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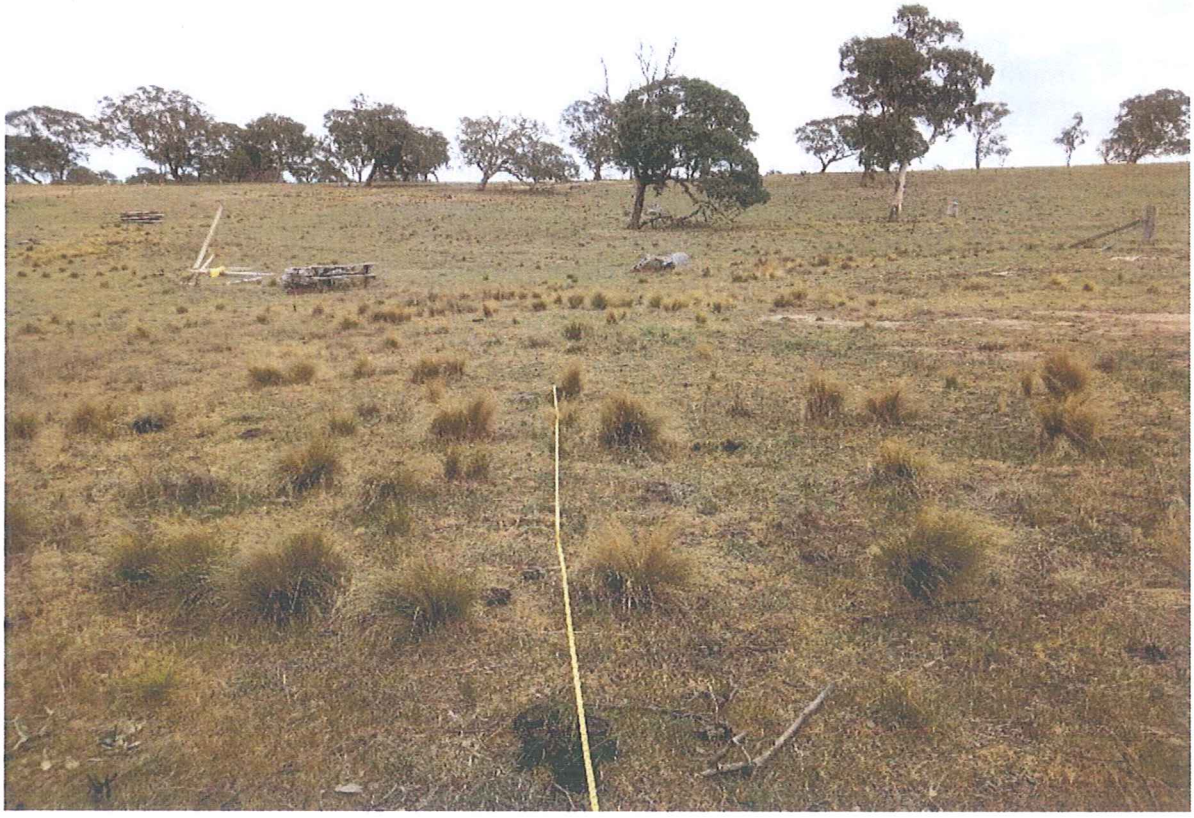

Flora and Fauna Assessment - Lot 28 DP 479, Goulburn, NSW

November 2017

Prepared for Cappello Developments Pty Ltd

Document Information

Report for:	Cappello Developments Pty Ltd
Prepared by:	Sam Reid & Robert Speirs
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- Giselle Ravarian, Urban Designer & Town Planner, SpaceLab Pty Ltd
- Ryan Cappello, Director, Cappello Developments
- Stephen William Heazlett Hazelton, landowner

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Executive Summary

Cappello Developments Pty Ltd intends to submit the following Development Applications (DA) for the subdivision and development of Lot 28 DP 479, Goulburn, NSW (the 'study area').

1. Stage 1 will split the study area into two lots, the approx. 20 ha lot to be created in the north east of the study area will contain the existing heritage-listed dwelling and associated buffers and will be retained by the existing land owner. The key purpose of Stage 1 is to facilitate the exchange of the contract with the existing landowner at an early stage in the development process, stage will not involve any on-ground works.

2. Stage 2 will then subdivide the residual lot to create 393 residential lots and a drainage reserve lot in the southeast corner. The subdivision will also include a network of public roads, surface water management measures, open space areas, and other urban infrastructure.

For the purposes of this Flora and Fauna Assessment (F&FA), the development associated with both stages is considered in a collective manner and is referred to as the 'proposed development'.

Capital Ecology Pty Ltd has been commissioned to undertake ecological surveys and prepare this F&FA to identify and assess the significance of the impacts that the proposed development may have upon the biodiversity values of the study area and surrounds.

The above has been completed in accordance with the:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- 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 includes:

- a desktop database and literature review;
- thorough on-ground surveys including vegetation assessment and mapping,
- 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 Commonwealth and NSW legislation.

Methods and Results

The NSW Biobanking Assessment Methodology was used to survey and map plant community types (PCTs) within the study area. In addition, a further level of categorisation was used to classify each PCT into Vegetation Zones based on the composition and condition of the groundstorey. The study area was assessed as supporting a single Vegetation Zone of the grassland PCT 'PCT1110 – River Tussock – Tall Sedge – Kangaroo Grass moist grasslands of the South Eastern Highlands Bioregion' and three discernible Vegetation Zones of the woodland PCT 'PCT1330 – Yellow Box Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands'. The distribution of each Vegetation Zone was ground-truthed, accurately mapped using a Geographic Information System, and quantified (i.e. total hectares).

None of the PCT1330 was determined to meet the EPBC Act Box-Gum Woodland definition, however Zones 1 and 4 of PCT1330 were determined to be consistent with the minimum definition under the TSC Act (albeit in a highly modified, marginal form).

A total of only 7 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 history of cultivation, high intensity set stock grazing, and other landscape and vegetation modification, it is considered unlikely that any threatened flora species occur within the study area.

Several TSC Act listed bird species and two TSC Act listed insectivorous bat species are considered to have a moderate or higher likelihood of occurrence within the study area. However, this occurrence is likely to be limited to occasional visits to forage within the patches of retained remnant eucalypts. No breeding habitat for any threatened or migratory fauna was identified within the study area.

A total of 16 exotic plant species were recorded within the study area, of which Serrated Tussock *Nassella trichotoma*, Blackberry *Rubus fruticosis* and African Box Thorn *Lycium ferocissimum* currently pose a moderate to extreme (i.e. Serratend Tussock) degree of threat to the biodiversity values of the study area and adjoining land.

The Red Fox *Vulpes vulpes*, European Rabbit *Oryctolagus cuniculus*, Indian Myna *Acridotheres tristis* and Common Starling *Sturnus vulgaris* were recorded during the field surveys, however the exotic pest species European Brown Hare *Lepus europaeus* and Feral Cat *Felis catus* 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 and peri-urban 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 the retention of the patches of remnant eucalypt trees and isolated paddock 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
Commonwealth		
Environment Protection and Biodiversity Conservation Act 1999	White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grassland (EPBC Act Box-Gum Woodland). Potential habitat for threatened flora species and threatened and/or migratory fauna species.	The proposed development is unlikely to have a significant impact on a MNES given the study area does not: • support any EPBC Act listed ecological communities; • support any EPBC Act listed flora species; or • contain habitat of potential importance to EPBC Act listed threatened or migratory fauna species. In light the above, EPBC Act referral is considered unwarranted and is not recommended.
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 flora and 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 as defined by SEPP 44.	No further consideration of this SEPP is required.
Native Vegetation Act 2003	Native vegetation.	The majority of the study area is zoned 'R5 – Large Lot Residential' which is considered an 'urban area' under Part 3 of Schedule 1, and therefore is excluded from the operation of the NV Act. The northwest portion of the study area is zoned 'RU6 – Transition' which is not listed as an excluded zone under Schedule 1. It is noted however that this portion of the study area is not proposed to be impacted by the proposed development. Accordingly, the NV Act does not apply to the proposed development.
Biosecurity Act 2015	Regional priority weeds.	Prepared under the Biosecurity Act, the *South East Region Strategic Weed Management Plan 2017-2022* (RSWMP), the RSWMP prescribes the requirements for the four regional priority weeds occurring within the study area (refer Section 4.5). The weed control measures described in Section 5 are consistent with the requirements of the RSWMP.
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 (as detailed in Section 5), the proposed development is unlikely to significantly affect any threatened species, population or ecological community listed pursuant to either the Commonwealth EPBC Act or the NSW TSC Act. Accordingly:

1. referral of the proposed action to the Commonwealth Minister for the Environment and Energy under the EPBC Act is not considered warranted; and

2. the preparation of Species Impact Statements, or the provision of a formal offset, under the EP&A Act and TSC Act is not considered warranted for the proposed development.

1 Introduction

Cappello Developments Pty Ltd intends to submit the following Development Applications (DA) for the subdivision and development of Lot 28 DP 479, Goulburn, NSW (the 'study area').

1. Stage 1 will split the study area into two lots, the approx. 20 ha lot to be created in the north east of the study area will contain the existing heritage-listed dwelling and associated buffers and will be retained by the existing land owner. The key purpose of Stage 1 is to facilitate the exchange of the contract with the existing landowner at an early stage in the development process, stage will not involve any on-ground works.

2. Stage 2 will then subdivide the residual lot to create 393 residential lots and a drainage reserve lot in the southeast corner. The subdivision will also include a network of public roads, surface water management measures, open space areas, and other urban infrastructure.

For the purposes of this Flora and Fauna Assessment (F&FA), the development associated with both stages is considered in a collective manner and is referred to as the 'proposed development'.

Capital Ecology Pty Ltd has been commissioned to undertake ecological surveys and prepare this F&FA to identify and assess the significance of the impacts that the proposed development may have upon the biodiversity values of the study area and surrounds.

The location of the study area for this assessment is shown in Figure 1, and the study area is overlaid 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 an 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 with reference to the:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- 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).

The planning and assessment for the proposed development has occurred over the last several months. This has included all surveys and associated works (including ecological surveys and mapping) required to progress the proposed development to the detailed design stage of the subdivision layout. On 25 August 2017 the NSW *Biodiversity Conservation Act 2016* (BC Act)

commenced and the TSC Act was repealed. However, as detailed in Part 7, 28, (1) of the NSW *Biodiversity Conservation (Savings and Transitional) Regulation 2017* (the 'Regulation') –

> *(1) The former planning provisions continue to apply (and Part 7 of the new Act does not apply) to the determination of a pending or interim planning application.*

As defined in Part 7, 27, (1) of the Regulation, a 'pending or interim planning application' means –

> *(e) except in the case of State significant development – an application for development consent under Part 4 of the Environmental Planning and Assessment Act 1979 (or for the modification of such a development consent) made within 3 months after the commencement of the new Act (but only if any species impact statement that is to be submitted in connection with the application is submitted within 12 months after the commencement of the new Act),*

In accordance with the above, provided that the DAs for the proposed development are made by 25 November 2017 (i.e. within 3 months of the commencement of the BC Act), then the former planning provisions apply. Accordingly, this F&FA has been prepared to assess the impacts of the proposed development against the former planning provisions, notably the TSC Act.

