	A
258	443	1657	*E. polyanthemos*	80	14	0	0	0	0		0	0	702210.8	6077002	A
259	444	1658	*E. polyanthemos*	60	12	0	0	0	0		0	0	702200.2	6077030	A
260	542	1756	*E. melliodora*	20	4	0	0	0	0		0	0	701523.6	6077190	A
261	579	1793	*E. rubida*	20	7	0	0	0	0		0	0	701576.3	6077419	A
262	580	1794	*E. rubida*	40	8	0	0	0	0		0	0	701575.7	6077423	A
263	581	1795	*E. rubida*	20	11	0	0	0	0		0	0	701576.1	6077428	A
264	584	1798	*E. rubida*	50	10	0	0	0	0		0	0	701576.5	6077433	A
265	590	1804	*E. rubida*	30	6	0	0	0	0		0	0	701580	6077452	A
266	592	1806	*E. rubida*	70	10	0	0	0	0		0	0	701580.9	6077476	A
267	598	1812	*E. rubida*	30	11	0	0	0	0		0	0	701583	6077491	A
268	599	1813	*E. rubida*	30	11	0	0	0	0		0	0	701583.6	6077493	A
269	607	1821	*E. rubida*	40	11	0	0	0	0		0	0	701585.9	6077510	A
270	616	1830	*E. nortonii*	30	5	0	0	0	0		0	0	701591.4	6077562	A
271	617	1831	*E. melliodora*	20	5	0	0	0	0		0	0	701590.7	6077563	A

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Tree ID	Biosis (2015) Tree ID	Biosis (2015) Tree Label	Species	DBH	Height	Hollows				Notes	Number of hollows	HBT	Easting	Northing	Dead / Alive
				cm	m	S	M	L	XL						
272	623	1837	*E. bridgesiana*	50	7	0	0	0	0		0	0	701592.8	6077588	A
273	626	1840	*E. melliodora*	20	6	0	0	0	0		0	0	701596	6077616	A
274	633	1847	*E. melliodora*	20	6	0	0	0	0		0	0	701599.2	6078002	A
275	634	1848	*E. melliodora*	70	12	0	0	0	0		0	0	701609.2	6078141	A
276	635	1849	*E. melliodora*	20	5	0	0	0	0		0	0	701617.2	6078155	A
277	636	1850	*E. melliodora*	20	6	0	0	0	0		0	0	701614.9	6078157	A
278	637	1851	*E. melliodora*	30	7	0	0	0	0		0	0	701625.7	6078167	A
279	638	1852	*E. melliodora*	40	12	0	0	0	0		0	0	701623.8	6078198	A
280	639	1853	*E. melliodora*	30	7	0	0	0	0		0	0	701656	6078262	A
282	641	1855	*E. melliodora*	110	15	0	0	0	0		0	0	702213.6	6078312	A
283	642	1856	*E. melliodora*	80	16	0	0	0	0		0	0	702363.1	6077990	A
284	643	1857	*E. melliodora*	110	15	2	3	3	0	2016 - Sulphur Crested Cockatoos nesting	8	1	702189.9	6078065	A
285	644	1858	*E. polyanthemos*	120	15	0	0	0	0		0	0	702035.3	6077877	A
286	645	1859	*E. polyanthemos*	100	14	1	0	0	0		1	1	701999.7	6077859	A
287	646	1860	*E. melliodora*	80	15	0	0	0	0		0	0	701978.6	6077797	A
288	647	1861	*E. polyanthemos*	60	15	0	0	0	0		0	0	702002.3	6077790	A
289	648	1862	*E. polyanthemos*	60	15	1	0	0	0		1	1	701999.2	6077795	A
290	649	1863	*E. polyanthemos*	70	12	1	0	0	0		1	1	702024	6077815	A
291	650	1864	*E. polyanthemos*	70	13	1	1	0	0		2	1	702074.9	6077775	A
292	651	1865	*E. polyanthemos*	90	16	0	0	0	0		0	0	702030.2	6077719	A
293	652	1866	*E. melliodora*	100	5	1	0	0	0	Dead trunk but coppicing	1	1	702078.5	6077660	A
294	653	1867	*E. melliodora*	70	16	1	1	0	0		2	1	702380.7	6077430	A

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Appendix 3. Grassland Fauna Habitat Transect Data

Note: bolded numbers on yellow provide the percentage of the groundstorey cover comprising *Rytidosperma* spp., the primary natural food genus for the Golden Sun Moth.

	Project	**2613 – Googong NH2 Flora & Fauna Assessment – GSM Surveys**							
	Assessor/s	**Robert Speirs and Samantha Vertucci**							
	Date	**Thursday, 14 December 2016**							
	Transect Number	**T1**		**T2**		**T3**		**T4**	
	Transect start waypoint	701747 6077790		701916 6077880		702179 6077564		702325 6077286	
	Transect end waypoint	701765 6077839		701879 6077846		702131 6077539		702370 6077307	
	Dominant noxious weed species (transect area)	*Carthamus lanatus*		None		None		*Nassella trichotoma*	
	Dominant non-noxious exotic perennial grass species (transect area)	None		None		None		None	
	Number of hits along a 50m transect	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Strata	**Bare ground**	5	10	9	18	1	2	6	12
	Cryptogam		0	3	6		0	4	8
	Embedded rock	1	2	1	2		0		0
	Loose surface rock		0		0		0		0
	Detached leaf litter	1	2		0	2	4		0
	Large tussock base (>10cm basal dia)	2	4	4	8	2	4	2	4
	Small tussock base (<10cm basal dia)	11	22	15	30	18	36	22	44
Exotic plant cover	**Exotic perennial grass**		0		0		0		0
	Exotic annual grass	11	22	2	4	12	24	8	16
	Trifolium spp.	1	2	1	2		0	1	2
	Exotic forb	14	28	4	8	15	30	1	2
	Noxious weed	1	2		0		0		0
Perennial native cover	**Native forb**		0	10	20		0	6	12
	Native shrub		0		0		0		0
	Sedge/rush		0		0		0		0
	Rytidosperma spp.	8	**16**	9	**18**	2	**4**	23	**46**
	Austrostipa spp.	3	6	5	10	18	36	1	2
	Elymus scaber		0	1	2		0		0
	Panicum spp.		0		0		0		0
	Dichlachne spp.		0		0		0		0
	Bothriochloa macra		0		0		0		0
	Themeda australis	1	2	5	10		0		0
	Microlena spp.		0		0		0		0
	Aristida ramosa		0		0		0		0
	Joycea spp.		0		0		0		0
	Poa spp.	4	8		0		0		0
	Totals	50	100	50	100	50	100	50	100

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Appendix 4. Golden Sun Moth surveys – weather conditions and results

Project No: 2713				**Project Name:** 2613 – Googong NH2 Flora & Fauna Assessment – GSM Surveys				
Survey No: 1				**Date:** 22-11-2016				**Observer/s:** RES & SMV
Reference Site: Ainslie (ACT region GSM email list)				**Survey Site:** Study area				
Time	**Air Temp.**	**Wind speed**	**Cloud cover**	**Time**	**Air Temp.**	**Wind speed & direction**	**Cloud cover**	**Other weather information (last rain/forecast rain, changes)**
Start: 12:40pm	22	30	0%	**Start:** 10:00am	26	32/NNW	0%	Rain on night of the 20th.
Finish: 12:50pm	22	24	0%	**Finish:** 12:15pm	28.4	30/NW	0%	
General site notes:				**General site notes:**				
Golden Sun Moths recorded: Males flying freely.				**Golden Sun Moths recorded:** None				
Survey No: 2				**Date:** 30-11-2016				**Observer/s:** RES & SMV
Reference Site: Kinlyside (ACT region GSM email list)				**Survey Site:** Study area				
Time	**Air Temp.**	**Wind speed**	**Cloud cover**	**Time**	**Air Temp.**	**Wind speed & direction**	**Cloud cover**	**Other weather information (last rain/forecast rain, changes)**
Start: 12:00pm	25	Light	Sunny	**Start:** 10:20am	21.5	7/W	30%	No recent rain. Warm and dry.
Finish: 13:40pm	28	Moderate	Sunny	**Finish:** 12:30pm	24	7/W	5%	
General site notes:				**General site notes:** Lots of invertebrates, hover flies, butterflies, grasshoppers etc.				
Golden Sun Moths recorded: Males flying spontaneously.				**Golden Sun Moths recorded:** None				

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Survey No: 3				**Date:** 13-12-2016				**Observer/s:** RES & SMV
Reference Site: Throsby (ACT region GSM email list)				**Survey Site:** Study area				
Time	**Air Temp.**	**Wind speed**	**Cloud cover**	**Time**	**Air Temp.**	**Wind speed & direction**	**Cloud cover**	**Other weather information (last rain/forecast rain, changes)**
Start: 11:00am	30	Gusty	0	**Start:** 11:30am	30	35/NW	30%	Gusty at times, but reasonably still between gusts. Hot and dry.
Finish: 13:30pm	31	Gusty	30	**Finish:** 1:15pm	32	37/WNW	70%	
General site notes:				**General site notes:**				
Golden Sun Moths recorded: Males flying spontaneously.				**Golden Sun Moths recorded:** None				
Survey No: 4				**Date:** 20-12-2016				**Observer/s:** RES & SMV
Reference Site: Kinlyside (ACT region GSM email list)				**Survey Site:** Study area				
Time	**Air Temp.**	**Wind speed**	**Cloud cover**	**Time**	**Air Temp.**	**Wind speed & direction**	**Cloud cover**	**Other weather information (last rain/forecast rain, changes)**
Start: 11:00am	27	Light-med	0	**Start:** 10:30am	26	18/NW	0%	No recent rain. Hot and dry.
Finish: 12:30am	29	Med-high	20	**Finish:** 12:45pm	31	22/WNW	25%	Gusty to noted wind speeds, overall light to moderate breeze.
General site notes:				**General site notes:** Lots of invertebrates, hover flies, butterflies, grasshoppers etc.				
Golden Sun Moths recorded: Males flying spontaneously.				**Golden Sun Moths recorded:** None				

*Temperature and wind speed data obtained from Bureau of Meteorology website, Canberra Airport (wind data corrected to reflect onsite observations where inconsistent).

