Subdivision of Jumping Creek Estate, Queanbeyan, NSW

Biodiversity Development Assessment Report

Final – March 2019

Prepared for Peet Limited and Spacelab Pty Ltd

Document Information

Report for: Peet Limited and Spacelab Pty Ltd

Prepared by: Robert Speirs and Sam Reid

Capital Ecology project no.: 2794

Citation: Capital Ecology (2019). *Subdivision of Jumping Creek Estate, Queanbeyan, NSW – Biodiversity Development Assessment Report*. Final – March 2019. Prepared for Peet Limited and Spacelab Pty Ltd. Authors: R. Speirs & S. Reid. Project no. 2794.

Version Control

Version	Internal reviewer	External reviewer	Date of issue
Draft version 01	Robert Speirs	-	17/01/2019
Draft version 02	Robert Speirs	Giselle Ravarian	25/01/2019
Final version 01	Robert Speirs	-	15/03/2019

Acknowledgements

Capital Ecology gratefully acknowledges the contributions and/or assistance of the following people and organisations in undertaking this study.

- Mitchell Alexander, Development Manager, Peet Limited
- Hamish Sinclair, Strategic and Statutory Planner, Spacelab Pty Ltd
- Giselle Ravarian, Principal Urban Designer & Planner, Spacelab Pty Ltd

Table of Contents

List of Figures

List of Tables

Executive Summary

Peet Limited is currently progressing with the planning and approval process to develop Jumping Creek Estate within Lot 5 DP1199045, Queanbeyan, NSW (the 'proposed development'). Capital Ecology Pty Ltd (Capital Ecology) has been commissioned by Spacelab Pty Ltd (Spacelab), the project managers for the proposed development, to complete the necessary biodiversity surveys and prepare this Biodiversity Development Assessment Report (BDAR) to identify and assess the significance of the impacts that the proposed development will have on the biodiversity values of the subject land.

Scope

Although general biodiversity values are identified and considered, the primary purpose of this BDAR is to present the results of Capital Ecology's application of the NSW *Biodiversity Assessment Method* (BAM) to assess the significance of the impacts of the proposed development on biota listed as threatened under the NSW *Biodiversity Conservation Act 2016* (BC Act). This BDAR also includes assessment of the potential impacts of the proposed development on Matters of National Environmental Significance (MNES) listed pursuant to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The 'study area' for this BDAR includes the entirety of Lot 5 DP1199045, Queanbeyan, NSW, encompassing a total area of 97.6 ha. The 'subject land' for this BDAR, encompassing a total area of 39.38 ha, relates only to the portion of the study area which will be impacted by the proposed development. Extending the area of investigation to include the larger study area ensured that all of the potential biodiversity values present in the locality were identified. The impact of the proposed development is subsequently determined based on the biodiversity values which occur within the subject land.

Survey overview

The following ecological surveys were performed by Capital Ecology.

- A biodiversity assessment undertaken between 31 July and 26 November 2018.
- Threatened flora and threatened bird surveys undertaken on 31 July 2018, 2 November 2018, and 5 November 2018.
- A Pink-tailed Worm-lizard survey undertaken on 10 September 2018.
- A threatened bat survey undertaken between 16 and 18 November 2018.

Vegetation and potential flora/fauna habitat were surveyed and mapped in accordance with the BAM, threatened flora and threatened birds were surveyed via random meanders through likely habitat and opportunistic observations, the Pink-tailed Worm-lizard was surveyed via an intensive rock turning survey consistent with the Commonwealth guidelines, and threatened bats were surveyed via ANABAT recordings.

Native vegetation

The subject land supports two Plant Community Types (PCTs).

- PCT1093 – Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion.
- PCT1334 – Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion.

The whole of the subject land and the majority of the study area have been utilised over an extended period for various purposes, including mining, quarrying, and grazing/agriculture. As a result, much of the study area has been cleared and the majority of the vegetation which remains is highly modified and dominated by exotic species. There are some stands of relatively intact native vegetation within the study area, these occurring along sections of the riparian corridors, the higher elevated portions of the study area, and the south-eastern boundary of the study area.

Threatened ecological communities

PCT1334 is identified as the potential threatened ecological community (TEC) *White Box Yellow Box Blakely's Red Gum Woodland* (BC Act) and *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (EPBC Act). This community is commonly referred to as Box-Gum Woodland. Assessments of structure and floristic composition determined that the vegetation zone PCT1334 Zone 1 meets the listing criteria for the EPBC Act listed TEC, and that the vegetation zones PCT1334 Zones 1 and 2 meet the listing criteria for the BC Act listed TEC.

Threatened species

The historic activities which have occurred across much of the subject land have substantially degraded the habitat value for flora and fauna. As a result, no threatened flora or fauna species were recorded within the subject land. Due to the low number of hollow bearing trees, the subject land is unlikely to be of value as breeding or nesting habitat for threatened birds.

While no threatened species were recorded within the subject land, the areas of more intact vegetation (i.e. PCT1093 Zone 1 and PCT1334 Zone 1) do provide potential foraging habitat for a variety of threatened fauna, particularly threatened birds and threatened bats. This is especially true across the wider study area where substantial patches of intact vegetation are present. Three threatened fauna species were recorded in the wider study area, specifically Dusky Woodswallow *Artamus cyanopterus* (BC Act vulnerable), Scarlet Robin *Petroica boodang* (BC Act vulnerable), and Eastern Bent-wing Bat *Miniopterus schreibersii oceanensis* (BC Act vulnerable). Despite substantial survey effort, no threatened flora species or Pink-tail Worm-lizards were recorded on the subject land or study area.

Impacts

The proposed development will impact 38.14 ha of vegetation, 6.90 ha of which meets the BC Act definition of native vegetation. Of this, 0.77 ha meets the listing criteria for EPBC Act Box-Gum Woodland, and 2.74 ha meets the listing criteria for BC Act Box-Gum Woodland.

The proposed development will not result in any other direct impacts on native vegetation or habitat.

As outlined below, the subject land contains vegetation with a vegetation integrity score that requires offsetting for impacts on ecosystem credits, including vegetation which meets the definition of a TEC (i.e. PCT1334 Zones 1 and 2).

- PCT1093 Zone 1 – vegetation integrity score of 48.8, proposed clearance of 1.45 ha.
- PCT1334 Zone 1 – vegetation integrity score of 49.3, proposed clearance of 0.77 ha.
- PCT1334 Zone 2 – vegetation integrity score of 35.1, proposed clearance of 1.97 ha.

The subject land supports PCT1334, an ecological community which is listed as a serious and irreversible impacts (SAII) entity. Accordingly, the proposed development could result in a SAII on a BC Act listed entity. However, the proposed removal of 2.74 ha of BC Act listed Box-Gum Woodland is unlikely to constitute an SAII as the impact is small and on vegetation that is already fragmented and partially degraded.

The proposed development will not impact any threatened species.

The proposed development is unlikely to result in biodiversity impacts that are unforeseen or uncertain.

Commonwealth EPBC Act requirements

The proposed development is unlikely to have a significant impact on EPBC Act listed flora and fauna given the subject land does not:

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

However, the proposed development does support EPBC Act listed Box-Gum Woodland. As described in the EPBC Act Significant Impact Criteria Assessment (Appendix E), the removal of 0.77 ha of this ecological community is unlikely to have a significant impact on the EPBC Act listed TEC.

As such, referral of the proposed action to the Commonwealth Minister for the Environment and Energy is unwarranted. Notwithstanding this, as the proposed development will remove 0.77 ha of this critically endangered ecological community, the proponent may wish to refer the proposed action to obtain legal certainty.

NSW BC Act biodiversity offset credit requirements

The proposed development will involve the clearance of three vegetation zones and generate the following ecosystem credits.

- PCT1093 Zone 1 – clearance of 1.45 ha which generates 31 ecosystem credits.
- PCT1334 Zone 1 – clearance of 0.77 ha which generates 19 ecosystem credits.
- PCT1334 Zone 2 – clearance of 1.97 ha which generates 35 ecosystem credits.

This vegetation clearance will generate an estimated ecosystem credit obligation of $506,335.15 (incl. GST). This estimate is based on the baseline credit price for the relevant entities on 14 March 2019.

The subject land does not support habitat of potential significance to any species credit species. Accordingly, the proposed development does not generate a species credit obligation.

1 Introduction

Peet Limited is currently progressing with the planning and approval process to develop Jumping Creek Estate within Lot 5 DP1199045, Queanbeyan, NSW (the 'proposed development'). Capital Ecology Pty Ltd (Capital Ecology) has been commissioned by Spacelab Pty Ltd (Spacelab), the project managers for the proposed development, to complete the necessary biodiversity surveys and prepare this Biodiversity Development Assessment Report (BDAR) to identify and assess the significance of the impacts that the proposed development will have on the biodiversity values of the subject land.

Although general biodiversity values are identified and considered, the primary purpose of this BDAR is to present the results of Capital Ecology's application of the NSW *Biodiversity Assessment Method* (BAM) (NSW Government 2017a[1]) to assess the significance of the impacts of the proposed development on biota listed as threatened under the NSW *Biodiversity Conservation Act 2016* (BC Act). This BDAR also includes assessment of the potential impacts of the proposed development on Matters of National Environmental Significance (MNES) listed pursuant to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.1 Study Area and Subject Land

The 'study area' for this BDAR includes the entirety of Lot 5 DP1199045, Queanbeyan, NSW, encompassing a total area of 97.6 ha (Figure 3). The 'subject land' for this BDAR, encompassing a total area of 39.38 ha, relates only to the portion of the study area which will be impacted by the proposed development (Figures 2 and 3). Extending the area of investigation to include the larger study area ensured that all of the potential biodiversity values present in the locality were identified. The impact of the proposed development is subsequently determined based on the biodiversity values which occur within the subject land.

The study area, as shown in Figure 1, is bordered by:

- land zoned for environmental conservation/management to the north, east and south;
- the Queanbeyan River to the west, beyond which is the suburb of Karabar; and
- the suburb of Greenleigh to the north-west.

Valley Creek (also known as Jumping Creek) runs from the south-east to the center of the study area, where, before draining into the Queanbeyan River approximately 500 m to the south-west, it is joined by an unnamed creek which enters from the north of the study area.

Located in the Queanbeyan-Palerang Regional Council Local Government Area (LGA), pursuant to the *Queanbeyan Local Environment Plan 2012* (Queanbeyan LEP), the study area is comprised of the following land zones[2]:

- E2 – Environmental Conservation;

[1] NSW Government (2017a). *Biodiversity Assessment Method*. NSW Office of Environment and Heritage. Published LW 25 August 2017.
[2] Queanbeyan Local Environment Plan (2012). Land Zoning Map - Sheet LZN_005 and LZN_006.

- E4 – Environmental Living; and
- RE1 – Public Recreation.

Parts of the study area are identified on the Queanbeyan LEP Terrestrial Biodiversity Map[3]. The identified areas correspond to those which retain a woody overstorey or which form part of the river or creek corridors.

The elevation of the study area ranges from approximately 565 m Australian Height Datum (AHD) along the Queanbeyan River to 685 m AHD on the hill in the north-east of the study area. The topography varies across the study area, falling sharply around Valley Creek, the unnamed creek, and their associated tributaries.

There is no built infrastructure on the study area, but the Ellerton Drive Extension, which boarders the north-west of the study area, is currently under construction. The study area has been modified by its history of varying land uses, including mining, quarrying, and grazing/agriculture. These historic activities have substantially degraded the ecological values of the study area, which is now largely dominated by exotic plants and disturbed land. The study area has also been impacted more recently by other human activities, including off road vehicles and dumping of rubbish (e.g. abandoned cars, refuse). The existing access tracks and stock fences are in a poor condition.

EcoLogical Australia (2010[4]) performed a Flora and Fauna Assessment of the study area for a rezoning proposal. This included (but was not limited to) targeted threatened flora surveys, tree hollow surveys, dusk stagwatch surveys for nocturnal mammals and birds, spotlight surveys, playback surveys for nocturnal mammals and birds, ANABAT surveys, bird surveys, rock turning surveys, and Golden Sun Moth *Synemon plana* surveys. The survey timing, methods and effort were substantial and appropriate for the ecological values being investigated.

EcoLogical Australia (2010) identified the following significant ecological values occurring within the study area.

- Box Gum Woodland, meeting the criteria for the Threatened Ecological Community (TEC) under the *Threatened Species Conservation Act 1995* (TSC Act) and EPBC Act.
- Threatened fauna, specifically Gang-Gang Cockatoo *Callocephalon fimbriatum*, Speckled Warbler *Chthonicola sagittate*, Painted Honeyeater *Grantiella picta*, and Eastern Bentwing Bat *Miniopterus schreibersii oceanensis*.
- Threatened flora, specifically Hoary Sunray *Leucochrysum albicans* var*. tricolor*.
- Areas considered to possess considerable conservation values, specifically the riparian corridors associated with sections of the Queanbeyan River and Valley Creek and the areas of relatively intact native vegetation on the margins of the study area.

[3] Queanbeyan Local Environment Plan (2012). *Terrestrial Biodiversity Map - Sheet BIO_001.*
[4] EcoLogical Australia (2010). *Draft Flora and Fauna Assessment. Rezoning Investigations. Jumping Creek Estate, Queanbeyan.* Prepared for CIC Australia Limited, July 2010. Project No. E1080060.

1.2 Proposed Development

As stated in Section 1.1, the 'study area' for this BDAR includes the entirety of Lot 5 DP1199045 while the 'subject land' only relates to the area which will be impacted by the proposed development (refer to Figure 3).

The proposed development involves the subdivision of the subject land and the subsequent development for residential purposes. As shown in the Subdivision Layout[5], included herein as Figure 2, the proposed development will subdivide the subject land to create approximately 220 new lots. The lot size[6] for the subject land ranges from 'M – 600 m^2' to 'Y – 15,000 m^2' on land zoned 'E4 – Environmental Living'.

The proposed development includes four Water Sensitive Urban Design (WSUD) ponds at the confluence of Valley Creek and the unnamed creek, and a small park which will be situated directly to the east of the forked WSUD pond. The proposed development also involves a small re-alignment of a section of Valley Creek which borders Road 12, and a more substantial re-alignment of Valley Creek from the Road 13 creek crossing and around the 'island' formed by Road 13 (refer to Figure 2). All of the proposed impacts are captured within the subject land (refer to Figure 3).

The proposed development is assumed to clear all vegetation within the subject land (refer to Figures 3 and 6).

1.3 Commonwealth and State Assessment and Approval Processes

1.3.1 Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act is the key Commonwealth Government legislation for the protection and conservation of Australia's environment and biodiversity. The EPBC Act provides the legislative framework for the assessment and approval mechanism requiring that proposed 'actions' to be assessed in terms of their potential to impact upon 'Matters of National Environmental Significance' (MNES). MNES currently listed under the EPBC Act are:

- world heritage properties;
- national heritage places;
- wetlands of international importance (listed under the Ramsar Convention);
- threatened species and ecological communities;
- migratory species (protected under international agreements);
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park;
- nuclear actions (including uranium mining); and
- a water resource, in relation to coal seam gas development and large coal mining development.

[5] Subdivision Layout. *Jumping Creek Lot 5 DP1199045*. Draft Revision E, 18 January 2019.
[6] Queanbeyan Local Environment Plan (2012). Lot Size Map - Sheet LSZ_005 and LSZ_006.

Where a potential impact on a MNES may occur as a result of a proposed action, the significance of that impact must be assessed. Guidelines for determining whether an impact is significant are provided by the Department of the Environment and Energy (Commonwealth of Australia 2013[7]). If it is determined that a proposed action will, or is likely to, have a significant impact on a MNES, the action must be referred to the Commonwealth Minister for the Environment. The Department will then consider the referred action and the Minister (or his/her Delegate) will make a determination regarding whether the action requires approval under the EPBC Act and associated conditions and controls.

The following website provides further information regarding the EPBC Act referral and approval process: http://www.environment.gov.au/epbc/index.html

1.3.2 NSW *Biodiversity Conservation Act 2016*

The NSW BC Act commenced on 25 August 2017, the purpose of which is "*to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development*" (BC Act Part 1, Section 1.3). The BC Act outlines the NSW framework for addressing impacts on biodiversity from development and clearing. Supported by the NSW *Biodiversity Conservation Regulation 2017* (BC Regulation), the BC Act establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme (BOS).

1.3.2.1 NSW Biodiversity Offsets Scheme

The BOS creates a transparent, consistent and scientifically based approach to biodiversity assessment and offsetting for all types of development that are likely to have a significant impact on biodiversity. The BOS aims to ensure a no-net-loss outcome for biodiversity by applying a framework which requires that impacts are first avoided and minimised, and where this cannot be fully achieved, residual impacts must be offset. The BOS also establishes Biodiversity Stewardship Agreements (BSAs), which are voluntary in-perpetuity agreements entered into by landholders, to secure and manage offset sites for biodiversity conservation. The two key elements of the BOS are as follows.

1. A developer, landholder etc. who undertakes an activity (i.e. development, clearing, other impact) which generates a credit obligation must retire the necessary credits to offset their activity.
2. A landholder who establishes a biodiversity stewardship site on their land generates credits which may be sold to developers or landholders who require those credits to offset their credit obligation.

Under the BC Act, the BOS is triggered for proposed development or clearing which:

- will occur on or otherwise impact land identified on the Biodiversity Values Map; and/or
- will exceed the native vegetation clearance threshold for the smallest minimum lot size associated with the zoning of the subject land; and/or
- may significantly impact one or more BC Act listed entities (i.e. threatened species or ecological communities).

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

1.3.2.2 NSW Biodiversity Assessment Method

The NSW Biodiversity Assessment Method (BAM) is the assessment manual that outlines how an accredited person (i.e. a BAM Assessor) assesses impacts on biodiversity at development sites and biodiversity stewardship sites. The BAM is a scientific document that provides:

- a consistent (standard) method for the assessment of the biodiversity values of a proposed development site, major project site, or vegetation clearing site;
- guidance on how a proponent (i.e. developer, landholder) can avoid and/or minimise potential biodiversity impacts; and
- the number and class of biodiversity credits that need to be offset to achieve a standard of 'no net loss' of biodiversity values.