1.2 Scope of this Assessment

The scope of this F&FA has been developed to include all 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 the currently EPBC Act, TSC Act or FM Act listed significant biota (i.e. threatened species, populations and ecological 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.
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 Commonwealth and NSW environmental 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 details the extent and history of the study area.

- Subsection 2.2 details previous studies relevant to this assessment.
- Subsection 2.1 provides background to, and a detailed description of, the proposed development.

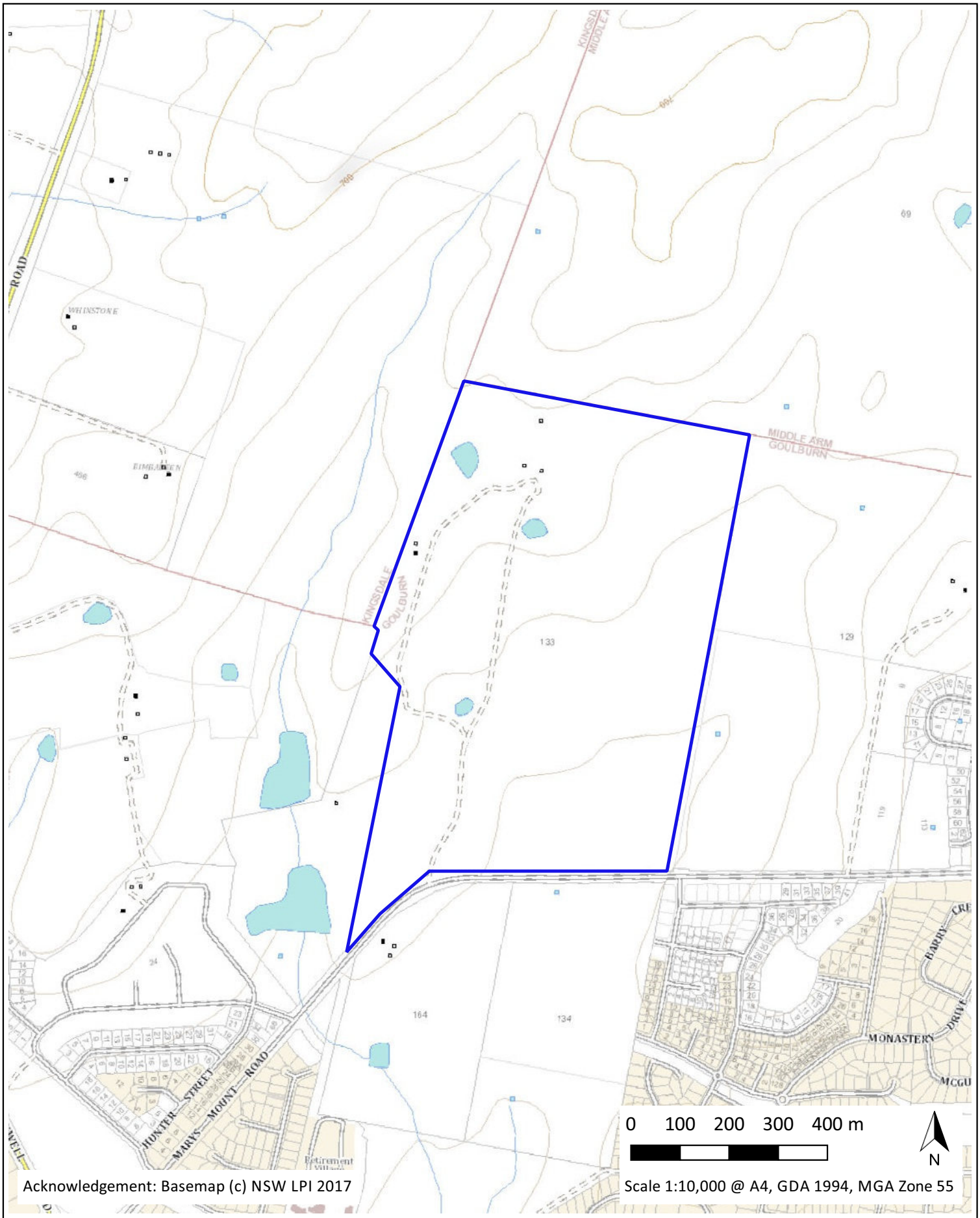
Section 3 – Describes the survey and assessment methodologies employed.

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 impacts under Commonwealth and NSW environmental legislation.

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



Acknowledgement: Basemap (c) NSW LPI 2017

Scale 1:10,000 @ A4, GDA 1994, MGA Zone 55

Figure 1. Locality Plan

Legend

Study Area

Capital Ecology Project No: 2760
Drawn by: R. Speirs
Date: 17 November 2017

Figure 2. Study Area on Aerial Image

Legend

Study Area

Capital Ecology Project No: 2760
Drawn by: R. Speirs
Date: 17 November 2017

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2 Background

2.1 Study Area and History of Land Management

Located at 133 Marys Mount Road, approximately 3 km directly north of the Goulburn town centre, the study area comprises the approximately 62 ha single private freehold lot formally known as Lot 28 DP479. The study area is located within Goulburn Mulwaree Local Government Area (LGA). The majority of the study area is zoned 'R2 Low Density Residential' on 'Land Zoning Map - Sheet LZN_001C' of the *Goulburn Mulwaree Local Environmental Plan 2009*. The north-west corner of the study area is zoned 'RU6 Transition'.

The study area contains the following built infrastructure:

- the large heritage-listed homestead and associated sheds and other buildings located on the hill in the northwest portion of the study area;
- a second dwelling and associated buildings located against the western boundary of the study area;
- four small farm dams, only one of which appears to contain water for extended periods;
- a network of unsealed driveways running from the front gate up to and between the two dwellings;
- boundary fences which are in generally good condition, together with various internal fences which are in generally dilapidated condition.

The north-east portion of the study area contains the remnants of an old orchard which now contains only scattered decrepit fruit trees, African Box Thorn *Lycium ferocissimum*, Blackberry *Rubus fruticosus* and a near monoculture groundcover of Serrated Tussock *Nassella trichotoma*.

The study area and surrounding locality has been used for agriculture since the mid 1800s and much of the land has been cleared to 'open up' the area for stock grazing and cropping. Patches of mature remnant eucalypt trees and a few scattered isolated paddock trees have been retained. The open paddocks have been historically cleared of all woody vegetation, cultivated and sown to exotic pasture (notably Cocksfoot *Dactylis glomerata* and various clovers *Trifolium* sp.). The entire study area, including the patches of remnant trees, has undergone long-term high intensity stock grazing.

Grazing has entirely removed the native midstrata and prevented regeneration of the canopy species throughout the study area. The groundstorey varies marginally within the study area reflecting the type and extent of land uses and resulting disturbance (i.e. areas that have and have not been cultivated), however the groundstorey is highly modified throughout the site with very little remaining of natural pre-European vegetation.

2.2 Previous Studies and Consultation

The study area has not been the subject of any previous formal ecological studies and the study area has not been previously identified as supporting significant biota (refer Section 3.2). However, a study recently completed by NGH Environmental (NGH Environmental 2017) provides a detailed investigation into the values of 129 Marys Mount Road (Lot 1 DP920161 & Lot 1 DP1225759) which adjoins the eastern boundary of the study area. The key finding of the NGH Environmental (2017)

study is that the adjoining property supports substantial areas of Yellow Box – Red Gum Grassy Woodland (EPBC Act and TSC Act) in both its structural woodland form and derived grassland form. Intensive surveys targeting threatened flora and fauna (incl. bats, birds and reptiles) did not record any such species, and the site was not identified as likely to support important habitat for threatened species. As is directly attributable to the differing history of land use types, intensity and duration, the adjoining property contains vegetation and associated potential habitat in a far less modified condition than that present within the study area. It is reasonable to draw upon the results of the surveys recently undertaken in the adjoining property when determining the likelihood that the relevant threatened flora and fauna species occur within the study area. This approach has been applied where relevant for the Likelihood of Occurrence Assessment (refer Section 3.4) prepared for the study area as part of this F&FA.

Capital Ecology consulted with representatives of the NSW Office of Environment and Heritage (OEH) when determining the scope for this F&FA. Specifically, in light of the nil result of the full program of tile surveys targeting the Striped Legless Lizard *Delma impar* completed across the adjoining property (NGH Environmental 2016), advice was sought from OEH regarding the need to complete a survey for this species within the study area. Advice received from OEH (email from Suzie Lamb, dated 28 September 2017) confirmed that a targeted survey for the Striped Legless Lizard is not required for the study area. This determination was based on the agreed very low potential for occurrence due to the history of cultivation and the fact that the neighbouring, better quality site, was surveyed for this species recently and that none were found.

2.3 Proposed Development

The study area will be subject to the following two Development Applications.

1. Stage 1 will split the study area into two lots, the approx. 20 ha lot to be created in the north east of the study area will contain the existing heritage-listed dwelling and associated buffers and will be retained by the existing land owner. The key purpose of Stage 1 is to facilitate the exchange of the contract with the existing landowner at an early stage in the development process, stage will not involve any on-ground works.

2. Stage 2 will then subdivide the residual lot to create 393 residential lots and a drainage reserve lot in the southeast corner. The subdivision will also include a network of public roads, surface water management measures, open space areas, and other urban infrastructure.

For the purposes of this F&FA, the development associated with both stages is considered in a collective manner and is referred to as the ‘proposed development’.

A primary objective for the subdivision design has been the retention and protection of the portions of the study area with the greatest biodiversity significance (relative to the remainder of the study area). In line with this objective, as illustrated in Figure 4, the proposed development has been designed in a manner that will permit the retention of the patches of remnant eucalypt trees and all but one of the isolated remnant eucalypt trees. As described above, the study area has undergone a history of modification such that the few remaining remnant eucalypts are the only natural feature of ecological / biodiversity conservation significance remaining within the study area.

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 the Likelihood of Occurrence Assessment 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 and Energy's online EPBC Act Protected Matters Search Tool (PMST) on 31 August 2017.

Ecological point data from the NSW Wildlife Atlas (BioNet) were obtained on 31 August, providing a list of threatened species which have previously been recorded within the broad locality of the study area (i.e. within a 10 km radius).

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 (critically endangered, 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 occurs 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.

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 in the locality. Some TSC Act listed threatened species have been included that have not been previously recorded in the locality, 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 3. Species assigned a moderate or higher likelihood of occurrence are considered in more detail in Section 4.4.2 of this F&FA.

3.5 Field Surveys

3.5.1 Tree Habitat Assessment

During the tree habitat assessment, all remnant trees 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;
- DBH (cm);
- approximate height (m); and
- number and size category of hollows and other habitat values such as bird nests, mistletoe etc.