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Appendix 5. Likelihood of Occurrence Assessment

Key for below table

EPBC Act:

CE - critically endangered

E - endangered

V - vulnerable

CD - conservation dependent

TSC Act:

CE1 - critically endangered (Part 1, Schedule 1A)

E1 - endangered species (Schedule 1, Part 1)

E2 - endangered population (Schedule 1, Part 2)

E4 - presumed extinct (Schedule 1, Part 4)

V1 - vulnerable species (Schedule 2, Part 1)

Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Birds				
Anthochaera phrygia Regent Honeyeater	E	CE1	A semi-nomadic species occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises a number of other eucalypt species. Nectar and fruit from the mistletoes *Amyema miquelii*, *A. pendula*, and *A. cambagei* are also eaten during the breeding season. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and sheoaks as well as within mistletoe haustoria (section of the root which connects with the host tree). An open cup-shaped nest is constructed by the female of bark, grass, twigs and wool.	Low The species may visit the study area to feed on flowering eucalypts and mistletoe, however there are no local records.
Artamus cyanopterus cyanopterus Dusky Woodswallow	-	V1	The Dusky Woodswallow has two separate populations. The eastern population is found from Atherton Tableland, Queensland south to Tasmania and west to Eyre Peninsula, South Australia. The other population is found in south-west Western Australia. The Dusky Woodswallow is found in open forests and woodlands, and may be seen	**Moderate** The species has been recorded in the locality although the study area supports low quality foraging habitat only.

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Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
			along roadsides and on golf courses. South-eastern population migrates north in autumn.	
Botaurus poiciloptilus Australasian Bittern	E	E1	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (Typha spp.) and spikerushes (Eleocharis spp.). Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails.	Low The species has been recorded in the locality however the dams within the study area provide low quality potential foraging habitat only.
Calidris ferruginea Curlew Sandpiper	CE	E	The Curlew Sandpiper is distributed around most of the Australian coastline. Inland records are probably mainly of birds pausing for a few days during migration. The Curlew Sandpiper breeds in Siberia and migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving in Australia between August and November, and departing between March and mid-April. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	Negligible There is no potential habitat for this species within the study area.
Callocephalon fimbriatum Gang-gang Cockatoo	-	V1	In summer the Gang-gang Cockatoo occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest. In winter, the species occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. The Gang-gang Cockatoo usually breeds in tall forests in the ACT region, however they have been observed on occasion to breed in Box-Gum Woodland on Red Hill and other similar lowland habitat around Canberra (R. Speirs pers. obs., M. Mulvaney pers. comm.).	**Moderate** The species may visit the study area to forage and has been recorded in the locality. The species is highly unlikely to breed within the study area.
Calyptorhynchus lathami Glossy Black-cockatoo	-	V1	The Glossy Black-cockatoo has a patchy distribution, having once been widespread across most of the south-east of Australia. The species is	Low

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Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
			now distributed throughout an area which extends from the coast near Eungella in eastern Queensland to Mallacoota in Victoria. Glossy black-cockatoos feed on casuarina seeds, however they occasionally consume seeds from eucalypts, angophoras, acacias and hakeas, as well as insect larvae. In the ACT region the species feeds almost exclusively on Drooping Sheoak *Allocasuarina verticillata*. Pairs mate for life and nest in the hollows of large, old living or dead eucalypt trees. Breeding takes place between March and August.	The species has been recorded in the locality, however the study area does not contain and Drooping Sheoak and is therefore does not provide potentially important foraging habitat. The species is unlikely to breed within the study area.
Chthonicola sagittata Speckled Warbler	-	V1	The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat includes scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area. The diet consists of seeds and insects, with most foraging taking place on the ground around tussocks and under bushes and trees. Pairs are sedentary and occupy a breeding territory of about ten hectares, with a slightly larger home-range when not breeding. The rounded, domed, roughly built nest of dry grass and strips of bark is located in a slight hollow in the ground or the base of a low dense plant.	**Moderate** The species is likely to visit the study area and has been recorded in the locality, including in the nearby Googong Foreshores. The study area is unlikely to be breeding habitat for the species, given its grazing history and the absence of shrubstorey and midstorey.
Circus assimilis Spotted Harrier	-	V1	The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn), with young remaining in the nest for several months. Preys on terrestrial mammals, birds and reptiles, occasionally insects and rarely carrion.	**Moderate** The species has been recorded in the locality and is likely to occasionally pass over the study area, however the species is unlikely to breed within the study area and the potential foraging habitat is unlikely to be of high value to the species.

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Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies)	-	V1	In the ACT region, Brown Treecreepers occur in dry woodlands and open forest below 1,000 metres. The species is relatively common along the Clear Range and along the Lower Naas River. Other populations occur at Mulligans Flat Reserve, Campbell Park, Burbong and former quarries south of the airport in the northern part of the ACT, and at Castle Hill, north of Tharwa. Brown Treecreepers also frequent paddocks and grasslands where there are sufficient logs, stumps and dead trees nearby. The species prefers relatively undisturbed woodland and dry open forest where the native understorey, especially grasses, has been preserved. The species usually prefers predominantly rough-barked trees such as Stringybarks and rough barked Boxes.	Low The species has been recorded in nearby Googong Foreshores, however the species is unlikely to utilise the study area given its grazing history and the absence of shrubstorey and midstorey vegetation.
Daphoenositta chrysoptera Varied Sittella	-	V1	In the ACT region, the Varied Sittella occurs in a wide variety of woodland and forest habitats, particularly in lowland areas. The species prefers areas with a dominance of rough barked trees, notably Red Stringybark at relatively high density. The species is rarely recorded in sparsely treed areas.	Low The study area does not support breeding or foraging habitat for the species.
Epthianura albifrons White-fronted Chat	-	V1	The White-fronted Chat is a small insectivorous bird found across the southern half of Australia. It mostly occurs in temperate to arid climates and very rarely sub-tropical areas, occupying foothills and lowlands up to 1000 m above sea level. In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. This species is gregarious, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They have been observed breeding from late July through to early March, with 'open-cup' nests built in low vegetation.	**Confirmed** One individual was recorded within the Googong development area, just east of the study area (Biosis 2015b). The species is likely to periodically forage within the study area, however it is unlikely to breed given the study area's grazing history and the absence of shrubstorey and midstorey vegetation.
Glossopsitta pusilla Little Lorikeet	-	V1	The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat, Nomadic movements are common, influenced by season and food availability,	**Moderate** The species has been recorded in the locality, and may fly across, or potentially forage within, the study

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Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
			Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species. Feeds mostly on nectar and pollen.	area. The study area does not support breeding habitat for this species.
Grantiella picta Painted Honeyeater	V	V1	The Painted Honeyeater is found in Queensland and New South Wales west of the Great Dividing Range, through to northern Victoria. The species displays some migratory movement and is occasionally found in the Northern Territory and is a vagrant to South Australia and the ACT. The species frequents eucalypt forests and woodlands, particularly those that are infested heavily with mistletoes. In the ACT, the species' primary habitat is River Oak (*Casuarina cunninghamiana*) along river systems, especially the Murrumbidgee River.	**Moderate** The species has been recorded in the locality and may visit the study area to forage.
Hieraaetus morphnoides Little Eagle	-	V1	The Little Eagle is distributed throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment, and occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. The species is sensitive to human disturbance.	**High** The study area may be part of the large foraging range of a pair of Little Eagles, however this species has not been recorded during past field surveys and no indications of breeding activity (i.e. large stick nests) have been observed within the study area.
Lathamus discolor Swift Parrot	CE	E1	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.	Low The periodically species may forage within the study area, although there are no nearby records.
Melanodryas cucullata cucullata Hooded Robin (southeastern form)	-	V1	The Hooded Robin occupies drier eucalypt forest, woodland and scrub, grasses and low shrubs, as well as cleared paddocks with regrowth or stumps. The species uses stumps, posts or fallen timber from which to locate prey on the ground. In the ACT region, the species is found in	**High** The species is likely to occur within the study area and surrounds, and is known to occur within the nearby Googong Foreshores.