The BAM is supported by the online BAM Calculator, into which a BAM Assessor enters the data from desktop and field investigations to determine the number and class of biodiversity credits generated:

- as an obligation for development/clearance, this obligation must be addressed by the proponent to secure approval for the development/clearance; or
- by the establishment and management of a biodiversity stewardship site, these credits being a commodity that may be sold.

The BAM determines the following two types of credits on both development/clearance sites and stewardship sites.

- Ecosystem credits, these are credits generated for impacts on, or conservation of:
  - threatened ecological communities; and
  - threatened species habitat for species that can be reliably predicted to occur within a given plant community type (PCT) (referred to in the BAM as 'ecosystem credit species').
- Species credits, these are credits generated for impacts on, or conservation of, individuals and/or the habitat of threatened species which cannot be reliably predicted to occur in a given PCT (referred to in the BAM as species credit species).

The BAM Assessor documents the results of the biodiversity assessment in a Biodiversity Assessment Report (BAR), of which there are the following three types.

- Biodiversity Development Assessment Report (BDAR). A BDAR is developed to assess the likely biodiversity impacts of a development or vegetation clearing proposal.
- Biodiversity Certification Assessment Report (BCAR). A BCAR is developed to assess the likely biodiversity impacts of conferring biodiversity certification over a specific area of land.
- Biodiversity Stewardship Site Assessment Report (BSSAR). A BSSAR is developed to assess the likely biodiversity conservation gain of establishing a specific area of land as a biodiversity stewardship site under a formal Biodiversity Stewardship Agreement.

1.4 Biodiversity Development Assessment Report

As prescribed under Part 6, Division 3, Section 6.12 of the BC Act, a BDAR is –

> *"a report prepared by an accredited person in relation to proposed development or activity that would be authorised by a planning approval, or proposed clearing that would be authorised by a vegetation clearing approval, that:*
>
> *(a) assesses in accordance with the biodiversity assessment method the biodiversity values of the land subject to the proposed development, activity or clearing, and*
>
> *(b) assesses in accordance with that method the impact of proposed development, activity or clearing on the biodiversity values of that land, and*
>
> *(c) sets out the measures that the proponent of the proposed development, activity or clearing proposes to take to avoid or minimise the impact of the proposed development, activity or clearing, and*
>
> *(d) specifies in accordance with that method the number and class of biodiversity credits that are required to be retired to offset the residual impacts on biodiversity values of the actions to which the biodiversity offsets scheme applies."*

A BDAR prepared applying the BAM by an accredited BAM Assessor must accompany any development application for which the BOS is triggered. As detailed previously, the BOS is triggered for a proposed development which:

- will occur on or otherwise impact land identified on the Biodiversity Values Map; and/or
- will exceed the native vegetation clearance threshold for the smallest minimum lot size associated with the zoning of the subject land; and/or
- may significantly impact one or more BC Act listed entities (i.e. threatened species or ecological communities).

With regard to the above, the minimum lot sizes for the subject land are 'M' 600 m^2, 'S' 800 m^2 and 'Y' 15000 m^2 (LEP Lot Size Map - Sheet LSZ_005; Lot Size Map - Sheet LSZ_006). Therefore, in accordance with Part 7, Clause 7.2 of the BC Regulation, as the proposed development will involve the clearance of approximately 6.90 ha of BC Act 'native vegetation' (defined in Part 5A of the *Local Land Services Act 2013* as plant species indigenous to NSW) (refer to Figure 7), a BDAR is required to assess the impacts of the proposed development. Also, a segment of Valley Creek and the buffer associated with the Queanbeyan River are identified on the Biodiversity Value Map https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap.

The BAM provides a standard method for assessing the impacts of a development/clearance proposal. This theme should carry over to the resulting BDAR such that it is as concise as possible whilst still addressing all of the relevant elements of the BAM in order to provide a complete assessment of the proposed development. The size of the BDAR should reflect the complexity of the subject land's biodiversity values and the scale and nature of the proposed development.

1.4.1 Objectives and Format

Developed to reflect the format of the BAM, this BDAR comprises the following two broad parts.

- Part 1 – Biodiversity Assessment (BAM Stage 1), includes assessment of the:
  - landscape context;
  - native vegetation, threatened ecological communities (TECs), vegetation integrity; and
  - habitat suitability for threatened species.
- Part 2 – Impact Assessment (BAM Stage 2), details the:
  - proposed measures to avoid, minimise and mitigate biodiversity impacts;
  - residual impacts (direct and indirect) of the proposed development; and
  - offset requirements relevant to the proposed development.

1.4.2 Technical Resources and Qualifications

This BDAR has been prepared by the following technical personnel:

- Robert Speirs – Director / Principal Ecologist – BAppSc (Ecology), DipPM, MEIANZ, CEnvP-E, Accredited BAM Assessor (No: BAAS17089)

  Robert was project manager for this assessment and completed or closely supervised all field surveys, data entry, GIS mapping, BAM credit calculations, and report preparation.

- Dr Sam Reid – Consultant Ecologist – BSc (Hons), PhD, MEIANZ

  Sam undertook field surveys, data entry, GIS mapping, and report preparation.

- Alan Vincent – Field Ecologist – BSc (Hons)

  Alan undertook field surveys, data entry, and GIS mapping.

- Shannon Thompson – Field Ecologist – BSc

  Shannon undertook field surveys and data entry.

All surveys for this assessment 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 Office of Environment and Heritage under s 132 C of the NSW *National Parks and Wildlife Act 1974* (SL101623).

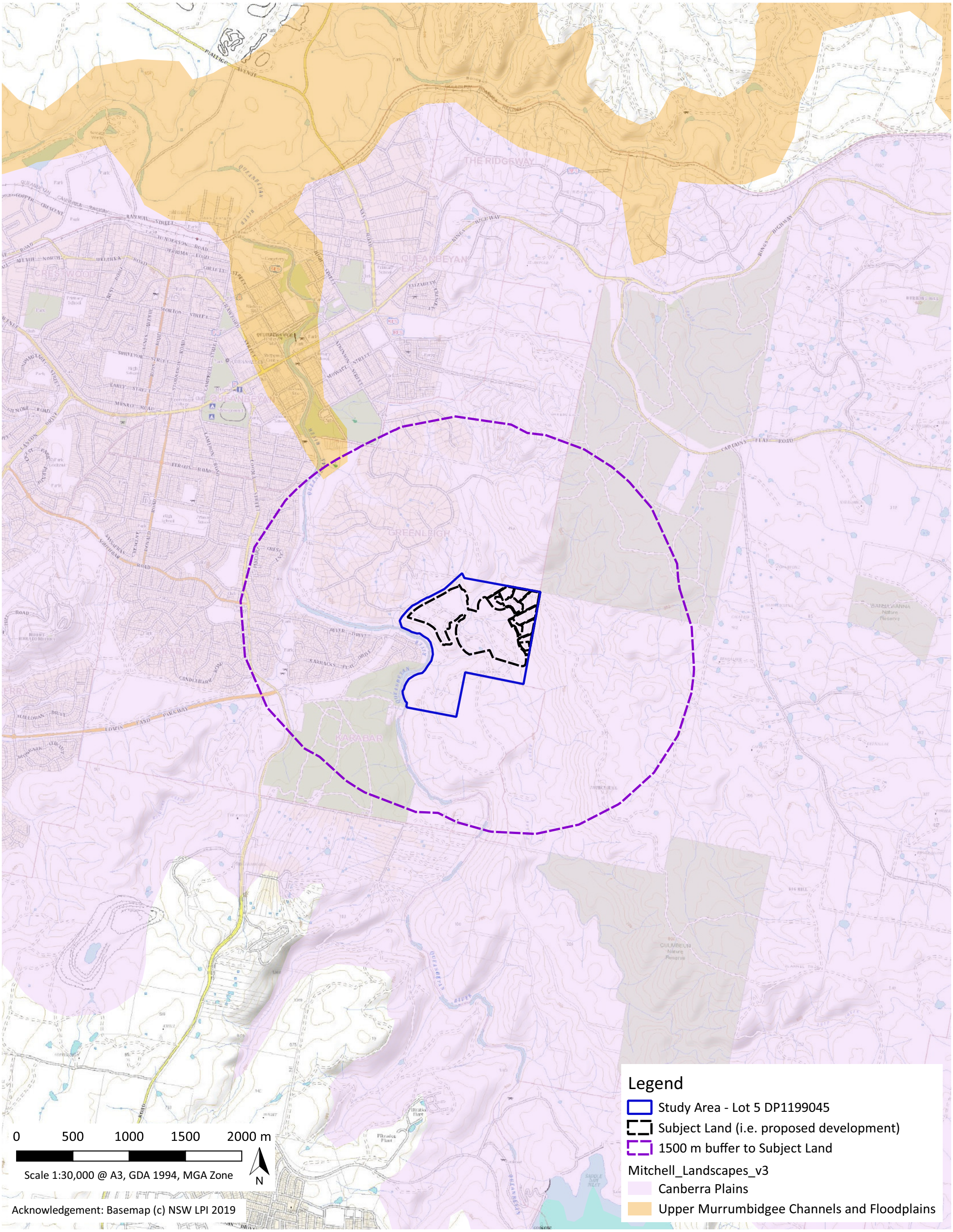
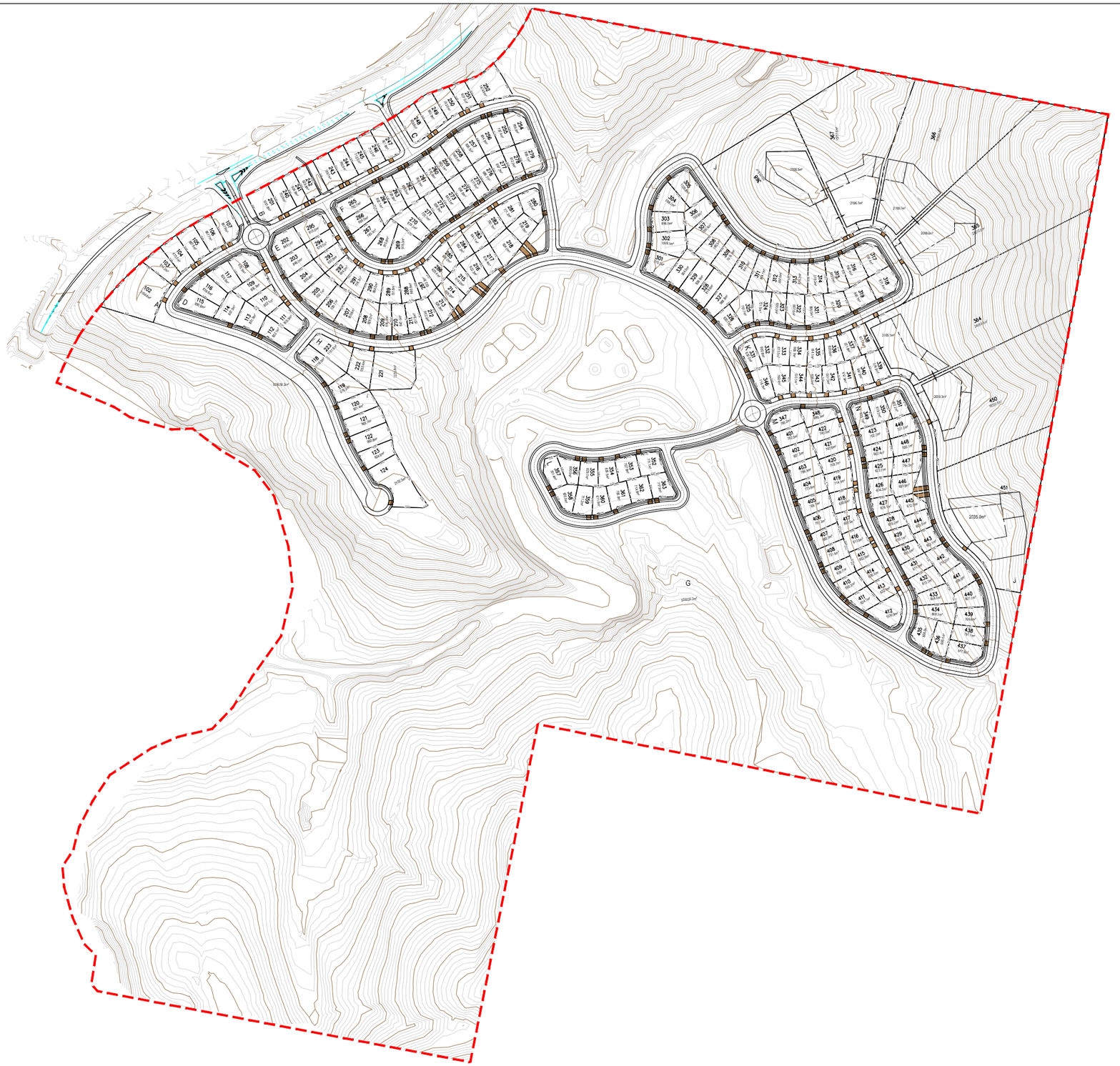


Figure 1. Locality Plan

Capital Ecology Project No: 2794
Drawn by: S. Reid
Date: 14 March 2019



LOT LAYOUT

PEET CLIENT	SPACELAB urban planning and design URBAN DESIGN AND PLANNING	spiire CIVIL	**JUMPING CREEK ESTATE DEVELOPMENT** LOT 5 DP 1199045	SCALE 1:2500 @ A1	DRAWING No L 400.0 REV E DATE 15.03.2019 PROJECT No J18-00393 DRAWN BY LX

Figure 3. Proposed Development Impact Area

Capital Ecology Project No: 2794
Drawn by: S. Reid
Date: 14 March 2019

Legend

- Study Area - Lot 5 DP1199045
- Subject Land (i.e. proposed Development)
- Proposed Lot Layout (12 March 2019)

capital ecology

2 Part 1 – Biodiversity Assessment (BAM Stage 1)

Part 1 of this BDAR provides an assessment of the biodiversity values of the subject land as set out in Stage 2 of the BAM.

2.1 Landscape Context

As detailed in Chapter 4 of the BAM, a range of landscape features must be identified where they occur on the subject land or within the assessment area surrounding the subject land. These features may contain/support biodiversity values that are important for the site context of the subject land, or for informing the likely habitat suitability of the subject land. Table 1 outlines the landscape features and overall landscape context of relevance to the subject land.

As stated in Section 1.1, the 'study area' for this BDAR includes the entirety of Lot 5 DP1199045 while the 'subject land' only relates to the area which will be impacted by the proposed development (refer to Figure 3).

Table 1. Landscape features.

Landscape Feature	Description	Figure Reference
IBRA bioregion	The subject land is located in the **South Eastern Highlands** IBRA bioregion.	-
IBRA subregion	The subject land is located in the **Monaro** IBRA subregion.	-
BioNet NSW landscapes (Mitchell landscapes)	As shown in Figure 1, the subject land contains the following Mitchell Landscapes: • **Canberra Plains** As per pg. 7 of OEH (2018), Canberra Plains has been used as the Mitchell Landscape for this BDAR as it covers the whole of the subject land and thus the entire impact area.	Figure 1
Rivers, streams and estuaries (Strahler[8] stream order)	Valley Creek (also known as Jumping Creek) is a 5th order stream where it enters the south-east of the study area (defined based on the NSW LPI Hydrology Map and as per Appendix 3 of the BAM). Valley Creek joins with a 5th order unnamed creek that enters from the north of the study area. From the point they join in approximately the centre of the study area, Valley Creek becomes a 6th order stream and subsequently flows south-west and joins the Queanbeyan River. A number of small, ephemeral drainage lines which flow into either Valley Creek or the unnamed creek are mapped within the study area. There is a small ephemeral dam within the subject land. Valley Creek, the unnamed creek, the ephemeral drainage lines, and the ephemeral dam had no aquatic habitat at the time of survey. They are known to remain dry throughout much of the year, with reliable flows only occurring following substantial rain events. Within the	Figure 3 Figure 4 Figure 6

[8] Strahler, AN (1952). *Hypsometric (area-altitude) analysis of erosional topology*. Geological Society of America Bulletin 63 (11): 1117–1142.