The DBH was used to determine the 'Mean Age Estimate' of all remnant trees over 70 cm DBH based on modelling of age in Yellow Box *Eucalyptus melliodora* in the Canberra Region developed by Banks (1997). This model is also used in this study for Blakely's Red Gum, however it is noted that the Banks (1997) study was based solely on Yellow Box.

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.

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 totalled 15 across the 5 zones as shown in Figure 3.

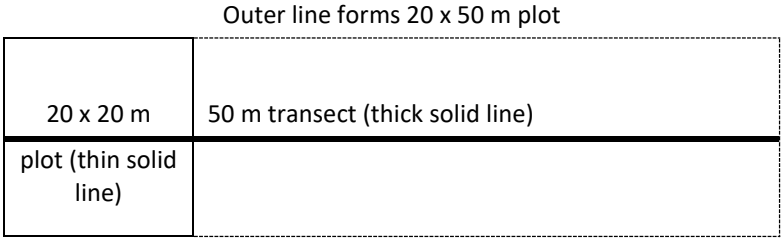

Diagram 1. Vegetation survey plot/transect set

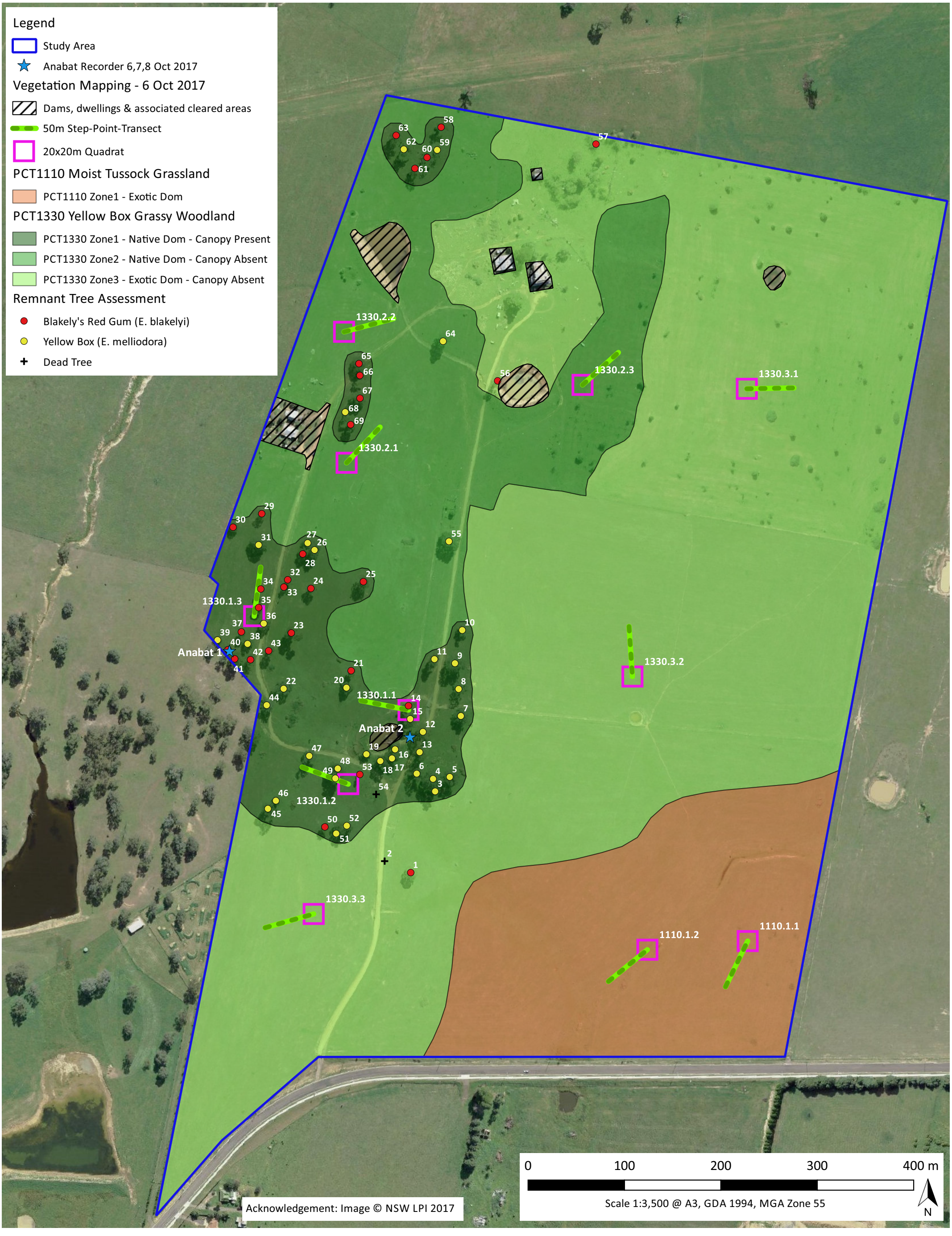

Figure 3. Vegetation Surveys

Capital Ecology Project No: 2760
Drawn by: R. Speirs
Date: 17 November 2017

3.5.3 Insectivorous Bat Surveys

Two Anabat® detectors were deployed for three nights (6,7,8 October 2017), the locations of which are illustrated in Figure 3. The weather conditions during the survey period are detailed in Table 1.

Table 1. Insectivorous bat surveys – weather conditions

Date	Temperate Range (°C)	Relative Humidity (%)	Wind (km/h) (predominant)	Cloud Cover	Rain (mm)
6/10/2017	9.7 – 21.9	22 – 69	WNW 28	7	0
7/10/2017	-1.7 – 19.7	37 – 71	SE 9	1	0
8/10/2017	4.0 – 21.0	52 – 90	S 6	7	0

The data from the Anabat® surveys were provided to Fly By Night Bat Surveys Pty Ltd for expert analysis and identification of the species recorded.

3.5.4 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 was 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 an 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 October, 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.

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.

Vegetation community mapping 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.

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 2.1, the study area and surrounding locality has been utilised for agriculture since the mid-1800s and the majority has been cleared, leaving patches of remnant trees and scattered paddock trees. The native midstorey and shrubstorey strata are entirely absent and are maintained so by set stock grazing. This stock grazing has also prevented regeneration of the remnant canopy eucalypts, such that the study area contains no native trees under 43 cm DBH. The African Box Thorn *Lycium ferocissimum* bushes and Blackberry *Rubus fruticosus* brambles comprise the only shrubstorey/midstorey vegetation within the study area.

The groundstorey is variable, including: cultivated paddocks historically sown to pasture, an old orchard which is now dominated by Serrated Tussock *Nassella trichotoma*, stock camps dominated by annual grasses and herbaceous weeds, and areas characterised by a marginal dominance of disturbance sensitive native grasses and very low native forb diversity.

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

1. **PCT 1110** – River Tussock – Tall Sedge – Kangaroo Grass moist grasslands of the South Eastern Highlands Bioregion.

   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*, Kangaroo Grass *Themeda triandra* 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. The entire area of PCT 1110 has been historically cultivated and sown to exotic pasture.

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.

   Whilst the groundstorey throughout the entire study area is highly degraded, as detailed below and illustrated in Figure 3, the study area contains patches of PCT1330 with varying characteristics. Some patches support a marginally native dominated groundstorey with very low forb diversity under scattered remnant trees (defined as 'Zone 1'). Other patches are cleared of the remnant canopy trees and characterised by a marginally native dominated

groundstorey with very low forb diversity (defined as 'Zone 2'). The remainder of the PCT has been historically cleared, cultivated and sown to exotic pasture (defined as 'Zone 3').

4.1.2 Vegetation Zones and Quadrat/Transect Results

The study area was found to support four discernible Vegetation Zones, as detailed in Table 1 and illustrated in Figure 1. Plates 1 to 5 provide representative photographs of each of the Vegetation Zones.

Eleven floristic plot/transect sets were completed, and the results are provided in Attachment 1. As discussed above, the groundcover throughout the study area has been highly modified by a history of high intensity set stock grazing, cultivation, pasture improvement, and other impacts. The result is that very little remains of the floristic composition and structure of the original (i.e. pre-European) vegetation communities. In this regard, it is noted that the plot-transect results do not indicate a clear distinction between the Vegetation Zones of PCT 1330 from a groundstorey vegetation perspective. Instead, the Vegetation Zones of PCT 1330 have been developed as a means of distinguishing and delineating the broad variance in the PCT within the study area as a result of vegetation modification (i.e. patches with retained canopy trees, cultivated areas etc.).

Table 2. Vegetation Zones

PCT	Vegetation Zone ID	Photograph Plate	Groundstorey Dominance (Native or Exotic)	Diversity (Low/Mod/High)	Number of Plots/Transects Completed	Total Area (Ha)
PCT1110	1110.1	1	Exotic	Low	2	8.86
PCT1330	1330.1	2	Native (marginal)	Low	3	5.96
	1330.2	3	Native (marginal)	Low	3	11.37
	1330.3	4	Exotic	Low	3	34.51

Plate 1. PCT 1110 – Zone 1

Plate 2. PCT 1330 – Zone 1

Plate 3. PCT 1330 – Zone 2

Plate 4. PCT 1330 – Zone 3 (note: dominance of Serrated Tussock)

4.1.3 Threatened Ecological Communities

Commonwealth EPBC Act

Two threatened ecological communities (TEC) have the potential to occur in the study 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'.

The portion of the study area mapped as PCT 1330 would have supported Box-Gum Woodland prior to European settlement. However, as detailed in Table 3, none of the zones of PCT 1330 within the study area support the tree cover or native diversity required to meet the criteria for the Commonwealth EPBC Act listed community. The assessment process outlined in Table 3 follows that provided in the Commonwealth *EPBC Act Policy Statement 3.5 – White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands* (Commonwealth of Australia 2006).

The portion of the study area mapped as PCT 1110 is estimated to have supported Natural Temperate Grassland prior to European settlement. However, as described Section 2.1, the entire area of PCT 1110 has been historically cultivated and sown to exotic pasture. No remnants of the original ecological community persist within the study area.