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Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
			woodland, often with scattered Yellow Box and/or Blakely's Red Gum, with long grass and low shrubs, or fallen logs.	
Numenius madagascariensis Eastern Curlew	CE	-	The eastern curlew is Australia's largest shorebird and a long-haul flyer. The eastern curlew takes an annual migratory flight to Russia and north-eastern China to breed, arriving back home to Australia in August to feed on crabs and molluscs in intertidal mudflats. It is extremely shy and will take flight at the first sign of danger.	Low The study area does not support potential foraging habitat of any significance to the species. There are no records of the species from the locality.
Pachycephala olivacea Olive Whistler	-	V1	The Olive Whistler inhabits the wet forests on the ranges of the east coast. It has a disjunct distribution in NSW chiefly occupying the beech forests around Barrington Tops and the MacPherson Ranges in the north and wet forests from Illawarra south to Victoria. In the south it is found inland to the Snowy Mountains and the Brindabella Range. Mostly inhabit wet forests above about 500m. During the winter months they may move to lower altitudes. They forage in trees and shrubs and on the ground, feeding on berries and insects. They make nests of twigs and grass in low forks of shrubs, laying two or three eggs between September and January.	Low The species has been recorded in the locality, however the study area is unlikely to provide habitat for this species.
Petroica boodang Scarlet Robin	-	V1	The Scarlet Robin is found in south-eastern Australia (extreme south-east Queensland to Tasmania, western Victoria and south-east South Australia) and south-west Western Australia. In NSW it occupies open forests and woodlands from the coast to the inland slopes, breeding in drier eucalypt forests and temperate woodlands.	**Confirmed** The species is likely to regularly occur within the study area and surrounds. It has been recorded nearby in Googong Foreshores in higher quality native remnant vegetation. The species was recorded by Biosis (2015b) just east of the study area, moving around in small flocks (5 to 20 birds), foraging on the ground and perching on fences. The species is unlikely to breed within the study area.
Petroica phoenica Flame Robin	-	V1	The Flame Robin is found in south-eastern Australia, from the 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. The	**Confirmed** Individuals and small flocks were recorded foraging near the study area by Biosis (2015b) field survey. The species is likely to periodically visit the study area

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Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
			species migrates in winter to more open lowland habitats such as grassland with scattered trees and open woodland on the inland slopes and plains.	to forage during winter. The study area does not provide potential breeding habitat for the species.
Polytelis swainsonii Superb Parrot	V	V1	Found mainly in open, tall riparian River Red Gum forest or woodland. Often found in farmland including grazing land with patches of remnant vegetation. Breeds in hollow branches of tall eucalypt trees within nine kilometres of feeding areas.	Low Although it has been recorded in the locality, the species rarely travels south of the Molonglo River in the ACT region. It does not breed it the locality.
Rostratula australis Australian Painted Snipe	E	E1	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. The species prefers freshwater wetlands, ephemeral or permanent, although it has been recorded in brackish waters.	Negligible There is no potential habitat for this species within the study area.
Stagonopleura guttata Diamond Firetail	-	V1	The Diamond Firetail is found in eastern Australia, from Eyre Peninsula, South Australia, to south-eastern Queensland. There has been a decline in density throughout the range, and many remaining populations may now be isolated. The species inhabits a wide range of eucalypt-dominated vegetation communities that have a grassy understorey, including woodland and mallee.	**High** The species is known to occur in the locality, including within Googong Foreshores, and is likely to occasionally forage within the study area. The species is unlikely to breed given the study area's grazing history and the absence of shrubstorey and midstorey vegetation.
Tyto novaehollandiae Masked Owl	-	V1	The Masked Owl may be found across a diverse range of wooded habitats that provide tall or dense mature trees with hollows suitable for nesting and roosting. The species has primarily been recorded in open forests and woodlands adjacent to cleared lands. They nest in hollows, in trunks and in near vertical spouts of large trees, usually living but occasionally dead. The nest hollows are usually located within dense forests or woodlands. Masked Owls prey upon hollow dependent arboreal marsupials, but terrestrial mammals including Rabbits and rodents make up the largest proportion of the diet. The species has a large home range of between 500 and 1000ha.	Low The species may occasionally forage within the study area, but is unlikely to roost or nest. There are no records from the locality on NSW Bionet.

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Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Fish and Crustacea				
Bidyanus bidyanus Silver Perch	CE	V1	Silver perch are endemic to the Murray-Darling system (including all states and sub-basins). They show a general preference for faster-flowing water, including rapids and races, and more open sections of river, throughout the Murray-Darling Basin. Silver perch are a highly migratory freshwater fish. The extensive migration of adults, particularly during flooding, has long been recognised and is considered to be part of their spawning behaviour.	Negligible There is no potential habitat within the study area for the species.
Maccullochella peelii Murray Cod	V	-	The Murray Cod's natural distribution extends throughout the Murray-Darling basin ranging west of the divide from south east Queensland, through NSW into Victoria and South Australia. The species is found in the waterways of the Murray– Darling Basin in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers, billabongs and large deep holes. Murray Cod is entirely a freshwater species and will not tolerate high salinity levels.	Negligible There is no potential habitat within the study area for the species.
Macquaria australasica Macquarie Perch	E	E1	Macquarie Perch are found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury and Shoalhaven catchments. Macquarie perch are found in both river and lake habitats, especially the upper reaches of rivers and their substantial tributaries.	Negligible There is no potential habitat within the study area for the species.
Frogs				
Litoria aurea Green and Golden Bell Frog	V	E1	The Green and Golden Bell Frog occurs mainly along coastal lowland areas of eastern NSW and Victoria. The furthest inland record of the species is at a recently discovered population near Hoskinstown in the Southern Tablelands (referred to as the Molongolo population). The species was previously known from elsewhere in the Southern Tablelands, but is now considered to have disappeared from the ACT and central slopes around Bathurst. In NSW, the species commonly occupies disturbed habitats, and breeds largely in ephemeral ponds. However, in	Negligible There is no potential habitat within the study area for the species and the species is not known to occur in the locality.

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Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
			Victoria, the Green and Golden Bell Frog occupies habitats with little human disturbance and commonly breeds in permanent ponds, as well as ephemeral ponds.	
Litoria castanea Yellow-spotted Tree Frog	E	CE1	The Yellow-spotted Tree Frog previously had a disjunct distribution, being recorded on the New England Tablelands and on the Southern Tablelands from Lake George to Bombala. The species has only recently (2010) been rediscovered on the Southern Tablelands. Prior to this the species had not been recorded on the Southern Tablelands since the 1970s. Found in large permanent ponds, lakes and dams with an abundance of bulrushes and other emergent vegetation, it shelters during autumn and winter under fallen timber, rocks, other debris or thick vegetation.	Negligible There is no potential habitat within the study area for the species and the species is not known to occur in the locality.
Litoria raniformis Growling Grass Frog	V	E1	In NSW the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. Usually found in or around permanent or ephemeral swamps or billabongs with an abundance of bulrushes and other emergent vegetation along floodplains and river valleys. The species has also been found in irrigated rice crops. Outside the breeding season animals disperse away from water and take shelter beneath ground debris such as fallen timber and bark, rocks, grass clumps and in deep soil cracks. The species previously occurred on the Southern Tablelands at a number of sites within the Murrumbidgee River corridor, however it is now widely considered to have become extinct on the Southern Tablelands.	Negligible There is no potential habitat within the study area for the species and the species is not known to occur in the locality.
Insects				
Synemon plana Golden Sun Moth	CE	E1	The Golden Sun Moth's NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. The species occurs in Natural Temperate Grasslands and Box-Gum Grassy Woodland in which the groundcover is dominated by Wallaby Grasses (*Rytidosperma* spp.). It is believed that the females lay up to 200 eggs at the base of the Wallaby Grass tussocks. After hatching, the larvae tunnel underground where they remain feeding on the roots of Wallaby Grass tussocks. The species	Low The species was not recorded despite extensive targeted surveys of potential habitat across the study area. The species is highly unlikely to occur within the study area.

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Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
			is also known to feed on the introduced species (and Weed of National Significance), Chilean Needle Grass *Nassella neesiana*.	
Mammals				
Dasyurus maculatus maculatus Spot-tailed Quoll (SE mainland population)	E	V1	The Spot-tailed Quoll occurs along the east coast of Australia and the Great Dividing Range. The species uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests. Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas. Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage. Seventy per cent of the diet is medium-sized mammals, and also feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage. The home range of a female is between 180 and 1000ha, while males have larger home ranges of between 2000 and 5000ha. Breeding occurs from May to August.	Low The species is likely to occur within the natural habitat provided in nearby Googong Foreshores, Tinderry Range, and other natural areas. The species may move through the study area, however the study area does not provide suitable habitat for the species.
Falsistrellus tasmaniensis Eastern False Pipistrelle	-	V1	The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. The species generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. The species prefers moist, tall forest environments. The species is known to occur in the ACT region however it has not been found to forage or roost in urban or highly modified rural areas.	**Moderate** The species has been recorded in intact dry sclerophyll forest in nearby Googong Foreshores and may forage within the study area. The study area does not support roosting habitat.
Miniopterus schreibersii oceanensis Eastern Bentwing Bat	-	V1	The Eastern Bentwing Bat is a subspecies of the Common Bentwing Bat, with a range thought to be from central Victoria to Cape York Peninsula, Queensland. It is a fast flyer, able to travel many kilometres in a night. Caves are the primary roosting habitat for this species however similar man-made structures are also used (culverts, eaves etc.). The species forages above the forest canopy.	**Moderate** The species has been recorded in intact dry sclerophyll forest in nearby Googong Foreshores and may forage within the study area. The study area does not support roosting habitat.
Myotis macropus Southern Myotis	-	V1	The Southern Myotis occurs from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100	Low

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Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
			km inland, except along major rivers. The species roosts close to water in caves, hollow-bearing trees, man-made structures (bridges, culverts etc.) and in dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and reservoirs. The species catches aquatic insects and small fish with their large hind claws, and also catches flying insects.	There are no suitable major waterbodies within the study area and the species is not known to venture far from such habitat features. The species has not been recorded in the vicinity.
Petauroides Volans Greater Glider	V	-	The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria, with an elevational range from sea level to 1200 m above sea level. The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It is primarily folivorous, and is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species	Negligible Due to past tree clearance, the study area does not provide potential habitat for this species.
Phascolarctos cinereus Koala (combined populations of Qld, NSW and the ACT)	V	V1	In NSW, the Koala mainly occurs on the central and north coasts with some populations in the western region. Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. They are solitary with varying home ranges. In high quality habitat home ranges may be 1-2 hectare and overlap, while in semi-arid country they are usually discrete and around 100 ha.	Negligible The species is not known to occur in the lowland areas of the ACT and surrounding region of NSW.
Pteropus poliocephalus Grey-headed Flying Fox	V	-	The Grey-headed Flying Fox occurs in the coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. Whilst Brisbane, Newcastle, Sydney and Melbourne are occupied continuously, the species is widespread throughout their range during summer. In autumn the species occupies coastal lowlands and is uncommon inland. In winter the species congregates in coastal lowlands north of the Hunter Valley and is occasionally found on the south coast of NSW and on the northwest slopes (associated with flowering eucalypts of these areas). The Grey-headed Flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises	**Low** The species may visit the study area to feed on the flowering eucalypts, however there are no camps (roost sites) in the locality.