Landscape Feature	Description	Figure Reference
	study area they do not provide aquatic habitat of potential value to aquatic flora or fauna. In general, the water courses within the study area are highly modified and generally dominated by exotic fringing vegetation (e.g. Willow *Salix* sp., Blackberry *Rubus fruticosus*, Hawthorn *Crataegus monogyna*). There are sections where the fringing vegetation is in better condition and dominated by relatively intact native vegetation. These sections mainly occur along the western section of the study area which borders the Queanbeyan River. There is a moderately sized patch of relatively intact native vegetation along the western extent of Valley Creek and another along the northern section of the unnamed creek. No intact native fringing vegetation occurs within the subject land. Immediately beyond the study area the vegetation along both Valley Creek and the unnamed creed is intact, native vegetation.	
Wetlands (important wetlands)	The subject land does not contain any important wetlands as listed in the Directory of Important Wetlands in Australia (DIWA) or coastal wetlands protected under State Environmental Planning Policy No 14.	-
Connectivity	The entirety of the subject land would have historically supported woody vegetation communities. The land use history of the subject land (i.e. mining, quarrying and grazing/agriculture) has generally replaced the previous native/natural overstorey and groundstorey vegetation with either heavily cleared and disturbed land or with exotic species (e.g. Tree of Heaven *Ailanthus altissima,* Willow, Blackberry, Hawthorn, St John's Wort *Hypericum perforatum*, Paterson's Curse *Echium plantagineum*). As a result, there are only five remaining patches of remnant vegetation within the subject land. The exotic vegetation and small remnant patches of native within the subject land are likely to be of some habitat value to numerous native bird species but are unlikely to constitute or comprise part of a recognised biodiversity corridor or other notable habitat connectivity feature. In the surrounding study area there are larger stands of relatively intact native vegetation. These areas of intact native vegetation are mainly found along the Queanbeyan River corridor and the higher elevations of the study area. They are connected to wide expanses of intact native vegetation outside of the study area which extend far to the north and south (estimated to be approximately 7,500 ha in size). The intact vegetation of the Queanbeyan River corridor, Valley Creek corridor, and the woodland bordering the study area are more likely to constitute important fauna habitat and therefore are more likely be important for connectivity. These areas are not within the subject land and will not be impacted by the proposed development.	Figure 5 Figure 6
Areas of geological significance and soil hazard	The subject land does not contain/support any karst, caves, crevices, cliffs or other areas/features of geological significance. The study area has historically been used for mining and quarrying activities. Two former mine sites were found contain 'contaminants of	-

Landscape Feature	Description	Figure Reference
	potential concern'. Coffey Environments Australia (2015a[9], 2015b[10]) has developed a remediation action plan for these two former mine sites.	
Areas of outstanding biodiversity value	The subject land does not support or occur near any declared area of outstanding biodiversity value (AOBV).	-
Percent native vegetation cover (buffer area)	A 1,500 m buffer was applied to the subject land resulting in an overall buffer area of 1,149 ha. This buffer area contains only woody PCTs (i.e. woodland, dry sclerophyll forest). Accordingly, the following two categories of native vegetation were defined to identify the total area of native vegetation in the buffer. 1. Woody vegetation – The areas which have a woody PCT and retain remnant woody vegetation or woody regrowth. 2. Non-woody vegetation – The areas which have a woody PCT from which the woody vegetation has been cleared, yet at least a substantial proportionate cover (i.e. > 25%) of native groundstorey species remains (often referred to as derived or secondary grassland). Native vegetation cover was first identified and mapped via interpretation of the available aerial imagery (ACT Government and NSW LPI). The presence of remnant canopy trees, residential/ commercial development, cultivation patterns in paddocks, abnormally green and/or uniform groundstorey vegetation etc., were important factors considered during aerial interpretation. Field reconnaissance was then undertaken where possible to ground truth and refine the mapping. This field reconnaissance involved driving the publicly accessible roads within the buffer area and making observations across paddocks etc. from the roadside. As shown in Figure 5, large areas in the buffer area have been developed to the west and north-west of the subject land. As shown below, those areas which have not been developed have retained their remnant woody vegetation. 1. Woody vegetation cover – 967 ha (84%) of the buffer area was determined to support native woody vegetation cover. 2. Non-woody vegetation cover – 0 ha (0%) of the buffer area was determined to support native non-woody vegetation cover. ↓ Total native vegetation cover – the total area of native vegetation cover in the buffer area is therefore 967 ha (84%). This falls into the >70% cover class in the BAM Calculator.	Figure 5

[9] Coffey Environments Australia (2015a). *Jumping Creek Development – Site Environmental Management Plan. Mine Site Area 3.* Prepared for CIC Australia Pty Ltd, 2 November 2015.
[10] Coffey Environments Australia (2015b). *Jumping Creek Development – Site Environmental Management Plan. Mine Site Area 4.* Prepared for CIC Australia Pty Ltd, 2 November 2015.

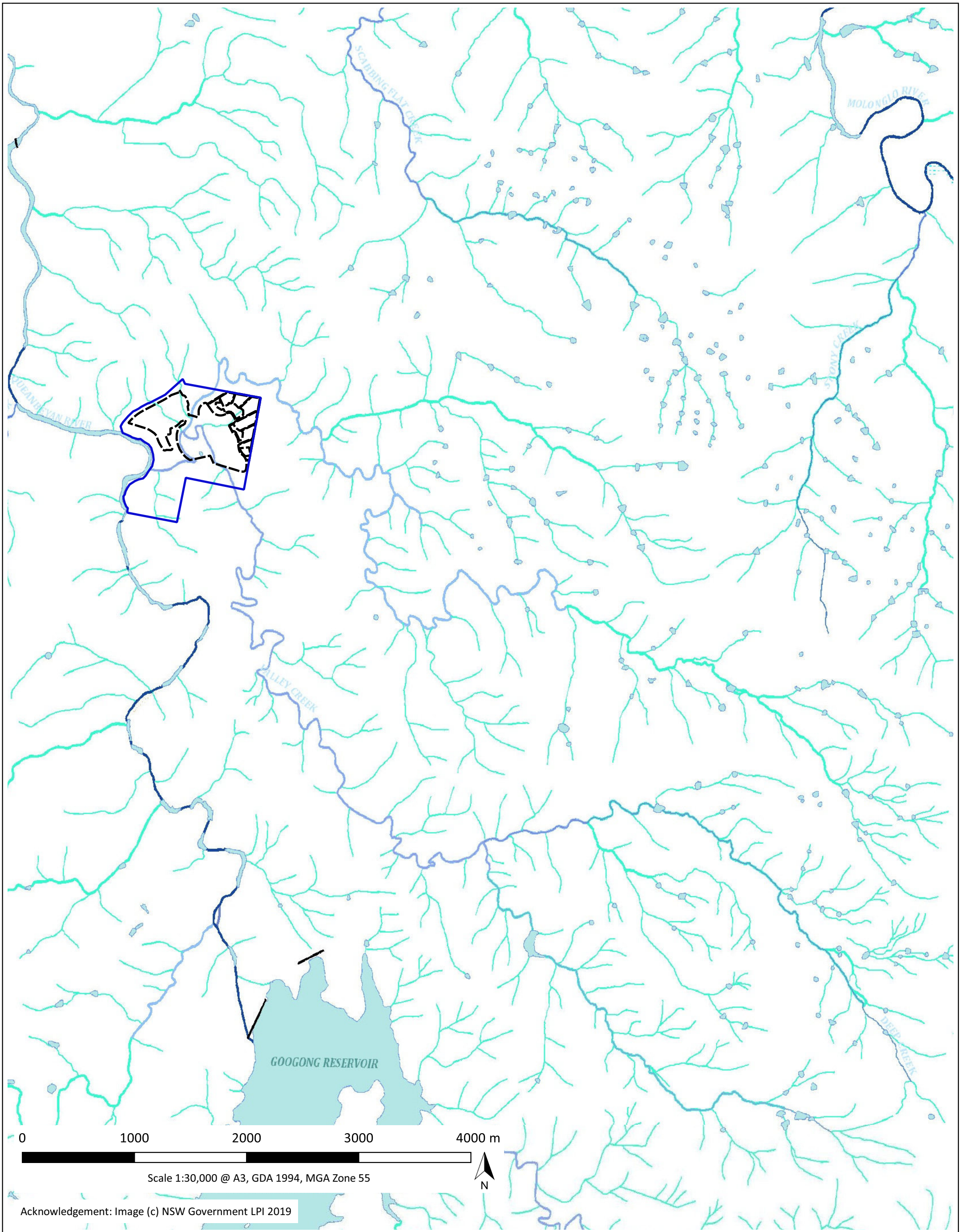


Figure 4. Hydrology

Legend

- Study Area - Lot 5 DP1199045
- Subject Land (i.e. proposed development)

capital ecology

Capital Ecology Project No: 2794
Drawn by: S. Reid
Date: 14 March 2019

0 250 500 750 1000 m

Scale 1:15,000 @ A3, GDA 1994, MGA Zone 55

N

Figure 5. Site Map

Legend

- Study Area - Lot 5 DP1199045
- Subject Land (i.e. proposed development)
- 1500 m buffer to Subject Land
- 1500 m buffer - woody native vegetation

Capital Ecology Project No: 2794
Drawn by: S. Reid
Date: 14 March 2019

capital ecology

2.2 Native Vegetation, Threatened Ecological Communities and Vegetation Integrity

2.2.1 Native vegetation extent

As per the BC Act, native vegetation is defined according to Part 5A of the *Local Land Services Act 2013* (LLS Act), which states:

> *"(1) For the purposes of this Part, native vegetation means any of the following types of plants native to New South Wales:*
>
> *(a) trees (including any sapling or shrub or any scrub),*
>
> *(b) understorey plants,*
>
> *(c) groundcover (being any type of herbaceous vegetation),*
>
> *(d) plants occurring in a wetland.*
>
> *(2) A plant is native to New South Wales if it was established in New South Wales before European settlement. The regulations may authorise conclusive presumptions to be made of the species of plants native to New South Wales by adopting any relevant classification in an official database of plants that is publicly accessible."*

As per this definition, planted vegetation which comprises plant species native to NSW, regardless of whether or not the species are indigenous to the specific region and/or PCT of the subject land, is classified as native vegetation.

The Commonwealth Government[11,12], ACT Government[13], and previous NSW Government[14] assessment guidelines for the temperate grassland and woodland PCTs of the NSW/ACT Southern Tablelands region each declare vegetation as native dominant if 50% or more of the perennial groundlayer is comprised of native species. However, no such threshold is defined by the BAM, and the Office of Environment and Heritage (OEH) have advised (Tobi Edmonds pers. comm., September 2018) that the criteria for use in determining native vs. exotic dominance must be more stringent than the previously applied 50/50 rule. It is understood that this is due to the potential for seasonal variation and/or assessor disparity to substantially alter the BAM mapping result. For example, a patch of vegetation that is classified as 55% native in one season may be classified as 45% native in another.

[11] Commonwealth of Australia (2006). *Policy Statement 3.5: White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands*. Commonwealth Department of Environment and Heritage.
[12] Commonwealth of Australia (2016). Approved conservation advice for the Natural Temperate Grassland of the South Eastern Highlands (NTG–SEH) ecological community.
[13] ACT Government (2010). *Survey guidelines for determining lowland vegetation classification and condition in the ACT*. Environment and Sustainable Development Directorate – Conservation Planning and Research.
[14] NSW Government (2014). *BioBanking Assessment Methodology 2014*. NSW Government Office of Environment and Heritage.

With regard to the above, for the purposes of this BDAR (and the supporting BAM assessment):

1. 'Native vegetation' is defined as any plant, naturally occurring or planted, which is native to NSW.
2. Exotic vegetation is defined as any plant which is not native to NSW.
3. A polygon of vegetation is 'native vegetation' if:
    a. 25% or more of the perennial groundlayer comprises species native to NSW; and/or
    b. species native to NSW are present in one or more of the other strata.

2.2.2 Vegetation survey and mapping methods

The vegetation throughout the entirety of the study area was surveyed and mapped in accordance with the BAM. Vegetation survey dates and survey effort are shown in Table 2. The methodology involved the following.

- Mapping of the on-ground boundaries of the Plant Community Types (PCTs).
- Stratification of each PCT into vegetation zones reflecting the broad condition state of vegetation.
- The completion of a series of surveys to measure the composition, structure, and function attributes of the vegetation.

These steps are described in more detail below. The full BAM and supplementary resources are available online via the OEH website https://www.environment.nsw.gov.au/biodiversity/assessmentmethod.htm.

Table 2. Vegetation survey dates and survey effort.

Task	Method	Date	Personnel	Survey effort
PCT and Zone mapping	Random meander	31/07/2018 02/11/2018	1 person 2 people	8 hours 16 hours
Vegetation assessment	BAM plot	16/11/2018 26/11/2018	4 people 4 people	32 hours 32 hours

2.2.2.1 Plant Community Type (PCT) mapping

The on-ground boundaries of each of the Plant Community Type (PCT) present within the study area were mapped 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) https://www.environment.nsw.gov.au/research/Vegetationinformationsystem.htm.

The PCTs were identified, and their boundaries 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).

2.2.2.2 Vegetation zone definition and mapping

The mapped PCTs were further divided into vegetation zones based on the structure, floristic composition and overall condition ('condition state') of the vegetation. The vegetation zones were mapped in the field and then digitised using GIS, which provided accurate calculations of the total area of each vegetation zone within the study area.

2.2.2.3 Survey Plots/Transects

A series of a BAM plots (i.e. vegetation assessment survey plot/transect sets) were completed to adequately sample each vegetation zone. As illustrated in Diagram 8 from NSW Government (2018[15]), each BAM Plot involved:

a. one 20 x 20 m (400 m^2) plot, used to assess the composition and structure attributes;

b. one 20 x 50 m plot (1,000 m^2) plot, used to assess the function attributes; and

c. five 1 m^2 sub-plots, used to assess average little cover (and other optional groundcover components) for the plot.

All BAM plot locations were selected randomly within the vegetation zone, by marking on a map and walking to the location. As stated in Section 1.1, the 'study area' for this BDAR includes the entirety of Lot 5 DP1199045 while the 'subject land' only relates to the area which will be impacted by the proposed development (refer to Figure 3). BAM plot locations were spread throughout the entire study area (refer to Figure 6). The information collected during this process was subsequently used to determine the condition of the vegetation present within the subject land. This approach resulted in the assessment of a greater number of BAM plots than if the subject land were considered in isolation, the outcome of which is a more accurate description of the condition of the vegetation within the subject land and surrounding area.

The number of BAM plots completed within each vegetation zone of the study area was determined as per the minimum required plot numbers specified in Table 4 of the BAM. With respect to PCT1334, additional plots were completed in order to adequately capture the vegetation characteristics across the PCT. As shown in Figure 6, a total of twenty-three plots were completed across six vegetation zones.

[15] NSW Government (2018). *Biodiversity Assessment Method Operational Manual – Stage 1*. State of New South Wales and Office of Environment and Heritage.

As stated in Section 5.1.1.5 of the BAM:

> '*areas that are not native vegetation (i.e. land not included in native vegetation extent) do not require further assessment in the BAM except where:*
>
> *(a) they are proposed for restoration as part of an offset (refer to Stage 3)*
>
> *(b) they are assessed as habitat for threatened species according to Section 6.4.*

However, plots were completed in zones which did not meet the definition of BC Act 'native vegetation' (i.e. PCT1093 Zone 3 and PCT1334 Zone 3, Figure 6). Surveying all zones ensured that the vegetation composition (including an accurate determination of BC Act native vegetation presence/absence) and potential threatened species habitat were accurately assessed across all of the vegetation condition types present within, and adjacent to, the subject land.

It is important to highlight that only those zones which occur within the subject land and which were classified as BC Act native vegetation and/or threatened species habitat were subsequently used to determine the impact of the proposed development (refer to Section 2.2.4.4 and Section 3.2).

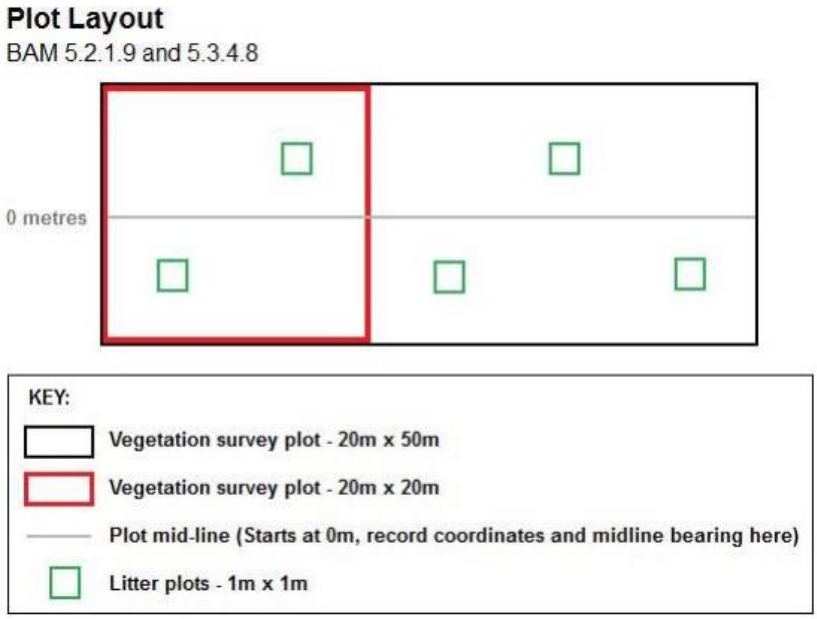


Figure 8 Plot layout to be used for site assessment

2.2.3 BAM targeted survey methods

A number of threatened flora and fauna species were identified by the BAM as potentially occurring on the subject land (refer Section 2.3.3 and Section 2.3.4). Some of these species were excluded from further consideration based on factors such as geographical constraints or the presence/absence of habitat features. Survey dates and survey effort for the remaining species considered to have the potential to occur on the subject land are shown in Table 3. Weather conditions for survey dates are shown in Table 4. In total, 144-person hours were spent on site during the development of this BDAR, plus an additional 60 hours of ANABAT recordings.

Table 3. Flora and fauna survey dates and survey effort.

Task	Method	Date	Personnel	Survey effort
Threatened flora and threatened bird survey	Random meander through likely habitat	31/07/2018 02/11/2018 05/11/2018	1 person 2 people 4 people	8 hours 16 hours 32 hours
	Opportunistic observations	10/09/2018 16/11/2018 26/11/2018	3 people 4 people 4 people	24 hours 32 hours 32 hours
Pink-tailed Worm-lizard survey	Rock turning survey	10/09/2018	3 people	24 hours
Threatened bat survey	ANABAT	16/11/2018 17/11/2018 18/11/2018	Two ANABAT locations per night.	60 hours of recordings

Table 4. Survey weather conditions.

Date	Temperature Min-Max	Wind @ 3pm	Cloud (8th)	Rain
31/07/2018	3.6 – 12.1°C	13 km/h	8	0.4 mm
10/09/2018	0.9 – 19.7°C	15 km/h	0	0 mm
02/11/2018	17.4 – 33.4°C	19 km/h	8	0 mm
05/11/2018	11.8 – 27.5°C	37 km/h	8	0 mm
16/11/2018	11.4 – 23.7°C	9 km/h	0	0.2 mm
17/11/2018	11.0 – 21.9°C	24 km/h	6	0 mm
18/11/2018	10.7 – 22.2°C	24 km/h	7	0 mm
26/11/2018	8.0 – 23.8°C	7 km/h	8	1.0 mm

2.2.3.1 Threatened flora and bird survey

Based on the location and the ecological communities present, the study area was assessed as having the potential to support EPBC Act and/or BC Act listed threatened flora species and threatened bird species.