Table 3. Assessment against the listing criteria for the EPBC listed TEC – White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Criterion		Assessment Results		
		PCT1330 Zone 1	**PCT1330 Zone 2**	**PCT1330 Zone 3**
1.	*Is, or was previously, at least one of the most common overstorey species White Box, Yellow Box or Blakely's Red Gum?*	Yes Yellow Box and Blakely's Red Gum are dominant.	Yes Yellow Box and Blakely's Red Gum are expected to have been dominant.	Yes Yellow Box and Blakely's Red Gum are expected to have been dominant.
2.	*Does the patch have a predominantly native understorey?*	Yes Marginal – the completed transects recorded varying dominance between native and exotic species.	Yes Marginal – the completed transects recorded a slight dominance of native over exotic species.	No The completed transects recorded a clear and consistent dominance of exotic species.
3.	*Is the patch 0.1 ha (1000 m2) or greater in size with 12 or more native understorey species present (excluding grasses)? There must be at least one important species.*	No The patch of Zone 1 within the study area is 5.96 ha, however no native non-grass species were recorded, nor were any important species.	No The patch of Zone 1 within the study area is 11.37 ha, however no native non-grass species were recorded, nor were any important species.	N/A – refer result for Criterion 2.
	Or			
	Is the patch 2 ha or greater in size with an average of 20 or more mature trees per hectare, or is there natural regeneration of the dominant overstorey eucalypts?	No The patch of Zone 1 within the study area is 5.96 ha, however it only has an average of 10.57 mature trees per hectare (i.e. 63 trees / 5.96 ha = 10.57). There is no natural regeneration of the dominant overstorey eucalypts within the study area.	No Zone 2 is primarily cleared of mature trees and has no natural regeneration.	No Zone 2 is primarily cleared of mature trees and has no natural regeneration.
	Does the patch meet the criteria for the listed TEC?	**No**	**No**	**No**

NSW TSC Act

Two TSC Act listed ecological communities have the potential to occur in the study area: 'White Box – Yellow Box – Blakely's Red Gum Woodland' (TSC Act Box-Gum Woodland) and 'Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions'.

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.

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 Zones 1 and 2 meet the minimum criteria for this community under the NSW TSC Act.

TSC Act Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland

This community, listed as endangered in NSW, is described below, together with an assessment of its presence and condition within the study area.

The below description is extracted from the NSW *Final Determination for the TSC Act endangered listed ecological community Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions* (NSW Scientific Committee 2011, gazetted 10 June 2011).

Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland typically forms an open-forest, woodland or open woodland that transitions into grassland at low tree cover. The canopy is dominated by Eucalyptus pauciflora (Snow Gum), E. rubida (Candlebark), E. stellulata (Back Sallee) and E. viminalis (Ribbon Gum), either as single species or in combinations. A shrub layer may be present and sub-shrubs are often a component of the ground stratum; characteristic species include Hymenanthera dentata and Melichrus urceolatus. The ground layer is dominated by grasses and other herbaceous species including Themeda australis, Poa spp., Austrostipa spp., Austrodanthonia spp., Leptorhynchos squamatus, Chrysocephalum apiculatum, and Asperula conferta. This community may also occur as secondary grassland where the dominant trees have been removed but the ground stratum remains.

The ecological community mainly occurs on valley floors, margins of frost hollows, footslopes and undulating hills between approximately 600 and 1400 m in altitude. It occurs on a variety of substrates including granite, basalt, metasediments and Quaternary alluvium. The ecological community occurs as a part of a mosaic of native vegetation communities including swamps, bogs, wetlands, grasslands and sclerophyll forests.

The final determination does not provide specific listing criteria against which to assess a patch of vegetation, however the presence of the key canopy eucalypts and a native dominated ground stratum are described as the key characteristics of the community. The final determination also states that the community may also occur as secondary grassland. In this regard, based on the final determination, a logical interpretation of the minimum criteria for a patch to constitute the listed community is that the patch must:

1. support a canopy which is dominated by the key eucalypt species and occurs in at least moderately intact condition; or

2. where the canopy has been cleared, the ground stratum remains in at least moderately intact condition (i.e. native dominated with moderate to high diversity).

Whilst it is possible that patches of this community once occurred within the study area, likely along the ecotone between PCT 1110 and PCT 1330, no elements of the community persist. Accordingly, the study area does not support this TEC.

Threatened Ecological Community Assessment – Summary

As detailed above, and illustrated in Figure 3:

1. No part of the study area supports a Commonwealth EPBC Act listed TEC.

2. PCT 1330 Zones 1 and 2 (total area = 17.33 ha) meet the minimum criteria for the NSW TSC Act listed community (albeit in a highly modified, marginal form).

4.2 Insectivorous Bat Surveys

As detailed in the report provided by Fly By Night Bat Surveys Pty Ltd (refer Appendix 6), insectivorous bats were recorded at each survey location on each survey night. A total of 256 passes were analysed and the following four species were identified with confidence:

- Gould's Wattled Bat *Chalinolobus gouldii*
- Eastern Bent-wing Bat *Miniopterus schreibersii oceanensis* (TSC Act – Vulnerable)
- Large Forest Bat *Vespadelus darlingtonia*
- Little Forest Bat *Vespadelus vulturnus*

The occurrence of the following additional species is considered 'probable' based on the calls recoded:

- Chocolate Wattled Bat *Chalinolobus morio*

The occurrence of the following additional two species is considered 'possible' based on the calls recoded:

- Eastern Faslistrelle *Falsistrellus tasmaniensis* (TSC Act – Vulnerable)
- Southern Forest Bat *Vespadelus regulus*

None of the above species are listed pursuant to the EPBC Act, however the Eastern Bent-wing Bat and the Eastern Faslistrelle are listed as vulnerable pursuant tom the TSC Act.

4.3 Habitat Values

4.3.1 Tree Habitat Assessment

During the tree habitat assessment, the 69 remnant trees present within the study area were assessed for their ecological values. The tree assessment results are provided as Appendix 2 and the trees recorded are shown on Figure 3. As detailed in Appendix 2, based on modelling of age in Yellow Box in the Canberra Region developed by Banks (1997), of the 69 remnant trees:

- 25 are in the 70-89 cm DBH class which has an estimated age range of 163-211 years;
- 8 are in the 90-109 cm DBH class which has an estimated age range of 211-257 years;
- 2 are in the 110-129 cm DBH class which has an estimated age range of 257-304 years;

Note: The Banks model was based solely on Yellow Box, however in this study it has also been applied for Blakely's Red Gum.

A total of 37 hollow-bearing trees, supporting 110 hollows, were recorded within the study area. Thirteen stick nests were recorded, all likely to have belonged to a Magpie *Cracticus tibicen*, Australian Raven *Corvus coronoides*, or similar species. A pair of Red-rumped Parrot *Psephotus haematonotus* and a pair of Wood Ducks *Chenonetta jubata* were recorded nesting in hollows, together with the numerous hollows occupied by Indian Mynas *Acridotheres tristis* and Common Starlings *Sturnus vulgaris*.

4.3.2 Fauna Habitat Features

The fauna habitat features within the study area include remnant eucalypts, highly modified native secondary grassland, exotic pasture, and scattered shrubs (primarily African Box Thorn *Lycium ferocissimum*). No regeneration of the canopy eucalypts has been permitted to establish within the study area. The study area contains four small farm dams, however no significant creek or wetland habitat is present. The study area does not contain any rock outcrops or scattered surface rock, however there are extensive piles of bricks and other building waste around the homestead. The fauna habitat features of the study area are detailed in Table 4.

Table 4. Fauna habitat features

Habitat Feature	Description	Relevant Native Fauna Species/Assemblages
Remnant eucalypts	The study area contains 69 remnant Yellow Box and Blakely's Red Gum trees. Hollows or various sizes were recorded in approximately half of these trees. 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 variety of birds. The hollows present may provide nesting/roosting habitat for microbats and native birds, however it is likely that nesting in this peri-urban location would be primarily limited to common native birds (i.e. Rosellas *Platycercus* spp., Red-rumped Parrot etc.), common arboreal mammals (i.e. Brush-tailed Possum *Trichosurus vulpecula* and Sugar Glider *Petaurus breviceps*), and exotic pest species (Indian Myna, Common Starling). It is possible that the hollow-bearing eucalypts provide roosting habitat for the Eastern Faslistrelle which was recorded as a 'possible' via the Anabat® surveys.
Grassland	As described in Section 4.1, the study area supports grassy vegetation communities in the form of grassy woodland, derived/secondary native grassland, and exotic pasture. The value of these areas to native fauna, particularly threatened species, is greatly reduced due to the very high degree of groundcover modification throughout the study area.	The highly modified grassy understorey of the retained woodland patch and adjoining derived grassland/pasture would provide limited foraging resources for the numerous woodland / farm birds occurring in the study area. Areas of grassland/pasture (the majority of the study area) would provide grazing resources for the common Eastern Grey Kangaroo *Macropus giganteus* (recorded during each site survey), however it is unlikely that other native ground dwelling mammals would forage within the study area. The open paddocks would provide hunting resources for raptors and other predatory birds.
Scattered shrubs	The midstorey and shrubstorey strata are absent across the entire study area and no regeneration of the canopy eucalypts has been permitted to establish. The shrubs present are primarily African Box Thorn.	The scattered African Box Thorn would provide limited nesting and refuge resources for the small native birds likely to occur within the study area and surrounds.
Farm dams	The study area contains four small farm dams, all but one of which was dry during the field surveys. These dams are used to water stock and are therefore murky and support little or no fringing vegetation.	The dams provide limited foraging 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 dense tree cover would prevent the dams from providing important habitat for any listed fauna species.

4.4 Flora and Fauna Species

4.4.1 Flora Species and Incidental Fauna Records

A total of 23 flora species were recorded within the study area during the completed plot/transect surveys, comprising 7 native species and 16 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 cattle and single alpaca grazing the study area, the only exotic fauna species recorded within the study area were the Red Fox *Vulpes vulpes*, European Rabbit *Oryctolagus cuniculus*, Common Starling and Indian Myna.

4.4.2 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 3. Nine EPBC Act and/or TSC Act listed threatened flora species and 26 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 6.2.1, 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. Table 5 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 5, none of the threatened species with the potential to occur in the locality are likely to be adversely impacted by the proposed development.

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 or over the study area, the habitat is highly unlikely to be important to any migratory species.

Table 5. Potential for adverse impacts to species with moderate or higher likelihood of occurrence

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	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	Potential foraging habitat	No	No	No	No
Falsistrellus tasmaniensis Eastern False Pipistrelle	-	V1	Potential foraging habitat	No	No	No	No
Hieraaetus morphnoides Little Eagle	-	V1	Potential foraging habitat	No	No	No	No
Miniopterus schreibersii oceanensis Eastern Bentwing Bat	-	V1	Potential foraging habitat	No	No	No	No
Petroica boodang Scarlet Robin	-	V1	Potential foraging habitat	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 6.2.1).

4.5 Weeds

As detailed in Appendix 1, 16 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 6 is listed as a Weed or National Significance (Commonwealth) and/or as a 'regional priority weed' in the *South East Region Strategic Weed Management Plan 2017-2022* (RSWMP). Although not identified as a priority weed, the infestation of African Box Thorn within the study area is substantial and requires control to prevent its further spread.