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Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
			vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands. The Grey-headed Flying-fox roosts in aggregations of various sizes on exposed branches. Roost sites are typically located near water, such as lakes, rivers or the coast. The roost at Commonwealth Park in Canberra is the only known roost in the ACT region.	
Reptiles				
Aprasia parapulchella Pink-tailed Worm-lizard	V	V	The Pink-tailed Worm-lizard is a fossorial species which lives beneath surface rocks and occupies ant burrows. It feed on ants, particularly their eggs and larvae. The species is thought to lay eggs within the ant nests and to use the rocks for thermoregulation. Key habitat features are: a cover of native grasses (particularly Kangaroo Grass), sparse or no tree cover, little or no leaf litter, and scattered small rocks, partially embedded in the soil surface.	Low Although there are patches of rocky habitat present within the study area, and the species occurs within Googong Township to the east of the study area, the thorough rock-turning survey completed for this F&FA did not record the species. The species is considered unlikely to occur within the study area.
Delma impar Striped Legless Lizard	V	V1	The Striped Legless Lizard is patchily distributed in grasslands of south-eastern NSW, the ACT, north-eastern, central and south-western Victoria, and south-eastern South Australia. In the ACT, the species is known to occur at four separate locations - in grassland areas of Gungahlin, Majura and Jerrabomberra Valleys, and Yarramundi. Unsuitable habitat, roads and urban development separate these sites. Most areas where the species persists are thought to have had low to moderate levels of agricultural disturbance in the past and it has been suggested that ploughing in particular may be incompatible with the survival of the species. Until recently, the species was thought to inhabit only native grasslands dominated by species such as Tall Speargrass and Kangaroo Grass. In recent years, surveys have revealed the Striped Legless Lizard in many sites dominated by exotic grasses such as Phalaris, Serrated Tussock and Flatweed (Biosis Research 2012). They have also been found in several secondary grassland sites, generally within two kilometres of primary grassland.	Low The study area is not located near primary habitat for the species (natural temperate grassland) and the closest records of the species are in the Jerrabomberra Valley. The rock-turning survey completed for this F&FA did not record the species, nor did the pitfall trapping survey undertaken in 2009 (Biosis Research and Ecowise Environmental 2009).

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Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Suta flagellum Little Whip Snake	-	V1	Occurs in Natural Temperate Grassland, grassy woodland, and secondary grasslands derived from clearing of woodland. Found on well-drained hillsides, mostly associated with scattered loose rocks.	Low There are no records of the species in the locality. There is a slight potential for the species to occur in the rocky habitat, however the thorough rock turning surveys completed for this F&FA did not record the species.
Tympanocryptis pinguicolla Grassland Earless Dragon	E	E1	In the Canberra-Monaro region the Grassland Earless Dragon appears to be restricted to Natural Temperate Grassland or native pasture that is dominated by perennial tussock-forming species and has an open structure. It is known to make use of grass tussocks, surface rocks and small holes in the ground that are created by invertebrates such as wolf spiders and crickets. Spiders and insects appear to comprise the majority of its diet. In the ACT region the species is known to occur in suitable native grassland habitat in the Majura and Jerrabomberra valleys and at the Queanbeyan Nature Reserve and 'Letchworth' property near Queanbeyan in NSW. It is presumed extinct in Victoria.	Low Although native tussocky grassland is present within the study area, the species is unlikely to be present due to the intensive grazing history of the land, the modification of the natural temperate grassland and Box Gum Woodland PCTs within the study area, the lack of known populations of the species in the vicinity, and the lack of captures during pitfall trapping which occurred within the Googong area in 2009 (Biosis Research and Ecowise Environmental 2009).
Varanus rosenbergi Rosenberg's Goanna	-	V1	Rosenberg's Goanna is a medium to large monitor species occurring in southern parts of Western Australia and South Australia, with isolated populations in Victoria and New South Wales. In NSW it has been recorded from coastal areas around Sydney and further south, and west to Mount Victoria and the Namadgi and Kosciusko national parks. The species is found in a range of habitats including coastal heaths, humid woodlands and both wet and dry sclerophyll forests, preferring eucalyptus woodlands and heathland. Termite mounds are a critical habitat component, and are used for egg incubation.	Low The species is known to occur in the Googong locality, however is unlikely to venture into the study area due to the extent of past vegetation clearing and the disturbance caused by long-term grazing. No termite mounds were recorded in the study area during the field survey.

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Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Plants				
Eucalyptus aggregata Black Gum	V	V1	Black Gum occurs on the central and southern tablelands of NSW, and in a small disjunct population in Victoria. In NSW, it occurs predominantly in the South Eastern Highlands Bioregion. The species is a small to medium-sized woodland tree which grows in grassy woodlands on alluvial soils in moist sites along creeks on broad, cold and poorly-drained flats and hollows. It commonly occurs with Candlebark *Eucalyptus rubida*, Ribbon Gum *E. viminalis*, and Snow Gum *E. pauciflora*, with a grassy understorey of River Tussock *Poa labillardieri*. Most populations are located on private land or road verges and travelling stock routes.	Negligible This species is not present within the study area.
Lepidium hyssopifolium Basalt Peppercress	E	-	This species is known from a few populations in NSW, Victoria and Tasmania. The Basalt Pepper-cress is known to establish on open, bare ground with limited competition from other plants. It was previously recorded from eucalypt woodland with a grassy ground cover, low open Casuarina woodland with a grassy ground cover and tussock grassland, however recently recorded localities have predominantly been in weed-infested areas of heavy modification, high degradation and high soil disturbance such as road and rail verges, on the fringes of developed agricultural land or within small reserves in agricultural land. Many populations are now generally found amongst exotic pasture grasses and beneath exotic trees.	Low The species is not known to occur in the locality.
Leucochrysum albicans var. *tricolor* Hoary Sunray	E	-	The Hoary Sunray occurs from Queensland to Victoria and in Tasmania. In the ACT the species can be seen in spring in abundance on the roadside along Fairbairn Avenue and into Mt Ainslie Nature Reserve, on the western slopes of Mt Majura and adjacent to the Federal Highway road easement. In NSW it is distributed on the inland slopes and plains including grasslands and woodlands on the Monaro and is quite a common species along Old Cooma Road and other less modified areas south of Queanbeyan. The species is usually found in ungrazed and lightly grazed areas, along roadsides in particular. It appears to be very	Low The species is abundant along the road verge of Old Cooma Road north of Googong Dam Road, however it was not recorded within the Study Area during extensive on-foot surveys completed during the flowering season of Hoary Sunray. This recorded absence is likely the result of long-term intensive sheep grazing.

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Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
			sensitive to grazing, but responds to disturbance as a coloniser and appears to tolerate mowing. Flowers spring to summer.	
Pelargonium sp. *Striatellum* Omeo Stork's-bill	E	E1	An undescribed species of Pelargonium, Omeo Stork's Bill is a tufted perennial herb threatened by grazing, recreational activities, and exotic species. It is known to occur just above the high water level of ephemeral lakes in NSW and Victoria.	Negligible There is no potential habitat for this species in the study area.
Pomaderris pallida Pale Pomaderris	V	V1	Pale Pomaderris has been recorded from near Kydra Trig, north-west of Nimmitabel, Tinderry Nature Reserve, and the Queanbeyan River. A record from Byadbo in Kosciuszko National Park has not been relocated. The main distribution is along the Murrumbidgee in the ACT. It was recorded recently in eastern Victoria. This species usually grows in shrub communities surrounded by Brittle Gum *Eucalyptus mannifera* and Red Stringybark *E. macrorhynca* or Black Cypress *Callitris endlicheri* woodland.	Negligible This species is conspicuous when present and was not recorded within the study area during the surveys.
Prasophyllum petilum Tarengo Leek Orchid	E	E1	When first described in 1991, the Tarengo Leek Orchid was known only from the Hall Cemetery in the ACT. It has since been found at four sites in New South Wales: Captains Flat Cemetery, Ilford Cemetery, Steves Travelling Stock Route (TSR) at Delegate and the Tarengo TSR near Boorowa. The Tarengo Leek Orchid occurs on relatively fertile soils in grassy woodland or natural grassland. The three cemetery sites originally contained grassy woodland, dominated by Snow Gum *Eucalyptus pauciflora* and Black Gum *E. aggregata* at Captains Flat, and Blakely's Red Gum *E. blakelyi* and Yellow Box *E. melliodora* at Hall and Ilford. Both Tarengo TSR and Steves TSR are natural grasslands. The species is intolerant of grazing and this is considered to be the key reason it has been found only within cemeteries and TSRs, land from which grazing has been restricted.	Low The species has not been recorded in the vicinity of the study area, and, if it was present in the past, is unlikely to have withstood the long-term intensive sheep grazing of the study area.
Rutidosis Leptorrhynchoides	E	E1	In the ACT and NSW, Button Wrinklewort occurs in box-gum woodland, secondary grassland derived from box-gum woodland or in natural	Negligible