Some threatened flora species and threatened bird species are identified by the BAM as a species credit species (refer Section 2.3.4), which is a species for which presence/absence and habitat value cannot be reliably predicted by location, vegetation type and vegetation condition. Accordingly, targeted surveys are required to determine the species credit value of the subject land for these species. Therefore, random meander searches were conducted throughout the subject land and study area, targeting significant species. Threatened flora surveys were done in addition to the vegetation survey and mapping (refer Section 2.2.2).

The targeted searches involved three full days of survey by one to four ecologists, totalling 56 hours of effective survey effort (Table 3). Surveys were timed to coincide with the peak flowering period for most of the significant flora species with the potential to occur in the study area and with the nesting period for most of the significant bird species with the potential to occur in the study area.

A thorough inventory of the flora and fauna species occurring at a study area on the Southern Tablelands cannot be compiled from a survey undertaken at three points during spring. For example, many groundstorey flora species, notably the orchids, lilies and peas, are only readily identifiable during their short and seasonally variable flowering period. As such, an inventory of all species identified within the study area was commenced during the preliminary field inspection (31 July 2018) and supplemented across all of the subsequent surveys undertaken until the final field inspection (26 November 2018). These inventories are presented in Appendix B (flora) and Appendix C (fauna). Maintaining an inventory in this manner ensures that the maximum possible diversity of species is recorded, and if relevant, any significant species are flagged. If detected, all significant species identified are recorded via a GPS waypoint and, if possible, the population size counted or estimated.

2.2.3.2 Pink-tailed Worm-lizard survey

A targeted survey was completed on Monday 10 September 2018, a sunny day with minimum temperature of 0.9 °C and maximum of 19.7 °C (Bureau of Meteorology records for nearest weather station, Canberra Airport). As search success appears to be greatest following substantial rain, the survey was timed to occur following the 24.6 mm of rain received across the locality on Friday 7 September 2018. These conditions were considered optimal for Pink-tailed Worm-lizard survey. Approximately 24 person-hours were spent during the survey (three ecologists for approximately eight hours).

Each patch of potential Pink-tailed Worm-lizard habitat across the study area, identified by the presence of loose surface rock, were surveyed for Pink-tailed Worm-lizard individuals. The survey involved the following.

- Searches for Pink-tailed Worm-lizard individuals or sloughed skins by carefully turning rocks over and then placing them back into position.
- Turning a minimum of 500 rocks per patch (considered adequate for confirming occurrence at large sites based on averages for detection presented in Jones 1999[16]), or until a Pink-tailed Worm-lizard was found and thus presence in the patch confirmed. Where it was not possible to turn 500 rocks because of a shortage of surface rock, all possible rocks were turned.

If discovered, each Pink-tailed Worm-lizard is classified as either an adult (≥12 cm total length) or juvenile (≤12 cm total length), and the position recorded via a handheld GPS.

The above survey methodology is consistent with the Commonwealth Survey Guidelines[17].

2.2.3.3 ANABAT threatened bat surveys

Two Anabat® detectors were deployed over three nights (16-18 November 2018), the locations of which are illustrated in Figure 9. Locations were chosen to survey across a variety of the habitat types which are present within the study area. The weather conditions during the survey period are detailed in Table

[16] Jones, S.R. (1999). *Conservation biology of the pink-tailed worm lizard (Aprasia parapulchella)*. PhD thesis Applied Ecology research group, University of Canberra.
[17] Department of Sustainability Environment, Water, Population and Communities (2011). *Survey guidelines for Australia's threatened reptiles.* Commonwealth of Australia, Canberra.

4. 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.

2.2.4 Vegetation survey and mapping results

2.2.4.1 Plant Community Type (PCT) mapping

Before European settlement the whole of the study area would have been characterised by woody PCTs. These woody PCTs were likely to have included open grassy woodland extending from the riparian corridors to the flatter, more gently sloping foothills (PCT1334), merging with dry sclerophyll forest on the higher elevated areas (PCT1093).

The whole of the subject land and the majority of the study area have been utilised over an extended period for various purposes, including mining, quarrying and grazing/agriculture. As a result, much of the study area has been cleared and the majority of the vegetation which remains is highly modified and dominated by exotic species such as Tree of Heaven, Willow, Blackberry, Hawthorn, St John's Wort, and Paterson's Curse (Figure 6).

There are some stands of relatively intact native vegetation within the study area (Figure 6). These areas occur along sections of the riparian corridors, the higher elevated portions of the study area, and the south-eastern boundary of the study area. Within the subject land there are five patches of remnant vegetation.

The study area supports two PCTs, as shown in Figure 6 and Table 5.

Table 5. PCTs recorded on the subject land.

PCT	PCT name	PCT description	Occurrence on study area	TEC status Commonwealth / NSW	PCT % cleared
1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	This community occurs on ridges and slopes between 550 m and 1150 m on the Southern and Central Tablelands. In its climax form this community would have been characterised by a low open forest or woodland with a canopy dominated by Red Stringybark, Brittle Gum and Inland Scribbly Gum and an understorey of sclerophyll shrubs with a sparse groundlayer.	This PCT was mapped across the higher elevated parts of the study area.	Not listed	61%

PCT	PCT name	PCT description	Occurrence on study area	TEC status Commonwealth / NSW	PCT % cleared
1334	Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion	This PCT occurs on valley flats, midslopes, and occasionally on crests. It is found in the Murrumbidgee River valley south of Royalla, the upper Shoalhaven River valley south of Bungonia, east of Queanbeyan, and south of Bungendore. It is characterised by an open woodland with a grassy groundlayer and sparse shrubstorey and midstorey. Dominant overstorey species include Yellow Box and Apple Box.	This PCT was mapped across the flatter low-lying parts of the study area and down into the river and creek corridors.	Critically Endangered (Commonwealth) and Endangered (NSW) when occurring in a condition consistent with the listing criteria of the TEC.	92%

2.2.4.2 Vegetation zones

As illustrated in Figure 6, PCT1093 and PCT1334 both contain three vegetation zones. PCT1093 Zones 1 and 2 contain a moderately diverse native groundstorey and are distinguished by the presence (Zone 1) or absence (Zone 2) of an overstorey. PCT1334 Zones 1 and 2 possess a native overstorey and are distinguished by the presence of a moderately diverse native groundstorey (Zone 1) or a low diversity exotic groundstorey (Zone 2). Both PCT1093 Zone 3 and PCT1334 Zone 3 lack all native strata and are instead dominated by a diversity of exotic trees, shrubs, forbs, and grasses.

As shown in Table 6 to Table 11, only a subset of the vegetation zones of each PCT meet the definition of BC Act 'native vegetation' (i.e. PCT1093 Zones 1 and 2, PCT1334 Zones 1 and 2, Figure 6 and Figure 7). As described in Section 2.2.2 and Section 2.2.4.4, these zones are assessed to determine vegetation integrity scores and the impact associated with the proposed development. PCT1093 Zone 3 and PCT1334 Zone 3 are clearly dominated by exotic grasses and forbs (i.e. > 75% perennial exotic) and do not contain a sufficient cover of native trees and/or shrubs. As per Chapter 5 of the BAM these zones do not require assessment to determine a vegetation integrity score unless they are determined to be threatened species habitat. As detailed in Table 17 and Section 2.3.4.2, PCT1093 Zone 3 and PCT1334 Zone 3 are not identified as habitat for threatened species and therefore do not require assessment to determine a vegetation integrity score.

Table 6. PCT1093 Zone 1 results summary.

	PCT1093 Zone 1
Description	Remnant dry sclerophyll forest with all strata intact. Vegetation is in good condition, characterised by a native dominant groundstorey with a moderate to high diversity of native shrubs and forbs. There is some evidence of historic fire damage. This zone is mainly restricted to the higher elevations along the northern and eastern boundaries of the study area.
Area – study area	9.84 ha.
Area – subject land	1.45 ha.
BAM plots assessed	3
Overstorey Species	Co-dominant = *E. macrorhynca*, *E. polyanthemos* and *E. rossii.*
Overstorey Cover	20% - 35%.
Overstorey Regeneration	Yes.
Perennial Groundlayer	79% - 100% native.
Significant Weeds	St John's Wort *Hypericum perforatum,* Briar rose *Rosa rubiginosa*, and Tree of Heaven *Ailanthus altissima*.
EPBC Act and/or BC Act listed TEC	No.
BC Act Native Vegetation	Yes.

Table 7. PCT1093 Zone 2 results summary.

	PCT1093 Zone 2
Description	The native overstorey has been historically cleared across the entire zone. The woody vegetation which remains is largely Burgan *Kunzea ericoides* regeneration, which can occur at high densities (Projected Foliage Cover of up to 85%). The groundstorey is sparse and dominated by native grasses and a moderate to high diversity of native forbs. There is some evidence of historic fire damage.
Area – study area	7.12 ha.
Area – subject land	2.71 ha.
BAM plots assessed	3
Overstorey Species	None.
Overstorey Cover	0%.
Overstorey Regeneration	No.
Perennial Groundlayer	95% - 100% native.
Significant Weeds	St John's Wort, Serrated Tussock, and Tree of Heaven.
EPBC Act and/or BC Act listed TEC	No.
BC Act Native Vegetation	Yes.

Table 8. PCT1093 Zone 3 results summary.

	PCT1093 Zone 3
Description	Highly modified vegetation dominated by a diversity of exotic trees, shrubs and forbs. Human activities have had a significant impact. The native overstorey and midstorey have been cleared and there is a high diversity and cover of significant weeds. The groundstorey is exotic dominant.
Area – study area	4.93 ha.
Area – subject land	3.25 ha.
BAM plots assessed	2
Overstorey Species	None.
Overstorey Cover	0%.
Overstorey Regeneration	None.
Perennial Groundlayer	2% - 33% native.
Significant Weeds	Hawthorn *Crataegus monogyna*, St John's Wort, Serrated Tussock, Briar Rose, and Blackberry *Rubus fruticosus*.
EPBC Act and/or BC Act listed TEC	No.
BC Act Native Vegetation	No.

Table 9. PCT1334 Zone 1 results summary.

	PCT1334 Zone 1
Description	Remnant woodland with all strata intact. Vegetation is in good condition, characterised by a native dominant groundstorey with a moderate to high diversity of native shrubs and forbs. This zone is mainly restricted to the river/creek corridors and the southern boundary of the study area.
Area – study area	13.22 ha.
Area – subject land	0.77 ha.
BAM plots assessed	5
Overstorey Species	Co-dominant = *E. melliodora* and *E. bridgesiana.*
Overstorey Cover	15% - 45%.
Overstorey Regeneration	Yes.
Perennial Groundlayer	77% - 99% native.
Significant Weeds	Hawthorn, St John's Wort, Serrated Tussock, Briar rose, Blackberry, and Orange Firethorn *Pyracantha angustifolia*.
EPBC Act and/or BC Act listed TEC	Yes (EPBC Act and BC Act).
BC Act Native Vegetation	Yes.

Table 10. PCT1334 Zone 2 results summary.

	PCT1334 Zone 2
Description	Woodland characterised by a native overstorey with a partially cleared midstorey and shrubstorey. The low diversity groundstorey is dominated by exotic grasses and forbs. Human activities have had an impact on this zone and there is evidence of historic clearing, grazing damage, and the presence of a moderate cover of significant weeds.
Area – study area	2.45 ha.
Area – subject land	1.97 ha.
BAM plots assessed	2
Overstorey Species	Co-dominant = *E. melliodora* and *E. bridgesiana*.
Overstorey Cover	15% - 55%.
Overstorey Regeneration	Yes.
Perennial Groundlayer	6% - 50% native.
Significant Weeds	St John's Wort, Serrated Tussock, Briar rose, and Blackberry.
EPBC Act and/or BC Act listed TEC	Yes (BC Act).
BC Act Native Vegetation	Yes.

Table 11. PCT1334 Zone 3 results summary.

	PCT1334 Zone 3
Description	Highly modified vegetation dominated by a diversity of exotic trees, shrubs and forbs. Human activities have had a significant impact. The native overstorey and midstorey have been cleared, and there is a high diversity and cover of significant weeds. The groundstorey is exotic dominant.
Area – study area	55.94 ha.
Area – subject land	28.00 ha.
BAM plots assessed	8
Overstorey Species	None.
Overstorey Cover	0%.
Overstorey Regeneration	None.
Perennial Groundlayer	0% - 27% native.
Significant Weeds	Hawthorn, St John's Wort, Serrated Tussock, Briar Rose, Blackberry, Tree of Heaven, Black Poplar *Populus nigra*, and Orange Firethorn.
EPBC Act and/or BC Act listed TEC	No.
BC Act Native Vegetation	No.

2.2.4.3 Patch size

As defined in the BAM, patch size is -

> *"an area of intact native vegetation that:*
>
> *a) occurs on the development site or biodiversity stewardship site, and*
>
> *b) includes native vegetation that has a gap of less than 100m from the next area of moderate to good condition native vegetation (or ≤30m for non-woody ecosystems).*
>
> *Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site."*

Where intact vegetation is defined as –

> *"vegetation where all tree, shrub, grass and/or forb structural growth form groups expected for a plant community type are present"*

With respect to the above, the native vegetation on the subject land which meets the definition of intact vegetation is:

- PCT1093 Zone 1; and
- PCT1334 Zone 1.

The intact native vegetation outside of the subject land extends far to the north and south. When vegetation from adjoining land is considered the patch size for each of the above vegetation zones is approximately 7,500 ha. This falls within the >100 ha class as defined by the BAM.

The remaining four vegetation zones (i.e. PCT1093 Zones 2 and 3, PCT1334 Zones 2 and 3) lack some or all of the structural growth forms expected of their respective PCTs.

2.2.4.4 Vegetation integrity scores

As stated in Section 1.1, the 'study area' for this BDAR includes the entirety of Lot 5 DP1199045 while the 'subject land' only relates to the area which will be impacted by the proposed development (refer to Figures 3 and 6). Zones which meet the definition of BC Act 'native vegetation' and which occur on the subject land are used to determine vegetation integrity scores and the impact associated with the proposed development (refer to Figure 7). Zones which do not meet the definition of BC Act native vegetation do not require further assessment in the BAM except where:

(a) they are proposed for restoration as part of an offset; or

(b) they are assessed as habitat for threatened species.

PCT1093 Zones 1 and 2 and PCT1334 Zones 1 and 2 meet the definition of BC Act 'native vegetation'. PCT1093 Zone 3 and PCT1334 Zone 3 are clearly dominated by exotic grasses and forbs and not meet the definition of BC Act native vegetation, and as detailed in Table 17 and Section 2.3.4.2, these zones are not identified as habitat for threatened species.

Table 12 presents the results of the BAM plot assessments and details the composition, structure, function, and resulting vegetation integrity score for PCT1093 Zones 1 and 2 and PCT1334 Zones 1 and 2.

Table 12. Vegetation integrity scores.