Table 6. Noxious weed occurrence

Key for below table

- WoNS - (Commonwealth) Weed of National Significance
- Regional Priority Weed in the South East Local Land Services region under the *NSW Biosecurity Act 2015*
  - P = Prevention
  - E = Eradication
  - C = Containment
  - AP = Asset Protection
  - LM = Species subject to Local Management programs

Name	Growth Form	Status	Description of Occurrence	Threat Level
Hypericum perforatum St John's Wort	Forb <1 m	LM	Scattered at low density across the study area.	Moderate – Stock grazing is likely controlling the spread of the species.
Nassella trichotoma Serrated Tussock	Tussock <0.6 m	WoNS, C	Very extensive and severe infestation throughout much of the study area, notably the northeast portion where the species consists of a near monoculture.	Extreme – Control should occur immediately to prevent the spread into adjoining properties.
Rubus fruticosis Blackberry	Shrub/bramble <3 m	WoNS, LM	A few small brambles within the study area, predominantly associated with drainage lines.	Moderate – The infestation is currently at low levels and the study area contains no 'at risk' biodiversity values. The species should be controlled to prevent spread of seed into adjoining properties.
Lycium ferocissimum African Box Thorn	Shrub 0.5 m to 5 m	WoNS, AP	Many shrubs scattered throughout all other non-cultivated areas.	High – Control should occur to ensure the species does not proliferate further within the study area and spread into adjoining properties.

4.6 Pest Animals

The Red Fox, European Rabbit, 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, and Feral Cat *Felis catus*, are also likely to occur within the study area and surrounds. The Red Fox and European Rabbit 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 and peri-urban land in the locality.

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 Box-Gum Woodland

In light of the advice provided by Capital Ecology following the vegetation assessment, the proponents of the proposed development have developed a subdivision layout which maximises the retention and protection of the portions of the study area with the greatest biodiversity significance, namely the areas of TSC Act Box-Gum Woodland occurring in the least modified condition (relative to the remainder of the study area). As detailed in Table 6 and illustrated in Figure 4, the proposed subdivision will avoid impacts to 99.6% of Zone 1 (low diversity mixed native/exotic with remnant trees) and 80.9% of Zone 2 (low diversity native with no remnant trees). The impacts to these zones have been avoided to the maximum extent possible whilst permitting the development of a functional subdivision layout and allowing for the incorporation of edge roads along much of the urban interface (a measure beneficial for natural area conservation).

The northwest portion of the study area not included within the subdivision will be retained as a single large lot. This measure will permit the retention of the Zone 1 patches and all but one of the remnant trees (Tree 1, refer Figure 3) present within the study area. As detailed in Section 4.3.1, most of the remnant trees within the study area are in excess of 100 years old. Numerous recent studies have demonstrated the very high ecological and biodiversity conservation value of such trees, particularly in the context of increasing rarity across the lowland landscapes of the Southern Tablelands (Stagoll *et al*. 2012; Le Roux *et al*. 2014a; Le Roux *et al*. 2014b; Gibbons *et al*. 2015). The retention of the remnant trees within the study area, as proposed, is a significant conservation measure and an example of ecologically sensitive development.

Table 7. PCT 1330 (Box-Gum Woodland) Vegetation Zones – Proposed clearance and retention

Vegetation Zone ID	Canopy (Present/Absent)	Groundstorey Dominance (Native or Exotic)	Diversity (Low/Mod/High)	Total Area (Ha)	Proposed Clearance		Proposed Retention	
					Area (Ha)	%	Area (Ha)	%
1330.1	Present	Native (marginal)	Low	5.96	0.02	0.39	5.94	99.61
1330.2	Absent	Native (marginal)	Low	11.37	2.17	19.10	9.20	80.90
1330.3	Absent	Exotic	Low	34.51	30.44	88.20	4.07	11.80

Weed Management

The study area currently contains a very severe infestation if Serrated Tussock, together with substantial infestations of numerous other noxious weeds. It is also noted that the groundstorey throughout the study area is highly degraded and supports no 'at risk' values of ecological / biodiversity conservation significance. Accordingly, the key weed management risks for the proposed development are the transfer of noxious weeds from the study area to other sites which do not support similar weed infestations, together with the risk that the site becomes a source of weed seed which may spread into adjoining properties. In this regard, the weed management measures that will be implemented to prevent the introduction and/or spread of weeds include the following.

- A weed control program will be developed to control the current weed infestations on site and prevent spread from the site. This program will involve an initial package of high intensity works to:
    - control the current Serrated Tussock infestation via herbicide application (via boom spray where required); and
    - remove the African Box Thorn (physical removal via tractor or similar) and Blackberry (cut and daub herbicide application).

  These initial works will be followed by an ongoing program to monitor and control regrowth of noxious weeds.
- Appropriate vehicle hygiene will be maintained. Vehicles and machinery entering and existing the study area will be clean of weed seed or propagules. This is likely to require the operation of a vehicle wash down faculty at the gate.
- No top-soil or other potentially weed seed laden organic material will be exported from the site to other sites. Such materials will be reused on site or taken directly to an appropriate facility for disposal.

Recommendations for Landscaping

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 PCT (i.e. Box-Gum Woodland) is provided as Appendix 3.
- 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 characteristic of Box-Gum Woodland.

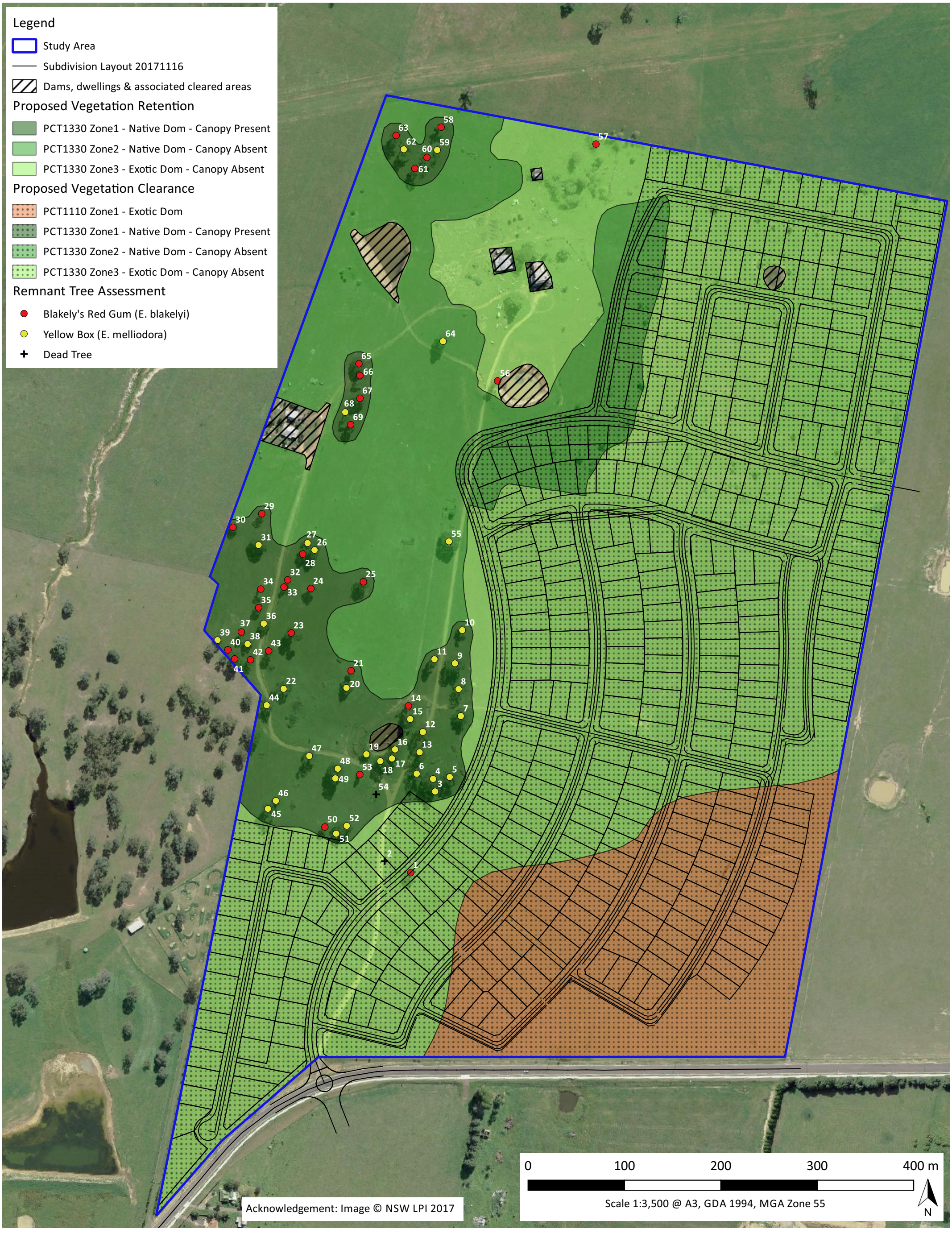

Figure 4. Proposed Development

Capital Ecology Project No: 2760
Drawn by: R. Speirs
Date: 17 November 2017

6 Assessment against Biodiversity Conservation Legislation and Policy

This section provides an assessment of the proposed development against the biodiversity conservation legislation and government policy which was current on 24 August 2017. As detailed in Section 1.1, provided that the DAs for the proposed development are made by 25 November 2017 (i.e. within 3 months of the commencement of the BC Act), then the former planning provisions apply.

6.1 Commonwealth

6.1.2 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth EPBC Act requires that proposed 'actions' be assessed in terms of their potential to impact upon 'Matters of National Environmental Significance' (MNES) as defined under the Act.

Where a potential impact on a MNES may occur as a result of a proposed action, the significance of that impact must be assessed. Guideline criteria for determining whether an impact is significant are provided under the Act. Where a proposed action will, or is likely to, have a significant impact on a MNES, the proposed action must be referred to the Commonwealth Minister for the Environment and Energy. The purpose of the referral is to determine whether a proposed action requires approval and/or controls under the EPBC Act.

As detailed in Section 4.1.3, none of the Box-Gum Woodland present within the study area is of a quality high enough to meet the criteria for the Commonwealth EPBC Act listed community.

With regard to the above, it is unlikely that the proposed development will have a significant impact on a MNES given the study area does not:

- support any EPBC Act listed ecological communities;
- support any EPBC Act listed flora species; or
- contain habitat of potential importance to EPBC Act listed threatened or migratory fauna species.

In light the above, EPBC Act referral is considered unwarranted and is not recommended.

6.2 New South Wales (State)

6.2.1 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 parts of the EP&A Act of key relevance to the protection and conservation of biodiversity are 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 is likely to significantly affect a threatened species, population, ecological community 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 Zones 1 and 2 support the NSW listed TEC 'White Box – Yellow Box – Blakely's Red Gum grassy woodland', albeit occurring in only a highly modified, marginal form. An AoS has been prepared to assess the impact of the proposed development on this community and is provided in Appendix 4, the results of which indicate that the proposed development is unlikely to significantly affect this TEC.

As detailed in Table 5, the proposed development is unlikely to significantly affect any TSC Act listed species. As such, no TSC Act listed species are considered to warrant the preparation of AoS.

Given the above, the preparation of a SIS is considered unwarranted 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:

> *(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 Mulwaree 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, the closest record being approximately 20 km to the east within intact eucalypt forest.

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 area as follows.

1. The list of local government areas to which SEPP 44 applies will be updated to recognise recent council amalgamations, therefore Goulburn Mulwaree will be listed. However, as noted above, the study area occurs within the former Mulwaree 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 the above, as there are no records of koalas in the locality, the study area does not currently support 'koala habitat' as defined by SEPP 44.