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Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Button Wrinklewort			temperate grassland. It prefers open spaces where it does not have to compete for light. It is known from several sites in the ACT, NSW and Victoria, where it is threatened by habitat loss, grazing and weed encroachment.	The species is quite conspicuous when present and it was not recorded during the surveys.
Swainsona recta Small Purple-pea	E	E1	The Small Purple-pea occurs in the grassy understorey of woodlands and open forests dominated by Blakely's Red Gum, Yellow Box, Candlebark and Bundy. The species grows in association with understorey dominants that include Kangaroo Grass, Poa tussocks and spear-grasses. Plants die back in summer, surviving as rootstocks until they shoot again in autumn. The species is intolerant of grazing but generally tolerant of fire, which also enhances germination by breaking the seed coat and reducing competition from other species.	Low Potential habitat for the species occurs within the study area, however the species has not been recorded in the vicinity of the study area. If the species once occurred within the study area, it is unlikely to have withstood the long-term intensive sheep grazing.
Swainsona sericea Silky Swainson-pea	-	V1	Silky Swainson-pea is a low growing perennial, found from the Northern Tablelands to the Southern Tablelands and Monaro region as well as further inland on the slopes and plains. The species is found in Natural Temperate Grassland and Snow Gum Woodland on the Monaro, and in Box-Gum Woodland in the Southern Tablelands and South West Slopes.	Low Potential habitat for the species occurs within the study area, and the species is known to occur in the locality. However, if the species once occurred within the study area, it is unlikely to have withstood the long-term intensive sheep grazing.
Thesium australe Austral Toadflax	V	V1	Found in very small to large populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Austral Toadflax is a root parasite that takes water and some nutrients from other plants, especially Kangaroo Grass. It is often found in damp sites in association with Kangaroo Grass but it is also found on other grass species at inland sites. Occurs on clay soils in grassy woodlands or coastal headlands.	Negligible There is no potential habitat for this species within the study area. The species has not been recorded in the locality.

Note: The brief species distribution and habitat descriptions provided in the above table are sourced from the threatened species online profiles, listing determinations and/or recovery plans prepared for the species by the Commonwealth Government and NSW Government. These resources and associated references are provided on the relevant government websites.

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Appendix 6. Recommended Species for Open Space Plantings

Note: The list of permitted plant species has been developed to provide a list of suitable species for each stratum (i.e. canopy, midstorey, shrubstorey and groundstorey), based on the objective of augmenting or recreating the strata of the relevant Plant Community Types (i.e. Box-Gum Woodland, Dry Sclerophyll Forest and Wet Tussock Grassland as identified and mapped for this F&FA).

It is noted that many of the species listed (notably groundstorey species) are not readily available from local suppliers, particularly during certain seasons. Accordingly, whilst the objective of the list is to ensure that only suitable species are planted, it is also important to maximise the species options. Therefore, whilst not exhaustive, the below table provides an extensive list of suitable species of which a sufficient diversity should be available.

Scientific Name	Common Name
Canopy	
Brachychiton populneus	Kurrajong
Eucalyptus blakelyi	Blakely's Red Gum
Eucalyptus bridgesiana	Apple Box
Eucalyptus dives	Broad-leaved Peppermint
Eucalyptus goniocalyx	Bundy
Eucalyptus macrorhyncha	Red Stringybark
Eucalyptus mannifera	Brittle Gum
Eucalyptus melliodora	Yellow Box
Eucalyptus nortonii	Mealy Bundy
Eucalyptus polyanthemos	Red Box
Eucalyptus rossii	Scribbly Gum
Eucalyptus rubida	Candlebark
Midstorey	
Acacia decurrens	Black Wattle
Acacia falcata	Sickle Wattle
Acacia implexa	Hickory
Acacia mearnsii	Late Black Wattle
Acacia melanoxylon	Blackwood
Allocasuarina verticillata	Drooping Sheoak
Eucalyptus pauciflora	Snow Gum
Eucalyptus stellulata	Black Sallee
Exocarpos cupressiformis	Cherry Ballart
Shrubstorey	
Acacia buxiflora	Box-leaf Wattle
Acacia dealbata	Silver Wattle
Acacia falciformis	Hickory
Acacia floribunda	White Sallow Wattle
Acacia genistifolia	Early Wattle

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Scientific Name	Common Name
Acacia gunnii	Ploughshare Wattle
Acacia rubida	Red-stem Wattle
Acacia siculiformis	Dagger Wattle
Acacia ulicifolia	Prickly Moses
Banksia marginata	Silver Banksia
Bursaria spinosa subsp. lasiophylla	Native Blackthorn
Cassinia aculeata	Common Cassinia
Cassinia longifolia	Cauliflower Bush
Cassinia quinquefaria	Rosemary Cassinia
Dodonaea viscosa	Hopbush
Grevillea rosmarinifolia	Rosemary Grevillea
Hakea decurrens	Bushy Needlewood
Hakea microcarpa	Small-fruited Hakea
Indigofera australis	Austral Indigo
Kunzea ericoides	Burgan
Kunzea parviflora	Violet Kunzea
Leptospermum brevipes	Slender Tea-tree
Leptospermum continentale	Prickly Teatree
Leptospermum lanigerum	Woolly Tea-tree
Leptospermum multicaule	Silver Teatree
Leptospermum myrtifolium	Swamp Teatree
Leptospermum obovatum	River Tea-tree
Lomatia myricoides	Long-leaf Lomatia
Melaleuca paludicola	River Bottlebrush
Pomaderris pallida	Pale Pomaderris
Rubus parvifolius	Native Raspberry
Styphelia triflora	Pink Five-corners
Groundstorey	
Shrub	
Bossiaea buxifolia	Box-leaved Bitter-pea
Bossiaea prostrata	Creeping Bossiaea
Brachyloma daphnoides	Daphne Heath
Correa reflexa	Common Correa
Cryptandra amara	Bitter Cryptandra
Daviesia genistifolia	Broom Bitter-pea
Daviesia latifolia	Hop Bitter-pea
Daviesia leptophylla	Narrow-leaf Bitter-pea
Daviesia mimosoides	Narrow-leaf Bitter-pea
Daviesia ulicifolia	Gorse Bitter-pea

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Scientific Name	Common Name
Dillwynia cinerascens	Grey Parrot-pea
Dillwynia glaucula	Michelago Parrot-pea
Dillwynia prostrata	Matted Parrot-pea
Dillwynia retorta	Heathy Parrot-pea
Dillwynia sericea	Showy Parrot-pea
Hardenbergia violacea	False Sarsparilla
Hibbertia obtusifolia	Grey Guinea-flower
Hibbertia riparia	Stream Guinea-flower
Leucopogon fletcheri	Pendant Beard Heath
Leucopogon fraseri	Beard Heath
Leucopogon virgatus	Common Beard Heath
Lissanthe strigosa	Peach Heath
Melichrus urceolatus	Urn Heath
Pultenaea procumbens	Heathy Bush-pea
Sedge, Rush	
Carex appressa	Tall Sedge
Carex inversa	Knob Sedge
Isolepis cernua	Nodding Club-rush
Isolepis hookeriana	Grassy Club-sedge
Isolepis inundata	Swamp Club-sedge
Juncus australis	Austral Rush
Juncus subsecundus	Finger Rush
Lepidosperma laterale	Sword Sedge
Lomandra bracteata	Mat-rush
Lomandra filiformis	Wattle Mat-rush
Lomandra longifolia	Spiny-headed Mat-rush
Lomandra multiflora	Many-flowered Matrush
Grass	
Aristida ramosa	Purple Wiregrass
Austrostipa bigeniculata	Tall Speargrass
Austrostipa densiflora	Dense Spear-grass
Austrostipa scabra	Corkscrew
Bothriochloa macra	Red-leg Grass
Chloris truncata	Windmill Grass
Cymbopogon refractus	Barbed Wire Grass
Dichelachne crinita	Longhair Plumegrass
Dichelachne hirtella	Slender Plumegrass
Dichelachne inaequiglumis	Plume Grass
Dichelachne micrantha	Short-hair Plumegrass

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Scientific Name	Common Name
Dichelachne parva	Plume Grass
Dichelachne rara	Plume Grass
Elymus scaber	Wheat Grass
Microlaena stipoides	Weeping Grass
Panicum effusum	Hairy Panic
Poa labillardierei	Tussock Grass
Poa sieberiana	Snow Grass
Rytidosperma bipartita	Wallaby Grass
Rytidosperma caespitosa	Ringed Wallaby-grass
Rytidosperma carphoides	Short Wallaby-grass
Rytidosperma laevis	Wallaby Grass
Rytidosperma monticola	Small-flower Wallaby Grass
Rytidosperma pallidum	Red-anther Wallaby Grass
Rytidosperma racemosa	Slender Wallaby Grass
Sorghum leiocladum	Wild Sorghum
Themeda triandra	Kangaroo Grass
Forb, Lily, Orchid	
Acaena novae-zelandiae	Bidgee-widgee
Acaena ovina	Sheep's Burr
Ajuga australis	Austral Bugle
Alternanthera nana	Hairy Joyweed
Arthropodium milleflorum	Vanilla-lily
Arthropodium minus	Small Vanilla Lily
Asperula conferta	Common Woodruff
Asperula scoparia	Prickly Woodruff
Brachyscome aculeata	Hill Daisy
Brachyscome decipiens	Field Daisy
Brachyscome diversifolia	Large-headed Daisy
Brachyscome graminea	Grass Dairy
Brachyscome heterodonta	Lobe-seed Daisy
Brachyscome multifida	Cut-leaved Daisy
Brachyscome rigidula	Leafy Daisy
Brachyscome scapigera	Tufted Daisy
Brachyscome spathulata	Spoon Daisy
Brunoniella australis	Blue Trumpet
Bulbine bulbosa	Bulbine Lily
Bulbine glauca	Rock Lily
Burchardia umbellata	Milkmaids
Caesia calliantha	Blue Grass-Lily