	PCT1093 Zone 1	PCT1093 Zone 2	PCT1334 Zone 1	PCT1334 Zone 2
PCT	1093	1093	1334	1334
Zone (condition class)	1	2	1	2
Description	- Native groundstorey - Canopy - Regeneration - Moderate diversity	- Native groundstorey - Native Scrub - Low diversity	- Native groundstorey - Canopy - Regeneration - Moderate diversity	- Exotic groundstorey - Canopy - Regeneration - Low diversity
Patch size	7,500 ha	0	7,500 ha	0
Area (ha) within the subject land	1.45	2.71	0.77	1.97
BAM plots assessed within the study area	3	3	5	2
Composition condition score	46.3	11.5	48.1	16.8
Structure condition score	48.4	19.5	37.3	37.0
Function condition score	51.7	4.1	66.6	69.5
Current vegetation integrity score	48.8	9.8	49.3	35.1

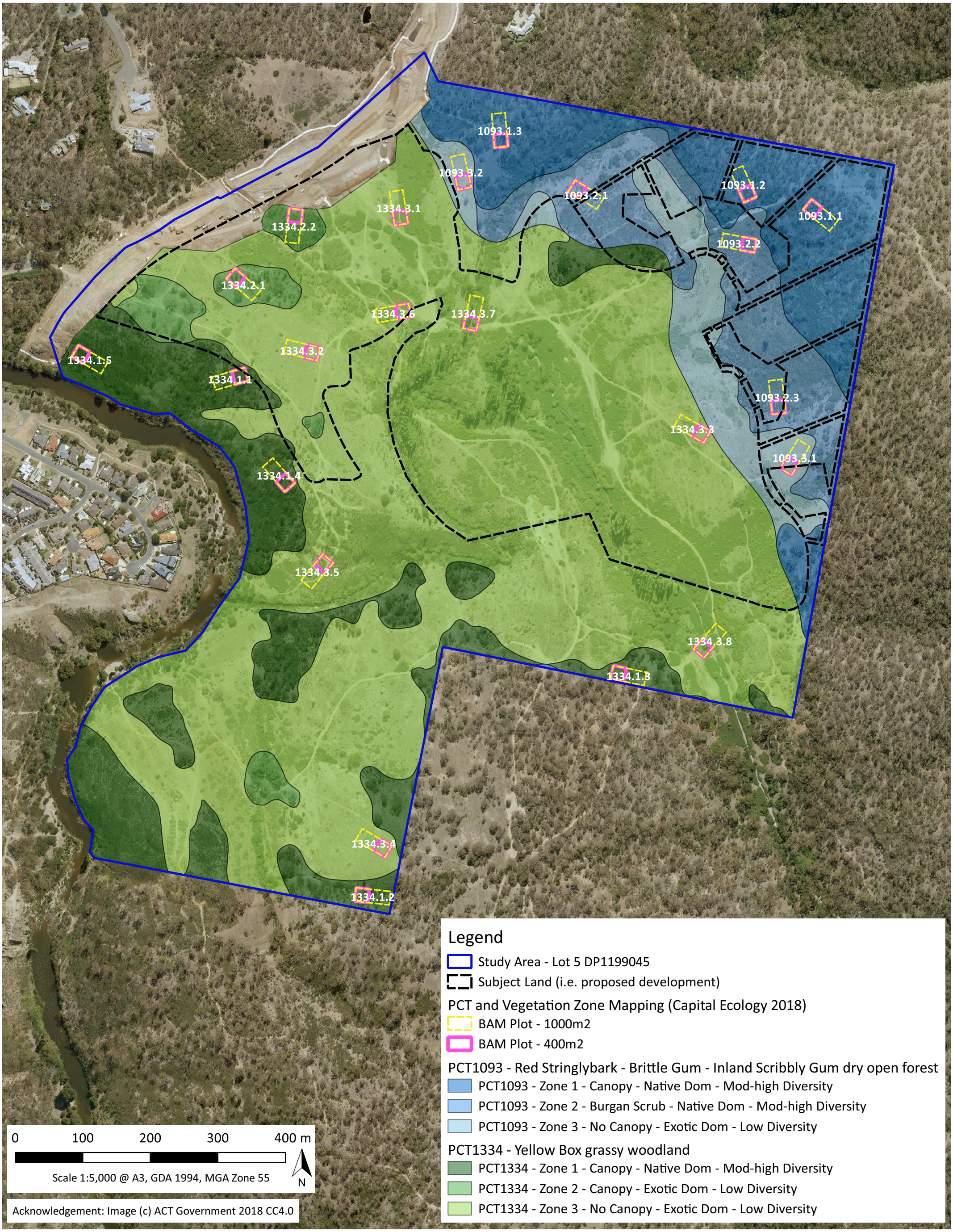


Figure 6. BAM Vegetation Mapping and Survey

Capital Ecology Project No: 2794
Drawn by: S. Reid
Date: 14 March 2019

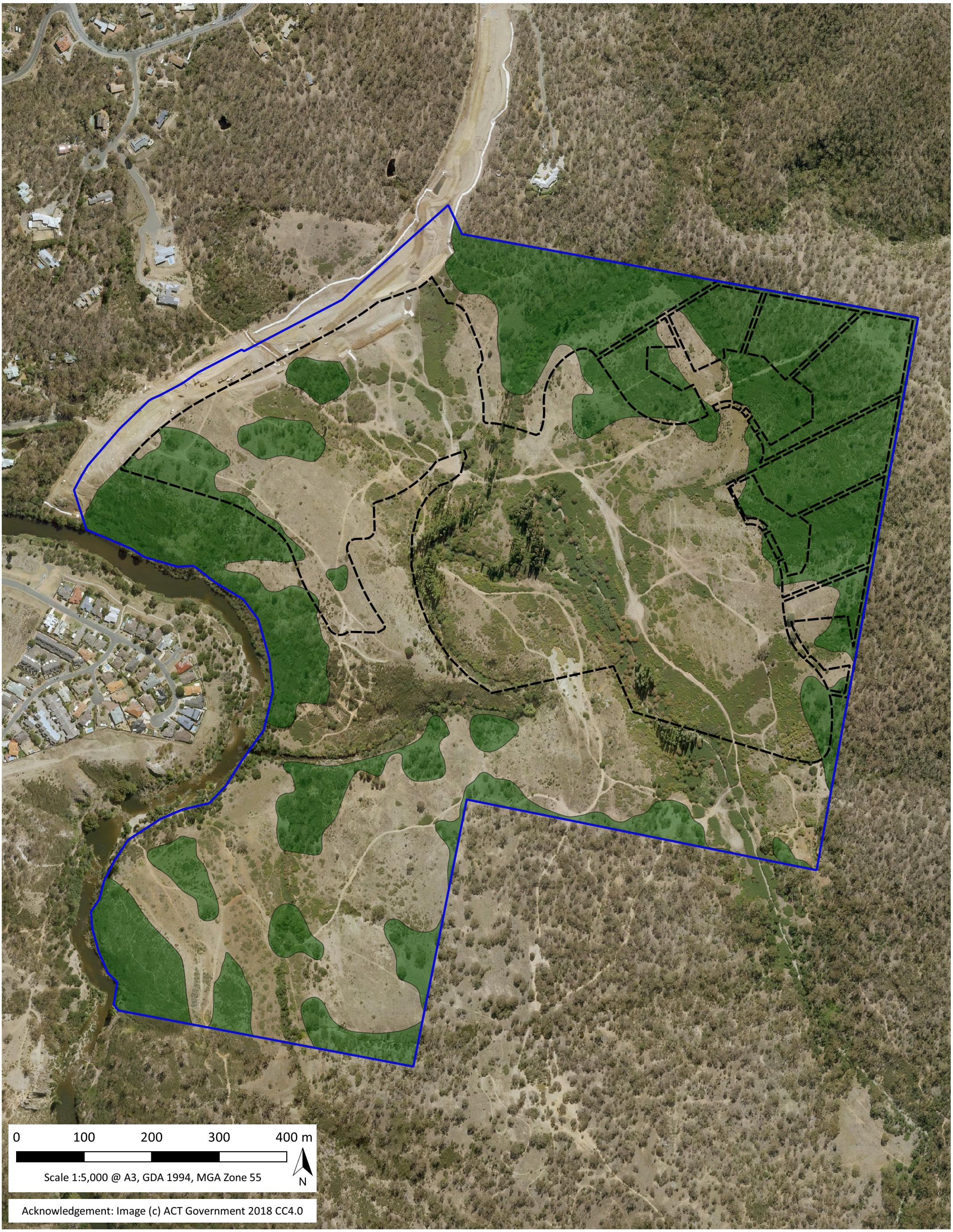


Figure 7. BC Act Native Vegetation

Legend

- Study Area - Lot 5 DP1199045
- Subject Land (i.e. proposed development)
- BC Act Native Vegetation

capital ecology

Capital Ecology Project No: 2794
Drawn by: S. Reid
Date: 14 March 2019

2.2.5 Threatened Ecological Communities

2.2.5.1 *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)

Two EPBC Act listed threatened ecological communities have the potential to occur in the locality, both listed as critically endangered under the EPBC Act: 'Natural Temperate Grassland of the South Eastern Highlands' (Natural Temperate Grassland), and 'White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland' (Box-Gum Woodland). Based on the recorded vegetation types, plant species, landscape position, and the vegetation on adjoining and nearby properties, only Box-Gum Woodland is considered to have the potential to occur on the subject land.

Description – The White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC is characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs (where shrub cover comprises less than 30% cover), and a dominance or prior dominance of White Box and/or Yellow Box and/or Blakely's Red Gum trees. This TEC occurs along the western slopes and tablelands of the Great Dividing Range from southern Queensland through New South Wales and the Australian Capital Territory to Victoria.

Presence in the subject land – Confirmed – The entire portion of the subject land mapped as PCT1334 would have once supported the climax community of this TEC.

↓

Assessments of structure and floristic composition were undertaken in each of the three condition categories (Vegetation Zones) of PCT1334 present on the subject land. The purpose of these assessments was to determine whether the patches of each Vegetation Zone support characteristics sufficient to meet the listing criteria for the EPBC Act listed TEC. The assessment process 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[18]). The results of this assessment are provided in Table 13. As detailed in Table 13, the area mapped as PCT1334 Zone 1 meets the criteria for the EPBC Act listed TEC. PCT1334 Zones 2 and 3 do not meet the listing criteria.

[18] Commonwealth of Australia (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.

Table 13. 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		
		PCT1334 Zone 1	**PCT1334 Zone 2**	**PCT1334 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 is co-dominant throughout this zone.	Yes Yellow Box is co-dominant throughout this zone.	Yes A few scattered Yellow Box remain in this zone. This species is expected to have been historically dominant or co-dominant throughout this zone.
2.	*Does the patch have a predominantly native understorey?*	Yes The understorey was recorded as ranging from 77% to 99% native species cover.	No The understorey was recorded as ranging from 6% to 50% native species cover, with an average of 28%.	No The understorey was recorded as ranging from 0% to 27% native species cover.
3.	*Is the patch 0.1 ha (1000 m^2) or greater in size with 12 or more native understorey species present (excluding grasses)? There must be at least one important species.*	Yes Both patches are greater than 0.1 ha in size. Within PCT1334 Zone 1, 8 to 16 native non-grass understorey species were recorded across the three plots, with an average of 13 native non-grass understorey species per plot.	N/A Refer Criterion 2 results.	No Refer Criterion 2 results.
	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?	Yes The patches of Zone 1 in the north-east of the subject land is 0.68 ha. However, the patch in the west extends well outside of the subject land, is 4.9 ha in size, and contains regeneration of the overstorey.	N/A Refer Criterion 2 results.	No Refer Criterion 2 results.
	Does the patch meet the criteria for the listed TEC?	**Yes**	**No**	**No**

2.2.5.2 *Biodiversity Conservation Act 2016* (NSW)

Two BC Act listed ecological communities have the potential to occur in the subject land:

- 'White Box – Yellow Box – Blakely's Red Gum Woodland' (BC 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'.

BC Act Box-Gum Woodland

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

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*) (NSW Scientific Committee 2002, gazetted 15 March 2002[19]).

> *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[20]), which draws its information from the final determination. As described in the final determination and the associated key, the definition for the BC 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 BC Act listed TEC.

The entire portion of the subject land mapped as PCT1334 would have once supported the climax community of this TEC. PCT1334 Zone 1 is characterised by a native overstorey with moderately diverse

[19] NSW Scientific Committee (2002). *Final Determination for the TSC Act endangered listed ecological community White Box – Yellow Box – Blakely's Red Gum Woodland*. Gazetted 15 March 2002.
[20] NSW Government (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.

native understorey and PCT1334 Zone 2 is characterised by a native overstorey with a low diversity exotic understorey. Both PCT1334 Zones 1 and 2 support vegetation which meets the criteria for this TEC under the BC Act. PCT1334 Zone 3 lacks a native overstorey and has a groundstorey that is highly modified and dominated by perennial exotic grasses and herbaceous weeds. As such, PCT1334 Zone 3 does not support vegetation which meets the criteria for this TEC under the BC Act.

BC 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 subject land.

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[21]).

> *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).

[21] NSW Scientific Committee (2011). *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*. Gazetted 10 June 2011.

Based on the recorded PCTs, plant species, landscape position, and the vegetation on adjoining and nearby properties, the subject land does not support vegetation which meets the criteria for this community under the BC Act.

Conclusion

The subject land supports the BC Act listed ecological community *White Box Yellow Box Blakely's Red Gum Woodland* in those areas mapped as PCT 1334 Zones 1 and 2. No part of the subject land supports the BC Act listed ecological community *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland*.

2.2.6 High threat weeds

Table 14 lists the eight high threat weeds which occur in the subject land and study area. Many of them occur at high densities and are widespread.

Table 14. High threat weeds.

Species Name	Common Name	Status
Trees		
Ailanthus altissima	Tree of Heaven	LM
Populus nigra	Black Popular	-
Salix sp.	Willow	LM/AP
Shrubs		
Pyracantha angustifolia	Orange Firethorn	-
Rosa rubiginosa	Briar Rose	-
Rubus fruticosus aggregate	Blackberry	WoNS, LM/AP
Forb		
Hypericum perforatum	St John's Wort	LM
Grass		
Nassella trichotoma	Serrated Tussock	WoNS, C

Table key.

- 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.

2.3 Habitat Suitability for Threatened Species

2.3.1 Fauna habitat

The habitat features on the subject land were identified during the field surveys and assessed regarding their potential value to native fauna species, both threatened and common species. The fauna habitat features of the subject land are described in Table 15.

Table 15. Fauna habitat features.

Habitat Feature	Description	Relevant Native Fauna Species/Assemblages
Remnant eucalypts	Within the subject land, PCT1093 Zone 1 and PCT1334 Zones 1 and 2 contain remnant trees. The majority of the trees within these zones do not contain functional hollows (see also EcoLogical Australia 2010). However, there are a small number of more mature, hollow bearing trees.	The mature, hollow bearing trees are likely to provide a nesting resource for birds, bats and marsupials, potentially including threatened species. All remnant trees, young and mature, are likely to provide foraging resources for a variety of birds and marsupials.
Other native vegetation (e.g. shrubs, forbs, grasses)	Much of the subject land has been historically cleared and disturbed. As such, there are only moderate patches which have retained a cover of native shrubs, forbs or grasses.	The native shrubs, forbs and grasses are likely to provide a foraging resource to a variety of native birds, reptiles and herbivores, potentially including threatened species.
Exotic trees and shrubs	Much of the vegetated portions of the subject land are dominated by exotic trees and shrubs.	The exotic trees and shrubs are only likely to provide a limited foraging resource to a variety common native and exotic birds. It is unlikely that the exotic trees and shrubs on the subject land would be of importance as nesting or roosting habitat for any threatened fauna species.
Exotic pasture	The majority of the subject land supports a highly modified derived grassland, all of which is exotic dominant and has been heavily disturbed by historic mining, quarrying and grazing/agriculture. As a result, the groundlayer across this area is largely bare and only sparsely covered by exotic grasses and forbs.	The sparsely covered grassy areas would provide a limited grazing resources for common birds, reptiles and herbivores such as the Eastern Grey Kangaroo *Macropus giganteus* and Common Wombat *Vombatus ursinus.* Open areas are likely to provide a hunting resource for raptors and other predatory birds.
Surface rock	Loose surface rock is scattered across the slopes and crests of the subject land and study area.	The loose surface rock is likely to provide refuge and foraging habitat for common herpetofauna and invertebrates.
Termite mounds	Seventeen termite mounds are spread across the study area. The termite mounds are largely found in the areas of intact vegetation (PCT1093 Zone 1 and PCT1334 Zone 1). Only one termite mound occurs within the subject land.	Termite mounds are likely to provide a foraging resource for Short-beaked Echidna *Tachyglossus aculeatus*, and a foraging and nesting resource for the BC Act listed Rosenberg's Goanna *Varanus rosenbergi*.

Habitat Feature	Description	Relevant Native Fauna Species/Assemblages
Creeks, streams, dams	Valley Creek, an unnamed creek and several tributaries pass through the subject land. All were dry at the time of survey and are known to remain dry throughout much of the year. Reliable flows only occur following substantial rain events. The fringing vegetation along sections of Valley creek and the unnamed creek are relatively intact.	The creeks and tributaries are unlikely to provide habitat of value to aquatic flora or fauna. However, the intact sections of fringing vegetation along Valley Creek and the unnamed creek are likely to provide a foraging resource to a variety of birds, reptiles and herbivores, potentially including threatened species, and are likely to be important for connectivity.

2.3.2 Threatened Biodiversity Data Collection

2.3.2.1 Definitions of conservation significance

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

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

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

2.3.2.2 Database and literature review

Information regarding the suitability of the habitat on the subject land for threatened species was obtained from the Threatened Biodiversity Data Collection through the BAM Calculator. The species flagged by the BAM are detailed in Section 2.3.3 (ecosystem credit species) and Section 2.3.4 (species credit species).

In addition, a database search and literature review were completed to inform likelihood of occurrence assessments and provide useful background information for this assessment. This review included obtaining:

- 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 on the subject land obtained using the Department of the Environment's online EPBC Act Protected Matters Search Tool (PMST) on 10 August 2018 and updated on 7 January 2019; and
- ecological point data from the NSW Wildlife Atlas (BioNet), downloaded on 10 August 2018 and updated on 10 November 2018, providing a list of threatened species which have previously been recorded in the broad locality of the subject land (i.e. within 10 km) (refer to Figure 8).

Literature referred to during the conduct of the surveys for this study and/or during the preparation of this BDAR is listed under References.

2.3.2.3 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 on the subject land. 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 (i.e. within ten kilometres of the subject land). Some BC 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 on the subject land is categorised as either negligible, low, moderate or high. A species that has been identified on the subject land 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 D. Species assigned a moderate or higher likelihood of occurrence are considered in more detail in Section 2.3.4 as species credit species under the BAM (or as additional species if they are not flagged as species credit species).

0 1500 3000 4500 6000 m

Scale 1:90,000 @ A3, GDA 1994, MGA Zone

N

Legend

Study Area - Lot 1 DP1249543

10000 m buffer to Subject Land

Landscape Context and BioNet

NSWWildlife Atlas Threatened Species

- Green and Golden Bell Frog
- Southern Bell Frog
- Australasian Bittern
- Barking Owl
- Black-chinned Honeyeater (eastern subspecies)
- Brown Treecreeper (eastern subspecies)
- Diamond Firetail
- Dusky Woodswallow
- Flame Robin
- Fork-tailed Swift
- Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Hooded Robin (south-eastern form)
- Little Eagle
- Little Lorikeet
- Olive Whistler
- Painted Honeyeater
- Rainbow Bee-eater
- Scarlet Robin
- Speckled Warbler
- Spotted Harrier
- Superb Parrot
- Varied Sittella
- White-bellied Sea-Eagle
- White-fronted Chat
- White-throated Needletail
- Black Gum
- Button Wrinklewort
- Hoary Sunray
- Pale Pomaderris
- Silky Swainson-pea
- Small Purple-pea
- Thick Lip Spider Orchid
- Golden Sun Moth
- Eastern Bentwing-bat
- Eastern False Pipistrelle
- Koala
- Southern Myotis
- Spotted-tailed Quoll
- Rosenberg's Goanna

Figure 8. NSW Wildlife Atlas Threatened Species Search

capital ecology

Capital Ecology Project No: 2794
Drawn by: S. Reid
Date: 23 January 2019

2.3.3 Habitat suitability for ecosystem credit species

Threatened species classified as ecosystem credit species and identified by the BAM as potentially occurring on the subject land are listed in Table 16. The value of the habitat on the subject land for ecosystem credit species is determined based on the type and condition (i.e. vegetation integrity) of the vegetation present together with the landscape context (refer Section 2.1).