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

6.2.2 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.

6.2.3 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. The majority of the study area is zoned 'R5 – Large Lot Residential' which is considered an 'urban area' under Part 3 of Schedule 1, and therefore is excluded from the operation of the NV Act.

The northwest portion of the study area is zoned 'RU6 – Transition' which is not listed as an excluded zone under Schedule 1. It is noted however that this portion of the study area is not proposed to be impacted by the proposed development. Accordingly, the NV Act does not apply to the proposed development.

6.2.4 Biosecurity Act 2015

On 1 July 2017, the *Biosecurity Act 2015* came into force, replacing ten existing Acts (including the *Noxious Weeds Act 1993*) and parts of another four Acts. Supported by the *Biosecurity Regulation 2016*, the Biosecurity Act provides greater flexibility and improved capacity in the response, management and control of biosecurity risks, and supports the vision of the *Biosecurity Strategy 2013-2021* that biosecurity is a shared responsibility between government, industry and the community. It provides for a range of tools and powers that can be used to support risk-based decision making and allow for increased efficiency and decreased regulation. Further detail is available at: http://southeast.lls.nsw.gov.au/biosecurity

One of the key tools prepared under the Biosecurity Act is the new *South East Region Strategic Weed Management Plan 2017-2022* (RSWMP), available at: http://southeast.lls.nsw.gov.au/__data/assets/pdf_file/0006/722706/South-East-Regional-Weed-Mgmt-Plan.pdf

Under the Biosecurity Act, the previous 'noxious weed' status has been replaced by 'state priority weeds' and 'regional priority weeds', species within each category being subject to particular management/control requirements depending upon the region. The appendices of the RSWMP set out the requirements for the regional priority weeds occurring within the study area (refer Section 4.5). The weed control measures described in Section 5 are consistent with the requirements of the RSWMP.

6.2.5 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.

6.3 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 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 EPBC Act, EP&A Act and TSC Act. Table 8 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 8. Summary of assessment results and corresponding requirements

Legislation/Policy	Relevant Biodiversity Value/s	Assessment Results and Requirements
Commonwealth		
Environment Protection and Biodiversity Conservation Act 1999	White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grassland (EPBC Act Box-Gum Woodland). Potential habitat for threatened flora species and threatened and/or migratory fauna species.	The proposed development is unlikely to have a significant impact on a MNES given the study area does not: • support any EPBC Act listed ecological communities; • support any EPBC Act listed flora species; or • contain habitat of potential importance to EPBC Act listed threatened or migratory fauna species. In light the above, EPBC Act referral is considered unwarranted and is not recommended.
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 flora and 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 as defined by SEPP 44.	No further consideration of this SEPP is required.
Native Vegetation Act 2003	Native vegetation.	The majority of the study area is zoned 'R5 – Large Lot Residential' which is considered an 'urban area' under Part 3 of Schedule 1, and therefore, is excluded from the operation of the NV Act. The northwest portion of the study area is zoned 'RU6 – Transition' which is not listed as an excluded zone under Schedule 1. It is noted however that this portion of the study area is not proposed to be impacted by the proposed development. Accordingly, the NV Act does not apply to the proposed development.
Biosecurity Act 2015	Regional priority weeds.	Prepared under the Biosecurity Act, the *South East Region Strategic Weed Management Plan 2017-2022* (RSWMP), the RSWMP prescribes the requirements for the four regional priority weeds occurring within the study area (refer Section 4.5). The weed control measures described in Section 5 are consistent with the requirements of the RSWMP.
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.

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 either the Commonwealth EPBC Act or the NSW TSC Act. Accordingly:

1. referral of the proposed action to the Commonwealth Minister for the Environment and Energy under the EPBC Act is not considered warranted; and

2. the preparation of Species Impact Statements, or the provision of a formal offset, under the EP&A Act and TSC Act is not considered warranted for the proposed development.

References

Banks J.C.G (1997). *Tree ages and ageing in yellow box. In: Dargavel J, editor. The coming of age - Forest age and heritage values.* Canberra, Australia: Environment Australia. Pgs 17-28.

Cosgrove (2014). *Photographic Guide to Native Plants of the Australian Capital Territory*. Published by Meadow Argus.

DECC (2007). *Threatened Species Assessment Guidelines – The Assessment of Significance*. NSW Department of Environment and Climate Change.

DEH (2006). *Policy Statement 3.5: White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands. Environment Protection and Biodiversity Conservation Act 1999.* Commonwealth Department of Environment and Heritage.

Department of Planning and Environment (2016). *Explanation of Intended Effect (EIE) – State Environmental Planning Policy No 44 – Koala Habitat Protection.* November 2016.

DoE (2013). *Matters of National Environmental Significance - Significant Impact Guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth Department of the Environment.

Eddy D., Mallinson D., Rehwinkel R. and Sharp S. (2011). *Grassland Flora – A field quide to for the Southern Tablelands (NSW & ACT).*

Gibbons P., Ikin K., Le Roux D. and MacKenzie A (2015). *The case for retaining more mature trees within urban developments in Canberra.* Unpublished report for the Australian National University, Fenner School of Environment & Society.

Harden G.J. (2002). *Flora of New South Wales.* Volume 1-4. University of New South Wales Press Ltd., Kensington.

Le Roux DS., Ikin K., Lindenmayer DB., Manning AD. and Gibbons P (2014a). *The future of large old trees in urban landscapes.* PLOS One 9(6): e99403.

Le Roux DS., Ikin K., Lindenmayer DB., Blanchard W., Manning AD. And Gibbons P (2014b). *Reduced availability of habitat structures in urban landscapes: Implications for policy and practice*. Landscape and Urban Planning 125: 57-64.

NGH Environmental (2016). *Tile Surveys at Marys Mount Road. Goulburn.* Project Number 16/140. NGH Environmental Pty Ltd.

NGH Environmental (2017). *Flora and Fauna Assessment. Residential Subdivision, Goulburn*. Project Number 16-140, Version 2. NGH Environmental Pty Ltd.

NPWS (2002). *Identification Guidelines for Endangered Ecological Communities - White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland)*. NSW National Parks and Wildlife Service.

NSW Scientific Committee (2002). *Final Determination: White Box Yellow Box Blakely's Red Gum Woodland*. Gazetted 15 March 2002.

OEH (2014). *BioBanking Assessment Methodology 2014*. NSW Office of Environment and Heritage for the NSW Government.

OEH (2016). *NSW Vegetation Information System*. NSW Office of Environment and Heritage. http://www.environment.nsw.gov.au/research/Vegetationinformationsystem.htm

Richardson F.J, Richardson R.G. and Shepherd R.C.H (2011). *Weeds of the South-East – An Identification Guide for Australia.* Second Edition.

Stagoll K., Lindermayer DB., Knight E., Fisher J. and Manning AD (2012). *Large trees are keystone structures in urban parks.* Conservation Letters 5(2): 115-122.

Wood D. and Wood B. (2005). *Flowers of the ACT & Region – A field guide*. Wood's Books, ACT.

Appendices

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
Regional Priority Weed in the South East Local Land Services region under the NSW *Biosecurity Act 2015*
- P = Prevention
- E = Eradication
- C = Containment
- AP = Asset Protection
- LM = Species subject to Local Management programs

Note: For the below table, 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 table – 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 Date	5-6/10/2017
Surveyors	Robert Speirs and Sam Reid

Plant Community Type (PCT) Code			**1110**		**1330**								
Vegetation Zone			1		1			2			3		
Transect/Plot Number			1	2	1	2	3	1	2	3	1	2	3
Transect/Plot Identifier			**1110.1.1**	**1110.1.2**	**1330.1.1**	**1330.1.2**	**1330.1.3**	**1330.2.1**	**1330.2.2**	**1330.2.3**	**1330.3.1**	**1330.3.2**	**1330.3.3**
Zone description			Exotic pasture – previously cultivated and sown		Low diversity mixed native/exotic with remnant trees			Low diversity native, no remnant trees			Exotic pasture – previously cultivated and sown		
Native overstorey cover %			0	0	5	22.5	11	0	0	0	0	0	0
Native midstorey cover %			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
Native groundcover (grasses) %			18	22	20	10	56	66	52	52	10	32	40
Native groundcover (other) %			0	0	0	0	0	0	0	2	2	0	0
Exotic groundcover %			82	78	80	90	44	34	48	48	90	68	60
Total length of fallen logs (m)			0	0	3	0	0	0	0	0	0	0	0
Number of trees with hollows			0	0	2	3	0	0	0	0	0	0	0
Notes					Groundstorey highly disturbed with substantial stock camp patches. Few disturbance tolerate native grass species only.			Few disturbance tolerate native grass species only.			Much of this zone is dominated by Serrated Tussock, particularly the old orchard area.		
Species Name	**Common Name**	**Status**											
Overstorey (X = sp. present, R = sp. regeneration present)													
Eucalyptus blakelyi	Blakely's Red Gum				X		X						
Eucalyptus melliodora	Yellow Box				X	X	X						

Midstorey												
Lycium ferocissimum	African Box Thorn	WoNS, AP			X	X	X					
Groundcover												
Native												
Austrostipa bigeniculata	Tall Speargrass		X	X	X	X	X	X	X	X	X	X	X
Austrostipa scabra	Corkscrew				X						X		
Elymus scaber	Wheat Grass												X
Panicum effusum	Hairy Panic		X	X									
Rytidosperma sp.	Wallaby Grass							X	X		X		
Total Native Groundcover Species	**5**		**2**	**2**	**2**	**1**	**1**	**2**	**2**	**1**	**3**	**1**	**2**
Exotic													
Arctotheca calendula	Cape Weed			X									X
Bromus sp.	Brome Grass		X	X	X		X				X		
Dactylis glomerata	Cock's Foot		X	X	X	X	X	X	X	X	X	X	X
Echium plantagineum	Paterson's Curse		X	X	X	X				X	X		X
Eleusine tristachya	Goose Grass		X	X	X								
Hordeum sp.	Barley Grass				X	X	X	X	X				
Hypericum perforatum	St John's Wort	LM											
Hypochaeris radicata	Flatweed		X	X				X	X	X			X
Lolium perenne	Perennial Ryegrass				X		X						
Nassella trichotoma	Serrated Tussock	WoNS, C	X	X	X	X	X	X	X	X	X	X	X
Paspalum dilatatum	Paspalum										X		
Phalaris aquatica	Phalaris			X									
Rubus fruticosus	Blackberry	WoNS, LM	X										
Trifolium sp.	Clover		X					X	X	X	X		
Vulpia myuros	Rat's Tail Fescue		X		X	X	X	X	X	X	X	X	X
Total Exotic Groundcover Species	**15**		**9**	**8**	**8**	**5**	**6**	**6**	**6**	**6**	**7**	**3**	**6**