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Scientific Name	Common Name
Calocephalus citreus	Lemon Beauty-heads
Calotis cuneifolia	Purple Burr-daisy
Calotis glandulosa	Mauve Burr-daisy
Calotis lappulacea	Yellow Burr-daisy
Calotis scabiosifolia	Rough Burr-daisy
Chamaesyce drummondii	Caustic-weed
Cheilanthes austrotenuifolia	Rock Fern
Chrysocephalum apiculatum	Common Everlasting
Chrysocephalum semipapposum	Clustered Everlasting
Clematis microphylla	Small-leaved Clematis
Convolvulus erubescens	Australian Bindweed
Cotula australis	Common Cotula
Craspedia variabilis	Billy Buttons
Cullen microcephalum	Dusky Scurfpea
Cymbonotus lawsonianus	Austral Bears-ear
Cynoglossum australe	Australian Hound's-tongue
Cynoglossum suaveolens	Sweet Hound's-tongue
Daucus glochidiatus	Native Carrot
Derwentia perfoliata	Digger's Speedwell
Desmodium brachypodum	Large Tick-trefoil
Desmodium varians	Slender Tick-trefoil
Dianella longifolia	Smooth Flax Lily
Dianella revoluta	Black-anther Flax-lily
Dichondra repens	Kidney Weed
Dichopogon fimbriatus	Nodding Chocolate Lily
Dichopogon strictus	Chocolate Lily
Dipodium punctatum	Hyacinth Orchid
Diuris aequalis	Buttercup Doubletail
Diuris behrii	Golden Cowslips
Diuris chryseopsis	Common Golden Moths
Diuris dendrobioides	Long-tail Purple Diuris
Diuris maculata	Leopard Orchid
Diuris ochroma	Pale Golden Moths
Diuris pedunculata	Small Snake Orchid
Diuris punctata	Purple Donkey-orchid
Diuris semilunulata	Donkey-ears
Diuris sulphurea	Tiger Orchid
Drosera peltata	Pale Sundew
Drosera pygmaea	Pigmy Sundew

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Scientific Name	Common Name
Eriochilus cucullatus	Parson's Bands
Erodium crinitum	Native Crowfoot
Eryngium ovinum	Blue Devil
Galium gaudichaudii	Rough Bedstraw
Geranium antrorsum	Antrorse Geranium
Geranium retrorsum	Common Cranes-bill
Geranium solanderi	Native Geranium
Glossodia major	Wax-lip Orchid
Glycine clandestina	Twining Glycine
Glycine tabacina	Glycine Pea
Gonocarpus tetragynus	Raspwort
Goodenia hederacea	Ivy Goodenia
Goodenia pinnatifida	Scrambled Eggs
Helichrysum scorpioides	Button Everlasting
Hovea linearis	Creeping Hovea
Hydrocotyle laxiflora	Stinking Pennywort
Hypericum gramineum	Small St John's Wort
Isotoma axillaris	Rock Isotome
Leptorhynchos squamatus	Scaly Buttons
Leucochrysum albicans var. tricolor	Hoary Sunray
Lotus australis	Austral Trefoil
Luzula densiflora	Woodrush
Luzula meridionalis	Common Woodrush
Lythrum salicaria	Purple Loosestrife
Microseris lanceolata	Yam Daisy
Microtis parviflora	Slender Onion-orchid
Microtis unifolia	Common Onion Orchid
Opercularia diphylla	Stinkweed
Ophioglossum lusitanicum	Adder's Tongue
Oreomyrrhis eriopoda	Australian Carraway
Oxalis perennans	Perrenial Oxalis
Pelargonium australe	Native Storks-bill
Pimelea curviflora	Curved Rice-flower
Plantago varia	Variable Plantain
Podolepis hieracioides	Tall Copper-wire Daisy
Podolepis jaceoides	Showy Copper-wire Daisy
Polygala japonica	Dwarf Milkwort
Ranunculus lappaceus	Common Buttercup
Rumex brownii	Swamp Dock

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Scientific Name	Common Name
Rutidosis leiolepis	Monaro Golden Daisy
Rutidosis leptorhynchoides	Button Wrinklewort
Schoenus apogon	Common Bog Sedge
Solenogyne dominii	Smooth Solenogyne
Solenogyne gunnii	Hairy Solenogyne
Stackhousia monogyna	Creamy Candles
Stellaria angustifolia	Swamp Starwort
Stellaria filiformis	Thread Starwort
Stellaria pungens	Prickly Starwort
Stylidium despectum	Dwarf Triggerplant
Stylidium graminifolium	Grass Triggerplant
Stypandra glauca	Nodding Blue Lily
Swainsona behriana	Behr's Swainson-pea
Swainsona monticola	Moutain Swainson-pea
Swainsona recta	Small Purple-pea
Swainsona sericea	Silky Swainson-pea
Thelymitra ixioides	Spotted Sun-orchid
Thelymitra malvina	Mauve-tuft Sun-orchid
Thelymitra pauciflora	Slender Sun-orchid
Thesium australe	Austral toadflax
Thysanotus patersonii	Twining Fringe-lily
Thysanotus tuberosus	Common Fringe-lily
Tricoryne elatior	Yellow Rush-lily
Triptilodiscus pygmaeus	Common Sunray
Velleia paradoxa	Spur Velleia
Viola betonicifolia	Arrowhead Violet
Viola hederacea	Native Violet
Vittadinia cuneata	Fuzzweed
Vittadinia gracilis	Woolly New Holland Daisy
Vittadinia muelleri	Narrow-leaved New Holland Daisy
Wahlenbergia communis	Tufted Bluebell
Wahlenbergia gracilis	Australian Bluebell
Wahlenbergia stricta	Tall Bluebell
Wurmbea dioica	Early Nancy
Xerochrysum viscosum	Sticky Everlasting Daisy

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Appendix 7. TSC Act Assessments of Significance

Section 5A of the EP&A Act lists seven factors against which a proposed development/action/activity must be assessed to determine whether it is likely to have a significant effect on species, populations and communities (and their habitats) listed under the TSC Act and FM Act. The Threatened Species Assessment Guidelines; the Assessment of Significance (DECC 2007) detail the manner in which the Assessment of Significance (AoS) (also known as the seven-part-test) is to be interpreted and applied. Prepared in this manner, AoS are provided below for the one TSC listed TEC and three TSC Act listed woodland birds considered to have some potential to be impacted by the proposal.

White Box – Yellow Box – Blakely's Red Gum Woodland (Box – Gum Woodland)

Introduction

White Box – Yellow Box – Blakely's Red Gum Woodland (TSC Act Box-Gum Woodland) is currently listed as an endangered ecological community under the TSC Act.

As described in the Final Determination (NSW Scientific Committee 2002) and the associated, the definition for the TSC Act Box-Gum Woodland TEC is broad and encompasses a range of community variants. In effect, any land for which the climax community is Box-Gum Woodland that has not been cultivated, become a stock camp or otherwise been entirely modified is likely to meet the definition of the TSC Act listed TEC.

With regard to the above, the TSC Act definition provides the absolute minimum requirements for a patch of vegetation to be considered to support the TEC. As such, the NSW Government encourages the use of a suitable biometric (such as the Biobanking Assessment Methodology) to categorise the vegetation within a given study area in a manner that reflects the actual and relative values of the vegetation. This categorisation is essential in informing planning processes, such that more intact (i.e. higher value) areas of TEC can be appropriately prioritised for conservation. Conversely, marginal areas of the TEC, such as those that support only scattered remnant trees or low diversity native grassland/pasture, may be unlikely to degrade further under an alternate management regime.

As described in Section 4.1.3 of this F&FA, the portions of the study area mapped as PCT 1330 Zone 1 are consistent with the listed community in a highly modified form. The occurrence of the TEC is characterised by some scattered remnant trees with no regeneration of the overstorey, and a modified weedy groundcover dominated by grazing-tolerant native grasses, with very few native forbs.

Assessment of Significance

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.

Not applicable, the matter is not a threatened species.

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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.

Not applicable, the matter is not an endangered population.

c. in the case of an endangered ecological community or critically 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, or

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.

Effect on the extent of the local occurrence

The proposed development will have a minor impact on the local occurrence of this community, as approximately 12.55 ha of the community is proposed to be cleared. The TEC is present within the study area in a highly modified form and is likely to continue to degrade under the current management regime (set grazing). The TEC is present in better condition in the locality and the proposed development is unlikely to have an adverse effect on the extent of the ecological community such that its local occurrence is placed at risk of extinction.

Effect on the composition of the local occurrence

The TEC proposed to be cleared is of low diversity and does not support any species of conservation significance. The proposed development is unlikely 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. Expanses of the community in more intact condition occur in the locality.

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, and

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, and

iii. 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.

Extent of habitat removal or modification

The proposed development will result in the clearance of approximately 12.55 ha of this community in a highly modified form. Some remnant trees may be kept within the development.

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Fragmentation and isolation of habitat

No fragmentation or isolation of habitat will occur. The area of the community present within the study area is unlikely to form a dispersal link (or important part thereof) for any native species.