Table 16. Predicted ecosystem credit species identified by the BAM as potentially occurring on the subject land.

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Presence	Rationale for presence = no
Anthochaera phrygia Regent Honeyeater (Foraging)	Critically Endangered	Critically Endangered	Yes – assumed	-
Artamus cyanopterus cyanopterus Dusky Woodswallow	Vulnerable	-	Yes – confirmed Observed in PCT1334 Zone 1.	-
Callocephalon fimbriatum Gang-gang Cockatoo (Foraging)	Vulnerable	-	Yes – confirmed Recorded in the study area by EcoLogical Australia (2010).	-
Calyptorhynchus lathami Glossy Black-Cockatoo (Foraging)	Vulnerable	-	Yes – assumed	-
Chthonicola sagittate Speckled Warbler	Vulnerable	-	Yes – confirmed Recorded in the study are by EcoLogical Australia (2010).	-
Circus assimilis Spotted Harrier	Vulnerable	-	Yes – assumed	-
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies)	Vulnerable	-	Yes – assumed	-
Daphoenositta chrysoptera Varied Sittella	Vulnerable	-	Yes – assumed	-
Dasyurus maculatus Spotted-tailed Quoll	Vulnerable	Endangered	Yes – assumed	-
Falsistrellus tasmaniensis Eastern False Pipistrelle	Vulnerable	-	Yes – assumed	-
Glossopsitta pusilla Little Lorikeet	Vulnerable	-	Yes – assumed	-

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Presence	Rationale for presence = no
Grantiella picta Painted Honeyeater	Vulnerable	Vulnerable	Yes – confirmed Recorded in the study are by EcoLogical Australia (2010).	-
Hieraaetus morphnoides Little Eagle (Foraging)	Vulnerable	-	Yes – assumed	-
Lathamus discolor Swift Parrot (Foraging)	Endangered	Critically Endangered	Yes – assumed	-
Lophoictinia isura Square-tailed Kite (Foraging)	Vulnerable	-	Yes – assumed	-
Melanodryas cucullata cucullata Hooded Robin (south-eastern form)	Vulnerable	-	Yes – assumed	-
Miniopterus schreibersii oceanensis Eastern Bentwing-bat (Foraging)	Vulnerable	-	Yes – confirmed Recorded in the study area via ANABAT survey.	-
Neophema pulchella Turquoise Parrot	Vulnerable	-	Yes – assumed	-
Ninox connivens Barking Owl (Foraging)	Vulnerable	-	Yes – assumed	-
Ninox strenua Powerful Owl (Foraging)	Vulnerable	-	Yes – assumed	-
Petaurus australis Yellow-bellied Glider	Vulnerable	-	Yes – assumed	-
Petroica boodang Scarlet Robin	Vulnerable	-	Yes – confirmed Observed in PCT1334 Zone 1.	-
Petroica phoenicea Flame Robin	Vulnerable	-	Yes – assumed	-
Phascolarctos cinereus Koala (Foraging)	Vulnerable	Vulnerable	Yes – assumed	-

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Presence	Rationale for presence = no
Potorous tridactylus Long-nosed Potoroo	Vulnerable	Vulnerable	Yes – assumed	-
Pteropus poliocephalus Grey-headed Flying-fox	Vulnerable	Vulnerable	Yes – assumed	-
Stagonopleura guttata Diamond Firetail	Vulnerable	-	Yes – assumed	-
Suta flagellum Little Whip Snake	Vulnerable	-	Yes – assumed	-
Varanus rosenbergi Rosenberg's Goanna	Vulnerable	-	Yes – assumed	-

2.3.4 Habitat suitability for species credit species

2.3.4.1 Candidate species credit species

Threatened species classified as species credit species and identified by the BAM as potentially occurring on the subject land are listed in Table 17. The likelihood of these species occurring on the subject land and the potential value of the habitat present is determined based on the subject land's vegetation type and condition (i.e. vegetation integrity), the presence/absence of specific habitat features, species records (BioNet and ecological reports), and/or the results of targeted surveys. A summary of the findings from each targeted survey is given in Section 4.3.4.2.

Table 17. Candidate species credit species identified by the BAM as potentially occurring on the subject land.

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Presence	Rationale for presence = no
Anthochaera phrygia Regent Honeyeater (Breeding)	Critically Endangered	Critically Endangered	No	The species is a rare visitor to the locality, and only failed breeding attempts have been recorded[22,23]. The species has not been recorded within 10 km of the subject land (Figure 8). It is unlikely that the species would nest and/or breed on the subject land or study area.
Aprasia parapulchella Pink-tailed Legless Lizard	Vulnerable	Vulnerable	No - surveyed	An intensive rock turning survey found that the species is not present within the subject land or study area.

[22] http://canberrabirds.org.au/our-birds/canberra-garden-birds/honeyeaters/regent-honeyeater/
[23] https://canberra.naturemapr.org/Community/Species/15130

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Presence	Rationale for presence = no
Caladenia tessellata Thick Lip Spider Orchid	Endangered	Vulnerable	No - surveyed	The species was not detected during surveys or previous ecological studies of the study area. Only two records from 1942 are recorded within 10 km of the subject land (Figure 8). The species is unlikely to be present on the subject land.
Callocephalon fimbriatum Gang-gang Cockatoo (Breeding)	Vulnerable	-	No – surveyed	The species is conspicuous when present. Targeted bird surveys combined with approximately 144 person hours spent 'on site' confirmed that the species is not nesting and/or breeding on the subject land or study area.
Calyptorhynchus lathami Glossy Black-Cockatoo (Breeding)	Vulnerable	-	No – surveyed	The subject land does not contain suitable foraging or nesting resources for the species. Targeted bird surveys combined with approximately 144 person hours spent 'on site' confirmed that the species is not nesting and/or breeding on the subject land or study area.
Cercartetus nanus Eastern Pygmy-possum	Vulnerable	-	No	The species has not been recorded within 10 kms of the subject land (Figure 8) and is not known to occur in the wider locality.
Dillwynia glaucula Michelago Parrot-pea	Endangered	-	No - surveyed	The species was not detected during surveys or previous ecological studies of the study area. The species has not been recorded within 10 kms of the subject land (Figure 8) and is unlikely to be present on the subject land.
Diuris aequalis Buttercup Doubletail	Endangered	Vulnerable	No - surveyed	The species was not detected during surveys or previous ecological studies of the study area. The species has not been recorded within 10 kms of the subject land (Figure 8) and is unlikely to be present on the subject land.
Dodonaea procumbens Creeping Hop-bush	Vulnerable	Vulnerable	No	The subject land is not located in the Lake Bathurst area or south

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Presence	Rationale for presence = no
				of Michelago and, as determined by the online BAM Calculator, this geographic limitation removes the species as a candidate for the subject land.
Eucalyptus pulverulenta Silver-leafed Gum	Vulnerable	Vulnerable	No	The subject land is not located south of Dalgety or the Tinderry Range and, as determined by the online BAM Calculator, this geographic limitation removes the species as a candidate for the subject land.
Heleioporus australiacus Giant Burrowing Frog	Vulnerable	Vulnerable	No	The subject land is not located within 10 kms of 8B and, as determined by the online BAM Calculator, this geographic limitation removes the species as a candidate for the subject land.
Hieraaetus morphnoides Little Eagle (Breeding)	Vulnerable	-	No – surveyed	Targeted bird surveys combined with approximately 144 person hours spent 'on site' confirmed that the species is not nesting and/or breeding on the subject land or study area.
Lathamus discolor Swift Parrot (Breeding)	Endangered	Critically Endangered	No	The species is a rare, non-breeding winter migrant in the locality and as such is unlikely to nest and/or breed on the subject land or study area.
Lophoictinia isura Square-tailed Kite (Breeding)	Vulnerable	-	No	The species is a rare, non-breeding vagrant in the locality[24,25] and as such is unlikely to nest and/or breed on the subject land or study area.
Miniopterus schreibersii oceanensis Eastern Bentwing-bat (Breeding)	Vulnerable	-	No	The subject land does not contain potential roosting and/or breeding habitat (caves, mines, water tunnels, etc.).
Ninox connivens Barking Owl (Breeding)	Vulnerable	-	No	The species is a rare, non-breeding vagrant in the locality[26,27] and as such is unlikely

[24] https://canberra.naturemapr.org/Community/Species/15281
[25] http://canberrabirds.org.au/birds/square-tailed-kite/
[26] https://canberra.naturemapr.org/Community/Species/15078
[27] http://canberrabirds.org.au/birds/barking-owl/

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Presence	Rationale for presence = no
				to nest and/or breed on the subject land or study area.
Ninox strenua Powerful Owl (Breeding)	Vulnerable	-	No	Within the subject land there are no potential nesting trees (DBH > 80 cm or over 150 years old, with large hollows at least 0.5 m deep). Previous ecological studies did not detect the species despite targeted surveys and there was no evidence of hollow occupation by owls on the subject land. The species is unlikely to nest and/or breed on the subject land
Petaurus norfolcensis Squirrel Glider	Vulnerable	-	No	The species is widely, though sparsely, distributed in eastern Australia. It inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forests west of the Great Dividing Range. The potential habitat within the subject land has been degraded to the extent that it is unlikely to provide habitat for the species.
Phascogale tapoatafa Brush-tailed Phascogale	Vulnerable	-	No	The species is mainly found around the coast of Australia, with only occasional records west of the Great Dividing Range. The species has not been recorded within 10 kms of the subject land (Figure 8), is not known to occur in the wider locality, and is unlikely to be present on the subject land.
Phascolarctos cinereus Koala (Breeding)	Vulnerable	Vulnerable	No	The species does occur in the locality. However, the species is unlikely to occur on the subject land as the majority of trees have been removed, particularly in comparison to the surrounding, intact vegetation. In addition, no evidence of koala was detected during surveys (e.g. scats, scratch marks) despite 144 person hours spent 'on site'.
Pomaderris pallida Pale Pomaderris	Vulnerable	Vulnerable	No - surveyed	The species is conspicuous throughout the year when present. The species was not

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Presence	Rationale for presence = no
				detected during surveys or previous ecological studies of the study area. The species is unlikely to be present on the subject land.
Pteropus poliocephalus Grey-headed Flying-fox (Breeding)	Vulnerable	Vulnerable	No - surveyed	Roosting camps are conspicuous when present. Approximately 144 person hours spent 'on site' confirmed that the species is not breeding on the subject land or study area.
Rutidosis leptorrhynchoides Button Wrinklewort	Endangered	Endangered	No - surveyed	The species is conspicuous when present. The species was not detected during surveys or previous ecological studies of the study area. The species is susceptible to grazing and the subject land and study area have been heavily grazed over an extended period. The species is unlikely to be present on the subject land.
Swainsona recta Small Purple-pea	Endangered	Endangered	No	The habitat within the subject land has been degraded to the extent that it is unlikely to support the species and does not contain areas dominated by the necessary associated grasses. The species was not detected during surveys or previous ecological studies of the study area. The species is susceptible to grazing and the subject land and study area have been heavily grazed over an extended period. The species is unlikely to be present on the subject land.
Swainsona sericea Silky Swainson-pea	Vulnerable	-	No	The habitat within the subject land has been degraded to the extent that it is unlikely to support the species and does not contain areas dominated by the necessary associated grasses. The species was not detected during surveys or previous ecological studies of the study area. The species is susceptible to grazing and the subject land and study area have been heavily grazed

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Presence	Rationale for presence = no
				over an extended period. The species is unlikely to be present on the subject land.
Synemon plana Golden Sun Moth	Endangered	Critically Endangered	No	The habitat within the subject land has been degraded to the extent that it is unlikely to support the species. The species, which is well studied in the wider locality, is not known to occur near the subject land. Previous ecological studies did not detect the species despite dedicated surveys. The species is unlike to occur on the subject land.
Zieria citriodora Lemon Zieria	Endangered	Vulnerable	No – surveyed	The species was not detected during surveys or previous ecological studies of the study area. The species has not been recorded within 10 kms of the subject land (Figure 8) and is unlikely to be present on the subject land.

2.3.4.2 BAM targeted survey results

As described in Table 17, surveys were completed to confirm the occurrence and/or habitat potential for the species credit species flagged by the BAM as having the potential to occur in the relevant PCTs of the subject land.

Threatened flora

A total of 137 flora species were recorded within the study area, comprising 93 native species and 44 exotic species (Appendix B).

Whilst not detected during surveys, EcoLogical Australia (2010) recorded Hoary Sunray *Leucochrysum albicans* var. *tricolor* (EPBC Act endangered) within the study area. These records were restricted to a small number of plants in the higher quality, intact Box-Gum Woodland on the south-western boundary of the study area and three plants in higher quality, intact dry sclerophyll forest on northern boundary of the study area. EcoLogical Australia (2010) did not record any Hoary Sunray plants within the subject land as defined in this BDAR. Being a daisy that has very effective dispersal properties, it is possible that Hoary Sunray may occur within the subject land in the future.

In light of the above, extensive field surveys confirmed that no threatened flora species occur within the subject land but, as indicated by EcoLogical Australia (2010), the wider study area does support Hoary Sunray.

Threatened birds

A total of 52 fauna species were recorded within the study area across all surveys, comprising 48 native species and 4 exotic species (Appendix C).

As shown in Figure 9, Dusky Woodswallow *Artamus cyanopterus* (BC Act vulnerable) were observed on three occasions (5/11/2018, 16/11/2018, and 25/11/218, Figure 9). On all occasions the species occurred within the higher quality, intact vegetation which borders Queanbeyan River. On the 16/11/2018 a pair were observed constructing a nest in a dead tree. On the other two occasions individuals were observed flying through and above the canopy.

A Scarlet Robin (BC Act vulnerable) was observed on the 31/07/2018 foraging in a small patch of intact woodland (Figure 9).

While not detected during the current surveys, EcoLogical Australia (2010) recorded non-breading observations of Gang-Gang Cockatoo *Callocephalon fimbriatum* (BC Act vulnerable), Speckled Warbler *Chthonicola sagittate* (BC Act vulnerable), and Painted Honeyeater *Grantiella picta* (EPBC Act and BC Act vulnerable).

All of the above species are assumed to be present on the subject land as ecosystem credit species (Table 16). Importantly, none of the threatened candidate species credit species identified in Table 17 as having the potential to breed on or around the subject land were observed nesting despite surveys occurring at the appropriate time of year.

In light of the above, it is concluded that the subject land does not support breeding habitat for the identified species credit species.

Pink-tailed Worm-lizard

No Pink-tailed Worm-lizards *Aprasia parapulchella* were detected during the survey (Figure 9). Surveys at a nearby site in Googong, NSW on the 19/09/2018 detected the species, indicating that the time of survey for this BDAR was appropriate to reliably detect the species if present.

In addition to many scorpions, spiders, centipedes and other common invertebrates, a number of non-target herpetofauna species were recorded during the survey, including Three-toed Skink *Hemiergis decresiensis*, Delicate Skink *Lampropholis delicata*, Eastern Froglet *Crinia signifera*, Eastern Banjo Frog *Limnodynastes dumerilii*, and Spotted Marsh Frog *Limnodynastes tasmaniensis*

In light of the above, it is concluded that the subject land does not support the Pink-tailed Worm-lizard.

Threatened bats

As detailed in the report provided by Fly By Night Bat Surveys Pty Ltd (received from Glenn Hoye on 9 December 2018), insectivorous bats were recorded at each survey location on each survey night (Figure 9). A total of 489 passes were analysed and the following seven species were identified with confidence:

- White-striped Mastiff Bat *Austronomus australis*;
- Southern Freetail Bat *Mormopterus planiceps*;

- Gould's Wattled Bat *Chalinolobus gouldii*;
- Chocolate Wattled Bat *Chalinolobus morio*;
- Eastern Bent-wing Bat *Miniopterus schreibersii oceanensis* (BC Act vulnerable);
- Large Forest Bat *Vespadelus darlingtonia*; and
- Little Forest Bat *Vespadelus vulturnus.*

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

- Southern Forest Bat *Vespadelus regulus*

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

- Southern Freetail Bat *Mormopterus ridri*

None of the above species are listed pursuant to the EPBC Act, however the Eastern Bent-wing Bat is listed as vulnerable pursuant to the BC Act. This species is identified as an ecosystem credit species (foraging) and species credit species (breeding). As detailed in Table 17, the subject land does not support potential Eastern Bent-wing Bat roosting and/or breeding habitat (caves, mines, water tunnels, etc.).