Appendix 2. Tree Habitat Assessment

Tree Number	Coordinates GDA94, MGA Zone 55		Species Name	Common Name	Remnant/ Planted	DBH cm	Height m	Hollows*				Alive/ Dead	Estimated Mean Age**		Notes - Other Habitat Values (nests, mistletoe etc.)
	Easting	Northing						S	M	L	XL		Size Range (DBH)	Estimated Mean Age (Years)	
1			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	72	11					Alive			1 stick nest (Magpie or similar)
2			Unknown	Unknown	Remnant	47	5					Dead			
3			*Eucalyptus melliodora*	Yellow Box	Remnant	56	18	4				Alive			
4			*Eucalyptus melliodora*	Yellow Box	Remnant	108	16					Alive	90-109	211-257	1 stick nest (Crow or similar)
5			*Eucalyptus melliodora*	Yellow Box	Remnant	94	16	1				Alive			
6			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	84	16	1				Alive			
7			*Eucalyptus melliodora*	Yellow Box	Remnant	83	14	3				Alive	70-89	163-211	
8			*Eucalyptus melliodora*	Yellow Box	Remnant	96	17	5	1			Alive			
9			*Eucalyptus melliodora*	Yellow Box	Remnant	86	18	2				Alive	70-89	163-211	1 stick nest (Magpie or similar)
10			*Eucalyptus melliodora*	Yellow Box	Remnant	69	12					Alive			
11			*Eucalyptus melliodora*	Yellow Box	Remnant	90	15	4				Alive	90-109	211-257	
12			*Eucalyptus melliodora*	Yellow Box	Remnant	83	19					Alive	70-89	163-211	
13			*Eucalyptus melliodora*	Yellow Box	Remnant	104	18	7	3			Alive	90-109	211-257	
14			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	75	13	2				Alive	70-89	163-211	1 stick nest (Magpie or similar)
15			*Eucalyptus melliodora*	Yellow Box	Remnant	112	12	3	4	3		Alive	110-129	257-304	
16			*Eucalyptus melliodora*	Yellow Box	Remnant	83	8			1		Alive	70-89	163-211	
17			*Eucalyptus melliodora*	Yellow Box	Remnant	79	14	1				Alive	70-89	163-211	
18			*Eucalyptus melliodora*	Yellow Box	Remnant	109	14	3				Alive	90-109	211-257	
19			*Eucalyptus melliodora*	Yellow Box	Remnant	45	5					Alive			
20			*Eucalyptus melliodora*	Yellow Box	Remnant	81	6	2	1			Alive	70-89	163-211	
21			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	70	11	3	1			Alive			1 stick nest (Magpie or similar)
22			*Eucalyptus melliodora*	Yellow Box	Remnant	103	10					Alive	90-109	211-257	
23			*Eucalyptus melliodora*	Yellow Box	Remnant	87	17					Alive	70-89	163-211	
24			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	62	8					Alive			
25			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	94	14	2				Alive	90-109	211-257	1 stick nest (Crow or similar)
26			*Eucalyptus melliodora*	Yellow Box	Remnant	80	16					Alive	70-89	163-211	1 stick nest (Crow or similar)
27			*Eucalyptus melliodora*	Yellow Box	Remnant	50	6	1				Alive			Red-rumped Parrot nesting in hollow.
28			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	38	6					Alive			
29			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	45,40	8					Alive			
30			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	75	6					Alive	70-89	163-211	
31			*Eucalyptus melliodora*	Yellow Box	Remnant	94	12					Alive	90-109	211-257	
32			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	54	7					Alive			
33			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	39	5					Alive			
34			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	74	9					Alive	70-89	163-211	
35			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	59	9					Alive			
36			*Eucalyptus melliodora*	Yellow Box	Remnant	79	9					Alive	70-89	163-211	

Tree Number	Coordinates GDA94, MGA Zone 55		Species Name	Common Name	Remnant/ Planted	DBH cm	Height m	Hollows*				Alive/ Dead	Estimated Mean Age**		Notes - Other Habitat Values (nests, mistletoe etc.)
	Easting	Northing						S	M	L	XL		Size Range (DBH)	Estimated Mean Age (Years)	
37			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	61	9					Alive			
38			*Eucalyptus melliodora*	Yellow Box	Remnant	63	8					Alive			
39			*Eucalyptus melliodora*	Yellow Box	Remnant	46	8					Alive			
40			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	43	6	4				Alive			
41			*Eucalyptus melliodora*	Yellow Box	Remnant	74	14	2				Alive	70-89	163-211	1 stick nest (Magpie or similar)
42			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	59	13	1				Alive			1 stick nest (Magpie or similar)
43			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	67	15					Alive			
44			*Eucalyptus melliodora*	Yellow Box	Remnant	84	9					Alive	70-89	163-211	
45			*Eucalyptus melliodora*	Yellow Box	Remnant	81	18	1	1			Alive	70-89	163-211	
46			*Eucalyptus melliodora*	Yellow Box	Remnant	90	9			1	2	Alive	90-109	211-257	Wood Duck nest in large hollow.
47			*Eucalyptus melliodora*	Yellow Box	Remnant	84	16	2	2			Alive	70-89	163-211	
48			*Eucalyptus melliodora*	Yellow Box	Remnant	82	17	2				Alive	70-89	163-211	
49			*Eucalyptus melliodora*	Yellow Box	Remnant	86	19	2	1			Alive	70-89	163-211	
50			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	61	10					Alive			
51			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	62	11					Alive			
52			*Eucalyptus melliodora*	Yellow Box	Remnant	71	11					Alive	70-89	163-211	
53			*Eucalyptus melliodora*	Yellow Box	Remnant	64	7	2				Alive			
54			Unknown	Unknown	Remnant	45	7	3				Dead			
55			*Eucalyptus melliodora*	Yellow Box	Remnant	122	18					Alive	110-129	257-304	1 stick nest (Crow or similar)
56			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	62	16	1	1			Alive			
57			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	43,48,34	8					Alive			
58			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	74	15	2				Alive	70-89	163-211	
59			*Eucalyptus melliodora*	Yellow Box	Remnant	72	14					Alive	70-89	163-211	
60			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	62	16	3	3			Alive			
61			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	81	16					Alive	70-89	163-211	
62			*Eucalyptus melliodora*	Yellow Box	Remnant	58	17		2			Alive			
63			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	96	16	3				Alive	90-109	211-257	1 stick nest (Magpie or similar)
64			*Eucalyptus melliodora*	Yellow Box	Remnant	92	18	3	2			Alive	90-109	211-257	
65			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	81	7	1				Alive	70-89	163-211	
66			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	86	13	1				Alive	70-89	163-211	
67			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	80	13					Alive	70-89	163-211	1 stick nest (Magpie or similar)
68			*Eucalyptus melliodora*	Yellow Box	Remnant	68,40	9	2	1			Alive			
69			*Eucalyptus blakelyi*	Blakely's Red Gum	Remnant	60	13	1				Alive			1 stick nest (Magpie or similar)

*Estimated size class of each hollow based upon entrance diameter (i.e. Small <5 cm, Medium 5-15 cm, Large 15 – 25 cm and Extra Large >25 cm).

**Estimate Mean Age of remnant woodland trees based on modelling of age in Yellow Box *Eucalyptus melliodora* in the Canberra Region developed by Banks (1997). The estimate model is also used for this study for Blakely's Red Gum, however it is noted that the Banks (1997) study was based solely on Yellow Box.

Appendix 3. 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 it has not been recorded in the locality and the trees within the study area provide only low quality potential foraging habitat.
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 only been recorded once in the locality, however it is commonly recorded across the Southern Tablelands and may visit the study area to forage. The species is unlikely to select trees within the study area to nest given the sparse nature of the

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.	canopy trees and absence of shrub and midstorey vegetation.
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.	Negligible There is no potential habitat for this species within the study area and there are no records in the locality.
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 and there are no records in the locality.
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.).	Low The species has been recorded once in the locality, approximately 2 km northeast of the study area. The species may visit the study area to forage, however the study area does not contain high quality foraging resources or potential breeding habitat for the species.

Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
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 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.	Low The species has been recorded once in the locality, approximately 7 km northeast of the study area in a large patch of intact dry forest. The study area does not contain any Drooping Sheoak and is therefore does not provide potentially important foraging habitat. The species is highly unlikely to breed within the study area.
Daphoenositta chrysoptera Varied Sittella	-	V1	On the Southern Tablelands, 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 species has been recorded twice in the locality, one record is approx. 6 km to the northwest and the other is approx. 5 km to the southeast. Both records are located in large patches of intact dry forest. The open woodland within the study area is unlikely to constitute potential foraging or breeding habitat for the species.
Ephippiorhynchus asiaticus Black-necked Stork	-	E1	Black-necked Storks are widespread in coastal and subcoastal northern and eastern Australia, as far south as central NSW (although vagrants may occur further south or inland, well away from breeding areas). In NSW, the species becomes increasingly uncommon south of the Clarence Valley, and rarely occurs south of Sydney. Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries.	Negligible The species has only been recorded once in the locality, approximately 9.5 km south of the study area along the Mulwaree River. There is no potential habitat for this species within the study area.
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	Low The species has not been recorded in the locality and is not known to occur in the broader Goulburn region.

Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
			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.	
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.	**Moderate** The species has not been recorded in the locality, however it occurs sparsely across most of the Southern Tablelands. The study area may be part of the large foraging range of a pair of Little Eagles, however the species was not observed within the study area or nearby during any of the surveys which were undertaken during the breeding season.
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 There are no records in the locality and the species is unlikely to visit the study area if it does move through the locality.
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.	Negligible The study area does not support potential foraging habitat for the species. There are no records of the species from the locality.
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.	**Moderate** The species has been recorded once in the locality, approximately 5 km northeast of the study area in a large patch of intact dry forest. The species may periodically visit the study area during foraging activity, however it is highly unlikely to nest within the study area given the lack of shrub and midstorey vegetation.

Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
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 The species is conspicuous when present and has not been recorded in 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 The study area does not support wetland habitats that are preferred by this species.
Fish and Crustacea				
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 Victoria, the Green and Golden Bell Frog occupies habitats with little human disturbance and commonly breeds in permanent ponds, as well as ephemeral ponds.	Negligible There is no potential habitat within the study area for the species.

Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
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.	Negligible The species has not been recorded in the locality and the study area does not contain potential 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 not known to forage or roost in urban or highly modified rural areas.	**Moderate** The species has been recorded once in the locality, approximately 5 km southeast of the study area within intact dry forest. The species was also recorded as a 'possible' detection via the ANABAT® surveys completed for this F&FA. Whilst the open woodland within the study area is unlikely to constitute potential roosting habitat for the species, it is possible that the species forages in the patch of remnant eucalypts.
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.	**Confirmed** The species has been recorded three times in the locality (each record being approximately 5 km east of the study area) and it was recorded as a 'confident' detection via the ANABAT® surveys completed for this F&FA. The study area does not support roosting habitat, however it is evident that

Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
				the species forages in the patch of remnant eucalypts.
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 The species has not been recorded in the locality and, due to past tree clearance and other disturbance, 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 There are no records of koalas in the locality, the closest record being approximately 20 km to the southeast within intact eucalypt forest.
Pseudomys novaehollandiae New Holland Mouse	V		The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. The species is known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes.	Negligible There are no records of the species in the locality, and no potential habitat occurs within the study area or locality.
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).	Low There is a single record of the species in the locality, located in central Goulburn. It is likely that this individual had visited a backyard fruit tree to feed while traveling through the region. There are no camps (roost sites) in the locality and the study area does not contain potentially important foraging habitat.

Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
			The Grey-headed Flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises 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 and NSW Southern Tablelands 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.	Negligible The species has not been recorded in the locality and the study area does not contain potential habitat for the species.
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 and NSW Southern Tablelands region, the species is known to occur at four separate locations - in grassland areas of Gungahlin, Majura and Jerrabomberra Valleys, and Yarramundi Reach. 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 (R. Speirs pers. obs.). They have also been found in	Low A single record occurs in the locality, located approximately 9 km south of the study area within a remnant patch of natural temperate grassland. A full program of tile surveys was completed across the higher quality habitat in the property adjoining the eastern boundary of the study area, no Striped Legless Lizards or other significant species were found. Given the low number of records in the locality, the nil result from surveys in better habitat adjoining the study area, and the very high degree of groundstorey modification (i.e. cultivation and grazing), the study area is highly unlikely to support the species.

Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
			several secondary grassland sites, generally within two kilometres of primary grassland.	
Plants				
Diuris aequalis Buttercup Doubletail	V	E1	The Buttercup Doubletail has been recorded in Kanangra-Boyd National Park, Gurnang State Forest, towards Wombeyan Caves, the Taralga - Goulburn area, and the ranges between Braidwood, Tarago and Bungendore. The species has been recorded in forest, low open woodland with grassy understorey and secondary grassland on the higher parts of the Southern and Central Tablelands (especially on the Great Dividing Range). Leaves die back each year and resprout just before flowering. Populations tend to contain few, scattered individuals; despite extensive surveys, only about 200 plants in total, from 20 populations are known.	Negligible Two records occur in the locality, however each is more than 110 years old and has an accuracy of >1000 m. Extensive surveys have not recorded the species within the study area or nearby. It is highly unlikely that the species would have persisted within the study area given the cultivation of some areas and the set stock grazing and that has occurred for more than a century.
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	Low The species was not recorded within the study area during the completed surveys and is not known to occur in the locality.

Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
			populations are now generally found amongst exotic pasture grasses and beneath exotic trees.	
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 sensitive to grazing, but responds to disturbance as a coloniser and appears to tolerate mowing. Flowers spring to summer.	Low The species is quite a common species of roadsides, reserves, and other less modified land across the Southern Tablelands. Numerous records occur in the locality. Notwithstanding this, the species was not recorded within the study area during the completed surveys. It is likely that the history of stock grazing has removed the species and any seed in the soil seed bank.
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.
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.	Negligible The species has not been recorded in the locality, and, if it was present in the study area in the past, it is unlikely to have withstood the long-term intensive grazing of the study area.

Species Name	EPBC Act Status	TSC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Rutidosis Leptorrhynchoides Button Wrinklewort	E	E1	In the ACT and NSW, Button Wrinklewort occurs in box-gum woodland, secondary grassland derived from box-gum woodland or in natural 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.	Negligible The species has been recorded along the Wollondilly River approximately 1.5 km south of the study area, and approximately 8 km south of the study area within a remnant patch of natural temperate grassland. The species is quite conspicuous when present and it was not recorded during the completed surveys. If once present, it is highly unlikely that the species would have persisted within the study area given the history of stock grazing.
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.	Negligible The species has not been recorded in the locality and the habitat within the study area is unsuitable for the species. If once present, it is highly unlikely that the species would have persisted within the study area given the history of stock 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 The species has not been recorded in the locality and the habitat within the study area is unsuitable for the species. If once present, it is highly unlikely that the species would have persisted within the study area given the history of stock grazing.

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.

Appendix 4. TSC Act Assessment 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, an AoS is provided below for the one TSC listed TEC 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 and/or low diversity native grassland/pasture, may be impacted without substantially impacting the conservation of the TEC.

As described in Section 4.1.3 of this F&FA, the mapping prepared for this assessment (displayed in Figure 3 and Figure 4) accurately represents the full extent of TSC Act Box-Gum Woodland present within the study area, including the highly modified, marginal forms of the community.

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.

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

As described in Section 5, in light of the advice provided by Capital Ecology, the proponents of the proposed development have developed a subdivision layout which maximises the retention and protection of the portions of the study area with the greatest biodiversity significance, namely the areas of TSC Act Box-Gum Woodland occurring in the least modified condition (relative to the remainder of the study area). As detailed in Table 7 and illustrated in Figure 4, the proposed subdivision will avoid impacts to 99.6% of Zone 1 (low diversity mixed native/exotic with remnant trees) and 80.9% of Zone 2 (low diversity native with no remnant trees). The impacts to these zones have been avoided to the maximum extent possible whilst permitting the development of a functional subdivision layout and allowing for the incorporation of edge roads along much of the urban interface (a measure beneficial for natural area conservation).

The northwest portion of the study area not included within the subdivision will be retained as a single large lot. This measure will permit the retention of the Zone 1 patches and all but one (Tree 1, refer Figure 3) of the remnant trees present within the study area. As detailed in Section 4.3.1, most of the remnant trees within the study area are in excess of 100 years old. Numerous recent studies have demonstrated the very high ecological and biodiversity conservation value of such trees, particularly in the context of increasing rarity across the lowland landscapes of the Southern Tablelands (Stagoll *et al*. 2012; Le Roux *et al*. 2014a; Le Roux *et al*. 2014b; Gibbons *et al*. 2015). The retention of the remnant trees within the study area, as proposed, is a significant conservation measure and an example of ecologically sensitive development.

With regard to the above, the proposed development will have a minor impact on the local occurrence of the TEC. The majority of the TEC (albeit it low condition) within the study area will be retained. Given this measure, and that other larger patches of moderate to good condition Box-Gum Woodland occur in the locality, 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 proposal will clear only highly modified, low condition Box-Gum Woodland. This Box-Gum Woodland 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.

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

As detailed in Table 7 and illustrated in Figure 4, the proposed subdivision will avoid impacts to 99.6% of Zone 1 (low diversity mixed native/exotic with remnant trees) and 80.9% of Zone 2 (low diversity native with no remnant trees). The impacts to these zones have been avoided to the maximum extent possible whilst permitting the development of a functional subdivision layout and allowing for the incorporation of edge roads along much of the urban interface (a measure beneficial for natural area conservation).

All but one of the remnant trees are proposed to be retained within the development.

Vegetation Zones – Proposed clearance and retention

Vegetation Zone ID	**Canopy** (Present/Absent)	**Groundstorey Dominance** (Native or Exotic)	**Diversity** (Low/Mod/High)	**Total Area** (Ha)	**Proposed Clearance**		**Proposed Retention**	
					Area (Ha)	**%**	**Area** (Ha)	**%**
1330.1	Present	Native (marginal)	Low	5.96	0.02	0.39	5.94	99.61
1330.2	Absent	Native (marginal)	Low	11.37	2.17	19.10	9.20	80.90
1330.3	Absent	Exotic	Low	34.51	30.44	88.20	4.07	11.80

Fragmentation and isolation of habitat

The study area is located in a currently highly fragmented landscape. The patch of the TEC within the study area is unlikely to form a key dispersal link (or important part thereof) for any native species. The proposed development will retain most of the structural woodland form of the TEC, thereby avoiding further fragmentation of the habitat in the locality.

Only common ground dwelling species (i.e. kangaroos, snakes, lizards etc.) are likely to traverse the study area. As such, the proposed development is unlikely to fragment habitat for significant fauna.

Importance of the habitat

The TSC Act Box-Gum Woodland to be removed is limited to a highly modified, marginal form of the ecological community, being characterised by a highly modified mixed native and exotic groundcover, with or without retained remnant eucalypts. 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 area of TEC proposed to be cleared is not a high-quality remnant of the TEC.

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 the below table, the proposed development will make a small contribution to the key threatening process 'Clearing of native vegetation' and may result in the invasion of escaped garden plants.

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 / peri-urban 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** A small area of the TEC, in highly modified / marginal form, is proposed to be cleared.
Removal of dead wood and dead trees	Neutral It is proposed to retain all but one of the trees (including dead trees) within the large residual lot.
Invasion of native plant communities by exotic perennial grasses	**Positive**

Key Threatening Process	Impact from Proposed Development Positive/Neutral/Negative
	The proposed development will include effective control of significant grassy weeds which occur in the study area, particularly Serrated Tussock, which otherwise may not occur. This may assist in protecting the TEC in the 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*	Neutral Feral cats are known to occur throughout the locality and would no doubt roam within the study area. The proposed development is unlikely to increase the impact of this KTP in the locality.
Predation, habitat degradation, competition and disease transmission by feral pigs *Sus scrofa*	Neutral Feral pigs are not known to occur in the study area or nearby. The proposed development is unlikely to result in the introduction of feral pigs to the study area.

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 very 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.

Appendix 5. Recommended Species for Open Space Plantings

Note: The list of recommended 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 Box-Gum Woodland 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 melliodora	Yellow Box
Eucalyptus rubida	Candlebark
Midstorey	
Acacia decurrens	Black Wattle
Acacia falcata	Sickle Wattle
Acacia implexa	Hickory
Acacia mearnsii	Late Black Wattle
Acacia melanoxylon	Blackwood
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
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

Scientific Name	Common Name
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
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

Scientific Name	Common Name
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
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

Scientific Name	Common Name
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
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

Scientific Name	Common Name
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
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

Scientific Name	Common Name
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
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

Scientific Name	Common Name
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

Appendix 6. ANABAT® Analysis Results

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14th November 2017

Hi Sam

Following are the results for the files you sent for the site at Goulburn, NSW.

Site	Date	C.go	C.mo	F.ta	M.sc	V.da	V.re	V.vu	Total Passes
Eastern	6/10/17	C		Po	C	C		P	19
Eastern	7/10/17	C			P	C		P	41
Western	6/10/17	C	P		C	P	Po	C	37
Western	7/10/17	C		Po	C	P	Po	Po	62

Species

C.go	Gould's Wattled Bat	*Chalinolobus gouldii*
C.mo	Chocolate Wattled Bat	*Chalinolobus morio*
F.ta	Eastern Faslistrelle	*Falsistrellus tasmaniensis*
M.sc	Eastern Bent-wing Bat	*Miniopterus schreibersii oceanensis*
V.da	Large Forest Bat	*Vespadelus darlingtoni*
V.re	Southern Forest Bat	*Vespadelus regulus*
V.vu	Little Forest Bat	*Vespadelus vulturnus*

Confidence of Identification

C	Confident	**P**	Probable	**Po**	Possible

Best wishes

Glenn Hoye