Importance of the habitat

The small area of the TSC Act Box-Gum Woodland to be removed is a marginal example of the ecological community (PCT 1330 Zone 1). Specifically, this vegetation zone is characterised by a highly modified yet native groundcover, with isolated remnant eucalypts. A patch of the community in this condition could be of value as a buffer to more intact Box-Gum Woodland and for its value as a component of fauna movement corridors, however in this location, the patch does not buffer higher quality TSC Act listed Box-Gum Woodland, nor is it an important component of a fauna movement corridor. The community in this condition is unlikely to respond substantially to assisted natural regeneration, is likely to continue to deteriorate under the current management regime, and is of relatively low importance to the long-term survival of the ecological community in the locality.

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

There are currently no critical habitat declarations, or draft declarations, for this community.

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

A targeted strategy for managing this community has been developed under the Saving Our Species program. The proposed development is not inconsistent with any of the management actions in the strategy as the TEC proposed to be cleared is not a high-quality remnant of the TEC.

The below table provides an assessment of the consistency of the proposed development with each of the activities listed on the NSW threatened species profile as recommended activities to assist the recovery of this community.

As described in the below table, the proposed development will have a generally neutral impact with regard to the activities recommended for TSC Act Box-Gum Woodland.

Recovery Activity	**Proposed Development's Influence on Action Positive/Neutral/Negative**
Undertake control of rabbits, hares, foxes, pigs and goats (using methods that do not disturb the native plants and animals of the remnant).	Neutral
Manage stock to reduce grazing pressure in high quality remnants (i.e. those with high flora diversity or fauna habitat).	Neutral
Do not harvest firewood from remnants (this includes living or standing dead trees and fallen material).	Neutral
Leave fallen timber on the ground.	Neutral

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Recovery Activity	Proposed Development's Influence on Action Positive/Neutral/Negative
Erect on-site markers to alert maintenance staff to the presence of a high quality remnant.	Neutral
Encourage regeneration by fencing remnants, controlling stock grazing and undertaking supplementary planting, if necessary.	Negative
Undertake weed control (taking care to spray or dig out only target species).	Neutral
Protect all sites from further clearing and disturbance.	Negative Clearance of a small area of the TEC is proposed. However, the TEC within the study area is a marginal example of the community and would be considered a low priority site for the recovery of this community.
Ensure remnants remain connected or linked to each other; in cases where remnants have lost connective links, re-establish them by revegetating sites to act as stepping stones for fauna, and flora (pollen and seed dispersal).	Neutral The proposed development will not fragment this TEC.
Mark remnants onto maps (of the farm, shire, region, etc) and use to plan activities (e.g. remnant protection, rehabilitation or road, rail and infrastructure maintenance work). On-site markers can alert maintenance staff to the presence of a threatened ecological community.	Neutral

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 key threatening processes (KTPs) currently listed on Schedule 3 of the TSC Act of relevance to TSC Act Box-Gum Woodland and the proposed development are listed in the below table.

As described in below table, the proposed development constitutes the key threatening process 'Clearing of native vegetation' and is likely to lead to a small increase in the impacts from the weeds and feral cats.

Key Threatening Process	Impact from Proposed Development Positive/Neutral/Negative
Aggressive exclusion of birds by Noisy Miners *Manorina melanocephala*	Neutral The study area is currently open agricultural land and the Noisy Miner is conspicuously present throughout. The proposed development is unlikely to increase the impact of this species.
Clearing of native vegetation	**Negative**

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Key Threatening Process	Impact from Proposed Development Positive/Neutral/Negative
	Approximately 12.55 ha of the TEC in low condition is proposed to be cleared.
Removal of dead wood and dead trees	Neutral Some modification through clearing of woody vegetation (including dead trees) will occur, however this will not extend beyond the proposed clearance area.
Invasion of native plant communities by exotic perennial grasses	**Positive** The proposed development will include effective control of significant grassy weeds which have been recently introduced to the area, particularly African Lovegrass, Chilean Needlegrass, and Serrated Tussock, which otherwise may not occur. This may help to protect the TEC in the broader locality.
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	**Negative** The proposed development is likely to slightly increase the impact of this KTP in the area.
Predation by the feral cat *Felis catus*	**Negative** Feral cats are known to occur throughout the locality and would no doubt roam within the study area. The proposed development is likely to marginally increase the impact of this KTP in the area.
Predation, habitat degradation, competition and disease transmission by feral pigs *Sus scrofa*	Neutral The proposed development is unlikely to increase the impact of feral pigs.

Conclusion

As determined via consideration of the above factors, the proposed development will have a minor impact upon the TEC, however due to the small size and the low condition of the patch to be impacted, the impact upon TSC Act listed Box-Gum Woodland is unlikely to be significant. Accordingly, a Species Impact Statement is not considered warranted for this TEC.

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Scarlet Robin *Petroica boodang* and Flame Robin *Petroica phoenica*

Introduction

Both the Scarlet Robin and Flame Robin are listed as a vulnerable species on Schedule 2 of the TSC Act.

The Flame Robin is an altitudinal migrant which breeds during spring-early summer in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. The species moves down to over-winter in dry forests, open woodlands, native grasslands and modified pastures, with or without scattered trees.

Less of a altitudinal migrant than the Flame Robin, the Scarlet Robin is known to breed on ridges, hills and slopes across the Southern Tablelands, preferring to move into more open grassy woodlands, native grasslands and grazed paddocks with scattered trees to over-winter.

While both species will readily forage across open highly modified agricultural land with a simplified groundstorey, an abundance of logs and other coarse woody debris is considered an important structural habitat component.

Non-breeding Scarlet Robins and Flame Robins were observed foraging throughout Neighbourhoods 2-5 of Googong during the field survey undertaken for the EVCA during May 2015 (Biosis 2015b). Substantial flocks of each of these species have been observed to over-winter in the open agricultural land across the locality, recorded generally between May to August at many study sites in the Googong, Burra, Royalla, Williamsdale and Michelago localities (R. Speirs pers. obs.).

Based on the known ecology of these species, their recorded occurrence within the study area and the habitat present, it is likely that study area comprises a portion of the broad over-winter foraging habitat for both species. Expansive areas of similar habitat occur in the broader locality.

Both species are unlikely to breed within the study area. The Flame Robin does not breed in the locality at all, however the Scarlet Robin may breed in the more intact woodland/dry forest nearby the study area (i.e. Googong Foreshores, west of Old Cooma Road etc.).

Assessment of Significance

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 proposed development will involve clearance or modification of up to 155 ha of low quality foraging habitat for these species. This is a small component of the substantial similar habitat which occurs in the locality.

The proposed development will result in the planting of trees and other vegetation along roadsides and in open space areas. Where practicable, these plantings will comprise indigenous species, chosen from the list provided in Appendix 6. Anecdotal evidence suggests that the development of native gardens encourages inhabitation by the Scarlet Robin and Flame Robin. It is likely that any increase of native shrub and midstorey vegetation would substantially increase the refuge and foraging resources present (i.e. increasing the number and diversity of invertebrate prey).

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As neither species is likely to breed within the study area, and they are unlikely to suffer a significant reduction in foraging resources, the proposed development is considered unlikely to have an adverse effect on the life cycle of either species, such that a viable local population is likely to be placed at risk of extinction.

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.

Not applicable, the matter is not an endangered population.

c. in the case of an endangered ecological community or critically 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, or

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.

Not applicable, the matter is not an endangered ecological community.

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, and

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, and

iii. 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.

<u>Extent of habitat removal or modification</u>

The proposed development will involve the clearance or modification of up to approximately 155 ha of low quality foraging habitat. The extent of the proposed clearance of foraging habitat for these species represents a small proportion of the foraging habitat present throughout the analogous habitat available across much of the broader locality. The species are likely to continue to utilise parts of the development, once established, for foraging, particularly open space areas and native gardens.

<u>Fragmentation and isolation of habitat</u>

The study area comprises a small portion of the analogous habitat occurring throughout much of locality in all directions. The proposed development is unlikely to fragment or isolate an area of habitat.

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Importance of the habitat

As discussed herein, the foraging habitat present within the study area is analogous with that that which occurs throughout much of the locality and is unlikely to be of any lesser or greater importance to these species. The study area does not contain potential breeding habitat for either species.

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

There are currently no critical habitat declarations, or draft declarations, for these species.

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

No specific recovery plan or threat abatement plan has been prepared for these species. However, both species have been assigned to the Landscape Species management stream under the 'Saving our Species Program' and associated Species Action Statement. The objective of the Species Action Statement is to ensure that a species is secure in the wild in NSW and that its NSW geographic range is extended or maintained.

The table on the following page provides an assessment of the consistency of the proposed development with the described actions. Only actions relevant to the proposed development are included in the table.

As described in the table, the proposed development is slightly inconsistent with one action, the buffering and conservation of remnant vegetation. As there are no high quality remnants within the study area, this action is unlikely to be targeted toward this scenario. In addition, the clearance of the modified vegetation is unlikely to impact the security of the species in the wild, or impact the geographic range of the species.