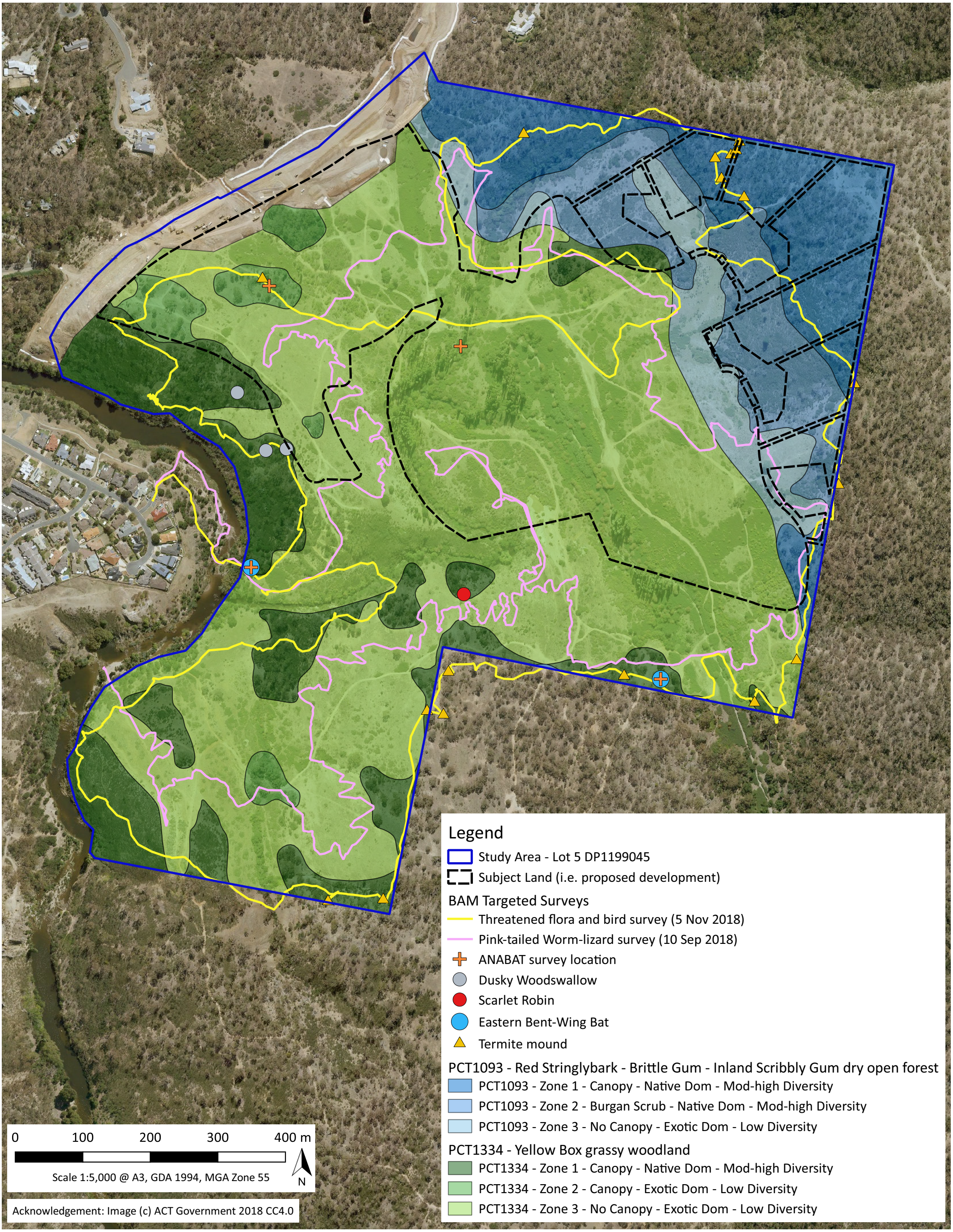


Figure 9. BAM Targeted Surveys

Capital Ecology Project No: 2794
Drawn by: S. Reid
Date: 14 March 2019

3 Part 2 – Impact Assessment (BAM Stage 2)

Part 2 of this BDAR provides an assessment of the impacts of the proposed development as set out in Stage 2 of the BAM.

3.1 Avoidance, Minimisation and Mitigation of Impacts on Biodiversity Values

In accordance with Chapter 8 of the BAM, a proponent is required to demonstrate that all reasonable and practicable measures have been employed to avoid, minimise and mitigate the impacts of a project on biodiversity values. This section outlines the measures that have been incorporated into the project design or will be implemented during construction and/or occupation of the proposed development.

3.1.1 Development location and design

As shown in Figures 2 and 3, the location of the proposed development is largely dictated by the topography of the study area, with the proposed development footprint (i.e. the subject land) occupying the areas of flatter topography. The proposed development footprint aligns well with the parts of the study area which have been historically disturbed (Figures 3 and 6). This is unsurprising as those same areas were likely to have been more suitable for the historic activities which have occurred within the study area, including mining, quarrying, grazing/agriculture, and movement across the landscape. Furthermore, preliminary mapping performed during the development of this BDAR informed the design of the proposed development, with the final design layout modified to avoid areas of high biodiversity value to the greatest extent practicable.

As demonstrated throughout this report, the proposed development largely avoids impacts on areas of higher biodiversity value. When compared to the biodiversity values across the wider study area, the proposed development within the subject land has the following impacts.

<u>High biodiversity value areas</u>

- PCT1093 Zone 1 – 1.45 ha of 9.84 ha (14.7%) will be impacted.
- PCT1093 Zone 2 – 2.71 ha of 7.12 ha (38.0%) will be impacted.
- PCT1334 Zone 1 – 0.77 ha of 13.22 ha (5.8%) will be impacted.
- PCT1334 Zone 2 – 1.97 ha of 2.45 ha (80.7%) will be impacted.

<u>Low biodiversity value areas (exotic vegetation and disturbed land)</u>

- PCT1093 Zone 3 – 3.25 ha of 4.93 ha (65.9%) will be impacted.
- PCT1334 Zone 3 – 28.00 ha of 55.94 ha (50.0%) will be impacted.

3.1.2 Construction

As discussed in Section 2.2.4 and Section 2.2.6, the study area and subject land are heavily infested with several high threat weed species. These high threat weeds provide a source of weed propagules for the wider locality and the downstream Queanbeyan River catchment.

The key potential risk to the biodiversity values of the subject land and adjoining areas during construction of the proposed development is the facilitated spread of these high threat weeds within the locality and/or the introduction of new weeds. The following weed management measures will be implemented to address this risk during construction.

- Appropriate vehicle hygiene will be maintained. Vehicles and machinery entering the subject land will be clean of weed seed or propagules.
- Only sterile materials such as hessian/jute or rice straw will be used for soil stabilisation or similar purposes.
- High threat weeds will be prevented from establishing on newly created road verges, landscaped areas, and other open space.

3.1.3 Occupation

Weed control within the subject land will be the responsibility of the proponents of the proposed development. Any future landscaping for the proposed development (subdivision and creation of lots) in areas of the subject land outside of the newly created lots will use only local native plant species. Where practicable within open space areas, all strata will be re-established (i.e. groundcover, midstorey shrubs, and canopy trees) to create fauna habitat complexity. This will discourage urban adapted species and encourage small woodland birds to visit the subject land.

3.2 Biodiversity Impacts of Proposed Development

3.2.1 Clearance and other direct impacts on native vegetation and habitat

As shown in Figure 6, the proposed development will result in the clearance of:

- 1.45 ha of PCT1093 Zone 1 – Moderate to high diversity intact, remnant vegetation (BC Act native vegetation);
- 2.71 ha of PCT1093 Zone 2 – Moderate to high diversity vegetation which lacks an overstorey (BC Act native vegetation);
- 3.25 ha of PCT1093 Zone 3 – Highly modified exotic vegetation;
- 0.77 ha of PCT1334 Zone 1 – Moderate to high diversity intact, remnant vegetation (BC Act native vegetation, EPBC Act and BC Act Box-Gum Woodland);
- 1.97 ha of PCT1334 Zone 2 – Native overstorey with a low diversity exotic groundlayer (BC Act native vegetation, BC Act Box-Gum Woodland); and
- 28.00 ha of PCT1334 Zone 3 – Highly modified exotic vegetation.

In total, the proposed development will result in the clearance of 6.9 ha of BC Act native vegetation. The proposed development will not result in any other direct impacts on native vegetation or habitat.

3.2.2 Indirect impacts on native vegetation and habitat

The potential indirect impacts of the proposed development include:

- weed introduction and/or spread during construction; and
- sedimentation of receiving waterways (i.e. Valley Creek or unnamed creek and then Queanbeyan River) from construction of roads, houses and other infrastructure.

As noted above, appropriate weed monitoring and control will occur to manage the potential impacts of high threat weeds. Similarly, it is assumed that appropriate site-based sediment and erosion controls will be implemented to prevent sedimentation of receiving waterways.

The proposed development involves a minor re-direction of sections Valley Creek, particularly at the confluence of Valley Creek and the unnamed creek. These creeks are known to remain dry throughout much of the year, with reliable flows only occurring following substantial rain events. Within the study area they do not provide aquatic habitat of potential value to aquatic flora or fauna. Therefore, assuming appropriate site-based sediment and erosion controls are implemented, the re-direction of sections of Valley Creek is unlikely to have any indirect biodiversity impacts.

The proposed development is therefore unlikely to result in any other indirect impacts on native vegetation or habitat.

3.2.3 Biodiversity risk weighting

The biodiversity risk weighting (Section 6.6 of the BAM) is a tool used in the BOS to mitigate the risk in offsetting the loss of vegetation, threatened entities and/or their habitat. The biodiversity risk weighting does this by increasing the quantum of credits required at an impact site. The biodiversity risk weighting is derived from two components:

- sensitivity to loss – based on threat status under legislation or evidence-based information that suggests the entity is at an increased risk of loss; and
- sensitivity to potential gain – based on life history characteristics and ecological information for a species.

The subject land contains vegetation with a vegetation integrity score that requires offsetting for impacts on ecosystem credits, including vegetation which meets the definition of a TEC (i.e. PCT1334). The biodiversity risk rating associated with each PCT differs and, as shown below, there is a greater risk weighting for the TEC.

- PCT1093 – Biodiversity risk rating of 1.75.
- PCT1334 – Biodiversity risk rating of 2.00.

3.2.4 Prescribed biodiversity impacts

As described in Section 8.2 of the BAM, some types of projects may have impacts on biodiversity values in addition to, or instead of, impacts from clearing vegetation and/or loss of habitat. For many of these impacts the biodiversity values may be difficult to quantify, replace or offset, making avoiding and

minimising impacts critical. Clause 6.1 of the BC Regulation identifies the following as impacts that are 'prescribed biodiversity impacts' that must be assessed using the BOS.

> *(a) impacts of development on the habitat of threatened species or ecological communities associated with:*
>
> > *(i) karst, caves, crevices, cliffs and other geological features of significance;*
> >
> > *(ii) rocks;*
> >
> > *(iii) human made structures;*
> >
> > *(iv) non-native vegetation;*
>
> *(b) impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range;*
>
> *(c) impacts of development on movement of threatened species that maintains their life cycle;*
>
> *(d) impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining);*
>
> *(e) impacts of wind turbine strikes on protected animals; and*
>
> *(f) impacts of vehicle strikes on threatened species or on animals that are part of a TEC.*

Following detailed surveys across the subject land and study area, only 'rocks' and 'non-native vegetation' were found to occur within the subject land.

3.2.4.1 Rocks

As detailed in Section 2.3.1 and Section 2.3.4.2, the study area contains substantial patches of loose surface rock, the removal of which is identified as a potential prescribed biodiversity impact, especially with respect to the two species identified by the BAM Calculator (i.e. Pink-tailed Worm Lizard *Aprasia parapulchella* and Little Whip Snake *Suta flagellum*). Accordingly, as detailed in Section 2.2.3.2 and 2.3.4.2, a rock turning survey was performed across the subject land and study area in order to determine the value of the loose surface rock to native fauna, with particular consideration given to the two flagged threatened species. No threatened fauna were detected and only a small number of common herpetofauna and invertebrates were found.

It is therefore unlikely that the removal of loose surface rock associated with the proposed development will have a prescribed biodiversity impact.

3.2.4.2 Non-native vegetation

As detailed in Section 2.2.4, the study area contains substantial patches of non-native vegetation, the removal of which is identified as a potential prescribed biodiversity impact. As detailed in the habitat assessment presented in Section 2.3.1, the non-native vegetation is only likely to provide a limited foraging resource to native and exotic birds. The intact native vegetation surrounding the subject land is

far more likely to provide a valuable resource to a wider variety of native fauna and is therefore likely to be utilised in preference to the non-native vegetation.

It is therefore unlikely that the removal of non-native vegetation associated with the proposed development will have a prescribed biodiversity impact.

3.2.5 Serious and irreversible impacts

The guidance to assist a decisionmaker to determine a serious and irreversible impact (NSW Government 2017b[28]) provides a list of threatened species and ecological communities which are likely to be the subject of serious and irreversible impacts (SAII). The potential for a project to impact these SAII entities must be assessed in the BDAR.

The subject land does not contain habitat of potential significance to any threatened flora or fauna species listed as a SAII entity. However, the subject land does support the following ecological community which is listed as a SAII entity.

- PCT1334 – Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion ('BC Act Box-Gum Woodland').

The proposed development will result in the removal of a total of 2.74 ha of BC Act listed Box-Gum Woodland (i.e. 0.77 ha of PCT1334 Zone 1 and 1.97 ha of PCT1334 Zone 2). Discussions with the Office of Environment and Heritage (Tobi Edmonds, Senior Conservation Planning Officer) indicate that a decision has been made not to develop entity specific thresholds for SAII. Instead, decisions will be made on a case-by-case basis. Accordingly, the below additional information is provided to support the decision maker to determine if the proposed removal of 2.74 ha of BC Act listed Box-Gum Woodland constitutes a SAII. This information is presented according to the requirements outlined in Section 10.2 of the BAM.

a. the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII

As detailed in Section 3.1.1, the location of the proposed development is largely dictated by the topography of the land, with the proposed development footprint occupying the areas of flatter topography. This aligns well with the parts of the study area which have been historically disturbed. Notwithstanding this, preliminary mapping performed during the development of this BDAR informed the final design of the proposed development, which was modified in order to reduce impacts on high biodiversity values, including areas of BC Act listed Box-Gum Woodland.

As detailed in Section 3.1.2 and Section 3.2.2, appropriate weed monitoring and control will occur to manage the potential impacts of high threat weeds. Similarly, it is assumed that appropriate site-based sediment and erosion controls will be implemented to prevent sedimentation of receiving waterways. The proposed development is unlikely to result in any other indirect impacts on BC Act listed Box-Gum Woodland.

[28] NSW Government (2017b). *Guidance to assist a decision-maker to determine a serious and irreversible impact*. State of New South Wales and Office of Environment and Heritage

b. *the area (ha) and condition of the TEC to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone*

The proposed development will directly impact (i.e. remove) of a total of 2.74 ha of BC Act listed Box-Gum Woodland (i.e. PCT1334), comprised of the following two vegetation conditions zones.

- 0.77 ha of PCT1334 Zone 1. Vegetation Integrity Score of 49.3. As described in Table 9, this zone is characterised as '*Remnant woodland with all strata intact. Vegetation is in good condition, characterised by a native dominant groundstorey with a moderate to high diversity of native shrubs and forbs*.'

- 1.97 ha of PCT1334 Zone 2. Vegetation Integrity Score of 35.1. As described in Table 10, this zone is characterised as '*Woodland characterised by a native overstorey with a partially cleared midstorey and shrubstorey. The low diversity groundstorey is dominated by exotic grasses and forbs. Human activities have had an impact on this zone and there is evidence of historic clearing, grazing damage, and the presence of a moderate cover of significant weeds*.'

c. *a description of the extent to which the impact exceeds the threshold for the potential entity that is specified in the Guidance to assist a decision-maker to determine a serious and irreversible impact*

As described above, discussions with the Office of Environment and Heritage (Tobi Edmonds, Senior Conservation Planning Officer) indicate that a decision has been made not to develop entity specific thresholds for SAII. Instead, decisions will be made on a case-by-case basis.

d. *the extent and overall condition of the potential TEC within an area of 1000ha, and then 10,000ha, surrounding the proposed development footprint*

BC Act listed Box-Gum Woodland is estimated to be occupy approximately 20% of the 1,000 ha area. This is based on an analysis of the topography and canopy spacing across the locality. Of the estimated 200 ha of BC Act listed Box-Gum Woodland, approximately 25% (50 ha) is likely to be in a reasonably intact condition based on observations taken to inform Section 2.1 of this BDAR.

The same methods and estimations apply to the 10,000 ha area. Accordingly, BC Act listed Box-Gum Woodland is estimated to be occupy approximately 20% of the 10,000 ha area. Of the estimated 2,000 ha of BC Act listed Box-Gum Woodland, approximately 25% (500 ha) is likely to be in a reasonably intact condition based on observations taken to inform Section 2.1 of this BDAR.

e. *an estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration*

The extant area and condition of BC Act listed Box-Gum Woodland remaining in the IBRA subregion will reduce by 2.74 ha as a result of the proposed development, comprising 0.77 ha of moderate to high diversity Box-Gum Woodland (PCT1334 Zone 1) and 1.97 ha of low diversity Box-Gum

Woodland (PCT1334 Zone 2). This represents a very small fraction of the current extent of BC Act listed Box-Gum Woodland across the IBRA subregion.

f. an estimate of the area of the potential TEC that is in the reserve system within the IBRA region and the IBRA subregion

No information was found relating to the area of BC Act listed Box-Gum Woodland that is in the reserve system within the IBRA region and subregion. However, as described in the NSW Scientific Committee's final determination[29] '*The community is poorly represented in conservation reserves. There are small occurrences of White Box Yellow Box Blakely's Red Gum Woodland in Border Ranges National Park, Goobang National Park, Goulburn River National Park, Manobalai Nature Reserve, Mt Kaputar National Park, Oxley Wild Rivers National Park, Queanbeyan Nature Reserve, Towari National Park, Warrumbungle National Park, Wingen Maid Nature Reserve and Wollemi National Park. The community also occurs in the following State Conservation Areas, Copeton State Conservation Area, Lake Glenbawn State Conservation Area and Lake Keepit State Conservation Area*. *Information last updated: 28 February 2011.'*

g. the development, clearing or biodiversity certification proposal's impact on:

i. abiotic factors critical to the long-term survival of the potential TEC; for example, how much the impact will lead to a reduction of groundwater levels or the substantial alteration of surface water patterns

The impact of the proposed development will not extend beyond the subject land. Weed monitoring and control will occur to manage the potential impacts of high threat weeds. Similarly, it is assumed that appropriate site-based sediment and erosion controls will be implemented to prevent sedimentation of receiving waterways.

ii. characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants

The subject land is located on the edges of the urban matrix of Greenleigh and Karabar. It has been heavily disturbed by historic activities including mining, quarrying and grazing/ agriculture. It is likely to be predominately inhabited by common native and exotic fauna, particularly birds. The proposed development is unlikely to adversely alter the species composition of the Box-Gum Woodland which surrounds the subject land or within any other patch. The impact of the proposed development is unlikely to lead to changes in fire or flooding regimes or increases in the harvesting of plants. The removal of understorey species will only occur as a direct result of vegetation clearing within the subject land.

iii. the quality and integrity of an occurrence of the potential TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the potential TEC

[29] https://www.environment.nsw.gov.au/determinations/BoxgumWoodlandEndComListing.htm

Many of the exotic species which occur in the locality already occur throughout the subject land and broader study area. The proposed development is unlikely to result in the introduction and establishment of additional invasive weeds. The construction works for the proposed development may temporarily increase the occurrence of the weed species already present, however appropriate vehicle hygiene and ongoing weed management measures will be implemented to minimise the risk of weed introduction and spread (refer Section 3.1 of this BDAR).