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Action Description	Scale (site or area/region)	Proposed Development's Influence on Action Positive/Neutral/Negative
Apply "corridor" or "stepping-stone enclosure" (20x20m plots maximum 100m apart) plantings to reconnect patches of isolated habitat, ensuring corridors are sufficiently wide and varied in structure and composition to deter noisy miners (using a mix of canopy and mid-layer tree species, shrubs, tussocky ground layer species); this measure is particularly appropriate along riparian corridors or along existing fence lines; plantings must use locally indigenous species, appropriate to the vegetation type predicted for replanting sites.	Site	**Neutral** Although the proposed development will include the removal of foraging habitat, it will also include native vegetation plantings within urban open space areas. Areas planted with dense and varied indigenous shrubs and trees are likely to improve habitat and provide stepping stones for the species.
Apply augmentation planting of missing structural layers (e.g., mid-layer wattles (*Acacia* spp.), shrub layer species, or coarse tussocky ground layer species), using locally indigenous species appropriate to the vegetation type predicted for replanting sites.	Site	**Neutral** As mentioned above, the development will include native vegetation plantings within urban open space areas. These will aim to include all natural structural layers.
Create buffers around existing remnants and increase size of remnants by fencing out a large area surrounding existing remnants; such buffers could consist of a native grassy ground layer, with or without scattered or regenerating trees; buffers could be additionally planted with locally indigenous trees and shrubs; buffers provide additional feeding grounds, as well as providing for future colonisation of native woody species (trees and shrubs).	Site	**Negative** The existing foraging habitat is proposed to be removed or modified and buffers are not proposed for native vegetation in urban open space areas. There are no high quality remnants to buffer.
Initiate a community education program with a focus on threatened woodland birds in important parts of the species' range; actions may include to: promote the Office of Environment and Heritage Threatened Species website; develop landholder guidelines; run bird identification courses and threatened woodland bird field days, particularly to demonstrate important habitat attributes at prime sites; and encourage experts to attend Landcare or other non-government organisation events, schools, agricultural shows, etc.	Area	**Positive** A community education program, including activities and educational material regarding local threatened species, is currently underway within Googing and is proposed to be extended to Neighbourhood 2 as the neighbourhood is established.

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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 key threatening processes (KTPs) currently listed on Schedule 3 of the TSC Act of relevance to these species and the proposed development are listed in the table below. Although the proposed development constitutes a KTP ('clearing of native vegetation'), the native vegetation to be cleared is foraging habitat only and unlikely to be of high significance to either species.

Key Threatening Process	**Impact from Proposed Development** **Positive/Neutral/Negative**
Aggressive exclusion of birds by Noisy Miners *Manorina melanocephala*	Neutral The study area is currently open agricultural land and the Noisy Miner is conspicuously present throughout. The proposed development is unlikely to increase the impact of this species.
Clearing of native vegetation	**Negative** Up to 73 ha of predominantly native vegetation is proposed to be cleared or substantially modified. The vegetation present is already highly modified, having been subject by many years of intensive grazing.
Removal of dead wood and dead trees	**Negative** Most of the vegetation within the study area, including dead wood and dead trees is proposed to be removed.
Invasion of native plant communities by exotic perennial grasses	**Positive** The proposed development will include effective control of significant grassy weeds which have been recently introduced to the area, particularly African Lovegrass, Chilean Needlegrass, and Serrated Tussock, which otherwise may not occur. This may help to protect native vegetation in the broader locality.
Predation by the European Red Fox *Vulpes vulpes*	**Neutral** The proposed development is unlikely to noticeably increase the impact of this KTP.
Predation by the Feral Cat *Felis catus*	**Negative** Feral cats are known to occur throughout the locality and would no doubt roam within the study area. The proposed development is likely to marginally increase the impact of this KTP in the area.

Conclusion

As determined via consideration of the above seven factors, the proposed development is unlikely to significantly affect either the Scarlet Robin or the Flame Robin. Accordingly, a Species Impact Statement is not considered warranted for these species.

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White-fronted Chat

Introduction

The White-fronted Chat is listed as a vulnerable species on Schedule 2 of the TSC Act.

This species is typically found in damp open habitats, such as saltmarsh, salt lakes, grassy plains, or swampy farm land. They are often found foraging on bare or grassy ground in wetland areas, although may also be found in shrubs adjacent to these areas. This species is observed to occur singly, in pairs, and in small flocks. The species is not generally migratory.

A single male White-fronted Chat was recorded in May 2015 just outside of the southeast boundary of the study area (Biosis 2015b). The individual was recorded in vegetation contiguous with and analogous to PCT 1298 Zone 1, a wet grassland/sedgeland now predominantly comprised of exotic species. The species is known to occur in nearby Googong Foreshores.

Based on the nearby record, the known ecology of this species, and the habitat present, it is likely that PCT 1298 Zone 1 comprises foraging habitat for the species. The species may nest within the study area, however this is considered unlikely due to a lack of shrubs and other low vegetation suitable for nesting. Breeding is more likely to occur within more intact habitat in the locality (i.e. Googong Foreshores etc.).

The species is known to be sensitive to human disturbance and thus would be unlikely to utilise the study area once post development.

Assessment of Significance

h. 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 proposed development will involve the clearance of up to approximately 18 ha of foraging habitat for this species. This is a small component of the substantial similar habitat which occurs in the locality. The species is unlikely to breed within the study area.

Given the above, the proposed development is considered unlikely to have an adverse effect on the life cycle of the species, such that a viable local population is likely to be placed at risk of extinction.

i. 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.

Not applicable, the matter is not an endangered population.

j. in the case of an endangered ecological community or critically 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, or

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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.

Not applicable, the matter is not an endangered ecological community.

k. in relation to the habitat of a threatened species, population or ecological community:

iv. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

v. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

vi. 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.

Extent of habitat removal or modification

The proposed development will involve the clearance or substantial modification of up to approximately 18 ha of foraging habitat.

Fragmentation and isolation of habitat

The proposed development is unlikely to fragment or isolate an area of habitat.

Importance of the habitat

As discussed herein, the foraging habitat present within the study area is analogous with that which occurs elsewhere within the locality and, given only one bird has been seen within, is unlikely to be of significance to the species. The species is unlikely to breed within the study area.

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

There are currently no critical habitat declarations, or draft declarations, for this species.

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

No specific recovery plan or threat abatement plan has been prepared for this species. However, the species have been assigned to the Landscape Species management stream under the 'Saving our Species Program' and associated Species Action Statement. The objective of the Species Action Statement is to ensure that the species is secure in the wild in NSW and that its NSW geographic range is extended or maintained.

The following table provides an assessment of the consistency of the proposed development with the described actions. As described in the table, the proposed development is likely to have neither a positive or negative influence on the conservation actions recommended for the White-fronted Chat.

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Action Description	Scale (site or area/region)	Proposed Development's Influence on Action Positive/Neutral/Negative
Encourage landholders managing areas of suitable habitat in south-western NSW—saltmarshes and grasslands close to waterways with intact shrub layer for nesting (e.g. Sclerostegia arbuscula) to enter into agreements, particularly in-perpetuity covenants or stewardship agreements, that promote the retention and protection of this habitat.	Area	Neutral The study area does not support suitable habitat with an intact shrub layer.
Where significant populations are identified, particularly on public land, take measures to reduce the impacts of human disturbance on these areas (e.g. by reducing access to the site, installing buffer zones or re-routing tracks).	Site	Neutral The study area does not support a significant population.
Investigate the feasibility of installing cages to protect individual nest-sites from vertebrate predators, in known breeding populations. Ensure that this intervention is accompanied by monitoring and evaluation of success in improving reproductive success and recruitment to the local population.	Site	Neutral The study area is unlikely to support breeding habitat.
Raise awareness among residential communities close to known important populations, of the importance of keeping domestic cats indoors and keeping dogs on leads.	Area	Neutral The study area does not support a known important population.
Liaise with agricultural landholders managing water within the species' habitat to negotiate stewardship agreements that discourage the alteration of flow regimes in rivers and floodplains close to known populations.	Area	Neutral As the study area is unlikely to support significant habitat for the species, this is not relevant.

n. 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 key threatening processes (KTPs) currently listed on Schedule 3 of the TSC Act of relevance to the White-fronted Chat and the proposed development are listed in the table below. The proposed development constitutes one KTP 'clearing of native vegetation'. Nevertheless, the vegetation to be cleared is already predominantly exotic and highly modified, the alteration to the flow regime is likely to lead to the loss of only a small area of foraging habitat. Predation levels from both foxes and cats are already likely to be high within the agricultural land in the locality. Cat numbers are not expected to increase significantly in the Googong Foreshores, as fencing and targeted control is being used to keep the numbers down.

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Key Threatening Process	Impact from Proposed Development Positive/Neutral/Negative
Aggressive exclusion of birds by Noisy Miners *Manorina melanocephala*	Neutral The study area is currently open agricultural land and the Noisy Miner is conspicuously present throughout. The proposed development is unlikely to increase the impact of this species.
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	Neutral The proposed development is unlikely to significantly change flow regimes downstream of the study area, however flow regimes within the study area will be substantially altered through landscaping, damming etc. Any impacts to the existing floodplain habitat will be countered by the creation of additional wetlands and associated fringing habitat.
Clearing of native vegetation	**Negative** Although the habitat for the species within the study area is highly modified and predominantly exotic, it is proposed to be cleared.
Invasion of native plant communities by exotic perennial grasses	Neutral The habitat within the study area is already predominantly exotic, with a high proportion of exotic perennial species.
Predation by the European Red Fox *Vulpes vulpes*	Neutral The proposed development is unlikely to noticeably increase the impact of this KTP upon the species in the area.
Predation by the Feral Cat *Felis catus*	**Negative** Feral cats are known to occur throughout the locality and would no doubt roam within the study area. The proposed development is likely to marginally increase the impact of this KTP in the area.

Conclusion

As determined through consideration of the above seven factors, the proposed development is unlikely to significantly affect the White-fronted Chat. Accordingly, a Species Impact Statement is not considered warranted for this species.

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