Some exotic pest fauna species are likely to occur within the subject land and surrounds. The proposed development is highly unlikely to increase the incidence of these species given the proximity of the subject land to existing urban areas (i.e. Greenleigh and Karabar). Notably, the proposed development is not likely to introduce or increase the numbers of exotic avifauna present in the area.

It is likely that herbicides will be used within the subject land to control the existing weed infestation and improve the overall ecological condition of the subject land. These herbicides will be applied in a targeted manner to treat specific species. Weed control works will be undertaken by suitably qualified and experienced personnel. It is noted that such chemicals are currently widely used in the locality.

h. direct or indirect fragmentation and isolation of an important area of the potential TEC

The proposed development will impact five patches of PCT1334 which meet the definition of BC Act Box-Gum Woodland. These patches occur on the subject land and are small and isolated. Within the wider study area, while meeting the definition of the TEC, the areas of BC Act Box-Gum Woodland do not constitute an important component of the ecological community in the locality or wider region. The removal of five patches of BC Act Box-Gum Woodland will not fragment or isolate an important area of the TEC.

The subject land is largely comprised of disturbed land and exotic vegetation. The remaining patches of BC Act Box-Gum Woodland in the subject land area small and isolated from other nearby patches of the community. In contrast, the occurrence of BC Act Box-Gum Woodland in the study area and wider locality is well connected to larger expanses of the community. These areas will not be impacted by the proposed development.

As such, the removal of 2.74 ha of BC Act Box-Gum Woodland within the subject land is unlikely to further fragment the ecological community.

i. the measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion.

No measures are proposed to contribute to the recovery of BC Act Box-Gum Woodland in the IBRA subregion.

3.2.6 Adaptive management for uncertain impacts

The proposed development is unlikely to result in biodiversity impacts that are unforeseen or uncertain.

3.3 Legislative Requirements

3.3.1 Commonwealth EPBC Act – Referral

The proposed development is unlikely to have a significant impact on EPBC Act listed flora and fauna given the subject land does not:

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

However, as detailed in Section 2.2.5.1, the proposed development does support EPBC Act listed Box-Gum Woodland. As described in the EPBC Act Significant Impact Criteria Assessment (Appendix E), the removal of 0.77 ha of this ecological community is unlikely to have a significant impact. As such, referral of the proposed action to the Commonwealth Minister for the Environment and Energy is unwarranted. Notwithstanding this, as the proposed development will remove 0.77 ha of this critically endangered ecological community, the proponent may wish to refer the proposed action to obtain legal certainty.

3.3.2 NSW BC Act – Offset Requirements

The BAM Calculator is the tool for quantifying the offset requirements for a project, the output being expressed as ecosystem credits and species credits. The results of the BAM credit calculations completed for the proposed development are provided below.

3.3.2.1 Ecosystem credit requirements

The results of the BAM credit calculations completed for the proposed development are provided in Table 18. As shown in Table 18, three of the vegetation zones in the proposed impact area (i.e. the subject land) have a vegetation integrity score sufficient for their clearance to result in generation of ecosystem credits, as outlined in Section 10.3.1.1 of the BAM, these being:

- *(a) a vegetation integrity score of ≥15 where the PCT is representative of an endangered or critically endangered ecological community, or*
- *(b) a vegetation zone that has a vegetation integrity score of ≥17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community, or*
- *(c) a vegetation zone that has a vegetation integrity score ≥20 where the PCT is not representative of a TEC or associated with threatened species habitat.*

Accordingly, the proposed development generates an ecosystem credit obligation.

Table 18. Ecosystem credit requirements.

PCT & Vegetation Zone	Vegetation Integrity Score	Proposed Clearance Area (ha)	Credits Required
PCT1093 Zone 1	48.8	1.45	31
PCT1093 Zone 2	9.8	2.71	0
PCT1093 Zone 3	N/A – Exotic	N/A – Exotic	N/A – Exotic
PCT1334 Zone 1	49.3	0.77	19
PCT1334 Zone 2	35.1	1.97	35
PCT1334 Zone 3	N/A – Exotic	N/A – Exotic	N/A – Exotic

3.3.2.2 Species credit requirements

As detailed herein, the subject land does not support habitat of potential significance to any species credit species. Accordingly, the proposed development does not generate a species credit obligation.

3.3.2.3 Estimated credit obligation

Table 19 outlines the estimated credit obligation associated with proposed development as determined by the BAM Calculator on 14 March 2019.

It is important to note that the baseline price per credit is subject to change (up or down) as influenced by trades in the subject credits and other market factors. The below estimate is based on the credit prices for the relevant entities on 14 March 2019, the actual credit price and corresponding monetary value of the credit obligation will be determined at the time at which the required credits are retired.

Table 19. Ecosystem credits for plant community types (PCTs), ecological communities and threatened species habitat.

IBRA sub region	PCT	Baseline price per credit	Risk premium	Administrative cost	Price per credit	No. of ecosystem credits	Final credits price
Monaro	1093	$4,477.84	20.49%	$20	$5,415.35	31	$167.875.82
Monaro	1334	$4,477.84	20.49%	$20	$5,415.35	54	$292.428.86
						Subtotal (excl. GST)	$460.304.68
						GST	$46.030.47
						Total ecosystem credits (incl. GST)	$506,335.15
						Grand total	$506,335.15

3.3.2.4 Credit obligation options

As detailed by the NSW Office of Environment and Heritage[30], the proponent can address the estimated offset obligation outlined in Table 19 in the following two ways.

1) The proponent can *'identify and purchase the required 'like for like' credits in the market and then retire those credits via OEH BOAMS* [Biodiversity Offsets and Agreement Management System]. *For example, credits could be located by using the OEH registers or by retaining a broker to locate credits for them.'*

2) The proponent can *'use the Offsets Payment Calculator to determine the cost of its credit obligation, and transfer this amount to the Biodiversity Conservation Fund via OEH BOAMS. The Biodiversity Conservation Trust is then responsible for identifying and securing the credit obligation.'*

When the proponent has completed these steps for all credits that the proponent is required to retire, they can proceed with their activity in accordance with their approval. The consent authority is responsible for ensuring compliance with credit obligations, and any other conditions of the consent or approval.

If the proponent chooses Option 2 to meet the credit obligations, the amount which must be paid into the Biodiversity Conservation Fund is shown in Table 19. The risk premium stipulated in Table 19 is included to account for the fact that the risks and costs involved in securing the offset have effectively been transferred to the Biodiversity Conservation Trust. These risks include the statistical probability that the market credit price paid by the Biodiversity Conservation Trust to landholders is higher or lower than that predicted. The benefits associated with Option 2 include a more streamlined process and no ongoing obligations once the required amount has been paid to the Biodiversity Conservation Fund.

[30] https://www.environment.nsw.gov.au/biodiversity/offsetsscheme.htm

References

ACT Government (2010). *Survey guidelines for determining lowland vegetation classification and condition in the ACT*. Environment and Sustainable Development Directorate – Conservation Planning and Research.

Coffey Environments Australia (2015a). *Jumping Creek Development – Site Environmental Management Plan. Mine Site Area 3*. Prepared for CIC Australia Pty Ltd, 2 November 2015.

Coffey Environments Australia (2015b). *Jumping Creek Development – Site Environmental Management Plan. Mine Site Area 4*. Prepared for CIC Australia Pty Ltd, 2 November 2015.

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

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

Commonwealth of Australia (2016). *Approved conservation advice for the Natural Temperate Grassland of the South Eastern Highlands (NTG–SEH) ecological community*. Commonwealth Department of the Environment and Energy.

Department of Sustainability Environment, Water, Population and Communities (2011). *Survey guidelines for Australia's threatened reptiles*. Commonwealth of Australia, Canberra.

EcoLogical Australia (2010). *Draft Flora and Fauna Assessment. Rezoning Investigations. Jumping Creek Estate, Queanbeyan*. Prepared for CIC Australia Limited, July 2010. Project No. E1080060.

Jones, S.R. (1999). *Conservation biology of the pink-tailed worm lizard (Aprasia parapulchella).* PhD thesis Applied Ecology research group, University of Canberra.

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

NSW Government (2017a). *Biodiversity Assessment Method.* NSW Office of Environment and Heritage. Published LW 25 August 2017.

NSW Government (2017b). *Guidance to assist a decision-maker to determine a serious and irreversible impact.* State of New South Wales. Office of Environment and Heritage.

NSW Government (2018). *Biodiversity Assessment Method Operational Manual – Stage 1.* State of New South Wales and Office of Environment and Heritage

NSW Scientific Committee (2002). *Final Determination for the TSC Act endangered listed ecological community White Box – Yellow Box – Blakely's Red Gum Woodland*. Gazetted 15 March 2002.

NSW Scientific Committee (2011). *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*. Gazetted 10 June 2011.

Strahler, AN (1952). *Hypsometric (area-altitude) analysis of erosional topology*. Geological Society of America Bulletin 63 (11): 1117–1142.

Subdivision Layout. *Jumping Creek Lot 5 DP1199045*. Draft Revision E, 18 January 2019.

Queanbeyan Local Environment Plan (2012).

- *LEP Land Zoning Map - Sheet LZN_005 and LZN_006*
- *LEP Lot Size Map - Sheet LSZ_005 and LSZ_006.*
- *LEP Terrestrial Biodiversity Map - Sheet BIO_001.*

Appendices

Appendix A. BAM plot/transect scores

PCT code	Veg. Zone	Plot no.	Species richness						Cover (%)						
			Tree species	Shrub species	Grass species	Forb species	Fern species	Other species	Tree	Shrub	Grass	Forb	Fern	Other	High threat weed
1093	1	1	3	5	2	7	0	0	20	20.4	0.2	0.7	0	0	0
		2	2	6	1	3	0	0	35	3.6	0.1	0.3	0	0	0
		3	2	4	2	7	0	1	25	5.4	1.2	0.8	0	0.5	5.1
	2	1	0	3	2	5	0	1	0	31.5	8	0.6	0	0.1	0.2
		2	0	4	0	1	0	0	0	85.3	0	0.1	0	0	0
		3	0	2	1	1	0	1	0	70.1	1	0.1	0	0.1	6
	3	1	0	0	1	2	0	0	0	0	0.2	0.2	0	0	20.1
		2	1	1	2	4	1	0	1.5	1.6	4.5	3	0.1	0	20.3
1334	1	1	2	3	2	3	0	2	45	5.2	1.1	0.3	0	1.1	2.6
		2	1	4	1	10	0	1	15	10.2	1	1.9	0	0.1	0.9
		3	3	2	5	7	1	4	31	48	2.4	0.8	0.1	0.4	3.4
		4	2	5	8	8	1	2	33	25.2	2.7	1	0.1	0.2	5.2
		5	1	2	2	8	1	1	25	72	0.3	0.8	0.1	0.2	0.2
	2	1	1	0	3	4	0	2	15	0	0.3	0.4	0	2.6	19.6
		2	2	3	1	1	0	0	55	10.1	0.1	0.1	0	0	10.4
	3	1	0	0	1	4	0	0	0	0	2	0.8	0	0	55.7
		2	0	0	4	1	0	0	0	0	0.6	0.1	0	0	21.5
		3	0	0	0	5	0	0	0	0	0	0.6	0	0	30.2
		4	0	1	0	1	0	0	0	0.1	0	0.1	0	0	3.4
		5	1	2	0	1	0	0	5	25	0	0.1	0	0	66
		6	0	0	0	0	0	0	0	0	0	0	0	0	53.1
		7	0	2	1	0	0	0	0	10.1	0.1	0	0	0	85
		8	0	1	1	1	0	0	0	2	0.1	3	0	0	30.3

PCT code	Veg. Zone	Plot no.	Tree regeneration	Large trees (count)	Trees with hollows (count)	Litter cover (%)	Fallen logs (m)	Tree composition (count)						
								Stems < 5 cm	Stems 5-10 cm	Stems 10-20 cm	Stems 20-30 cm	Stems 30-50 cm	Stems 50-80 cm	Stems 80 + cm
1093	1	1	Y	0	1	30	11	Y	Y	Y	Y	Y	-	-
		2	-	1	1	71.8	8	-	Y	Y	Y	Y	-	1
		3	Y	2	4	38.4	9	Y	Y	Y	-	Y	1	1
	2	1	-	0	0	6	0	-	-	-	-	-	-	-
		2	-	0	0	24	0	-	-	-	-	-	-	-
		3	-	0	0	45	0	-	-	-	-	-	-	-
	3	1	-	0	0	3.6	0	-	-	-	-	-	-	-
		2	-	0	0	7.1	0	-	-	Y	-	-	-	-
1334	1	1	Y	1	1	63.4	25	Y	Y	Y	Y	-	-	1
		2	Y	2	1	52	16	Y	Y	Y	-	Y	2	-
		3	Y	1	0	74	45	Y	Y	Y	Y	Y	1	-
		4	Y	1	1	67	40	Y	Y	Y	Y	Y	-	1
		5	Y	0	0	91.6	0	Y	-	Y	Y	Y	-	-
	2	1	Y	1	1	69.6	9	Y	Y	Y	Y	Y	-	1
		2	Y	1	1	95	50	Y	Y	Y	Y	Y	-	1
	3	1	-	0	0	25.8	0	-	-	-	-	-	-	-
		2	-	0	0	23.8	0	-	-	-	-	-	-	-
		3	-	0	0	65	0	-	-	-	-	-	-	-
		4	-	0	0	28	0	-	-	-	-	-	-	-
		5	Y	0	0	46.2	10	Y	Y	Y	-	-	-	-
		6	-	0	0	62	20	-	-	-	-	-	-	-
		7	-	0	0	75	20	-	-	-	-	-	-	-
		8	-	0	0	69.6	8	-	-	-	-	-	-	-

Appendix B. Flora Species Recorded

Common name	Scientific name
Exotic	
Sheep's Sorrel	*Acetosella vulgaris*
Tree of Heaven	*Ailanthus altissima*
European Hackberry	*Celtis australis*
Common Centaury	*Centaurium* sp.
Mouse-ears	*Cerastium* sp.
Yellow Centaury	*Cicendia quadrangularis*
Spear Thistle	*Cirsium vulgare*
Hemlock	*Conium maculatum*
Grey Cottoneaster	*Cotoneaster franchetii*
Common Hawthorn	*Crataegus monogyna*
Dogstail Grass	*Cynosurus echinatus*
Tall Flat-sedge	*Cyperus eragrostis*
Paterson's Curse	*Echium plantagineum*
Goosegrass	*Galium aparine*
Buchan Weed	*Hirschfeldia incana*
St John's Wort	*Hypericum perforatum*
Smooth Cats-ear	*Hypochaeris glabra*
Flatweed	*Hypochaeris radicata*
Broadleaf Privet	*Ligustrum lucidum*
White Horehound	*Marrubium vulgare*
Red-flowered Mallow	*Modiola caroliniana*
Forget-me-not	*Myosotis discolour*
Serrated Tussock	*Nassella trichotoma*
Scotch Thistle	*Onopordum acanthium*
Common Prickly Pear	*Opuntia stricta*
Proliferous Pink	*Petrorhagia nanteuilii*
Radiata Pine	*Pinus radiata*
Plantain / Lamb's Tongue	*Plantago lanceolata*
White Poplar	*Populus alba*
Black Poplar	*Populus nigra*
Brazilian Whitlow	*Pronychia brasiliana*
Plum	*Prunus* sp.
Bracken Fern	*Pteridium esculentum*
Orange Firethorn	*Pyracantha angustifolia*
Onion Grass	*Romulea rosea*

Common name	Scientific name
Briar Rose	*Rosa rubiginosa*
Blackberry	*Rubus fruticosus*
Willow	*Salix* sp.
Apple of Sodom	*Solanum linnaeanum*
Clover	*Trifolium* sp.
Elm	*Ulmus* sp.
Stinging Nettle	*Urtica dioica*
Common Mullein	*Verbascum thapsus*
Common Vetch	*Vicia sativa*
Native	
Cootamundra Wattle	*Acacia bailyana*
Early Wattle	*Acacia genistifolia*
Black Wattle	*Acacia mearnsii*
Red-leaved Wattle	*Acacia rubida*
Sheep's Burr	*Acaena ovina*
Honeypots	*Acrotriche serrulata*
Austral bugle	*Ajuga australis*
Hairy Joyweed	*Alternanthera nana*
Mistletoe	*Amyema* sp.
Necklace Fern	*Asplenium flabellifolium*
Native Cranberry	*Astroloma humifusum*
Tall Speargrass	*Austrostipa bigeniculata*
Rough Speargrass	*Austrostipa scabra*
Matted Bossiaea	*Bossiaea buxifolia*
Red-leg Grass	*Bothriochloa macra*
Daphne Heath	*Brachyloma daphnoides*
Sticky Everlasting	*Bracteantha viscosa*
Rock Lily	*Bulbine glauea*
Native Blackthorn	*Bursaria lasiophylla*
Long-leaf Cassinia	*Cassinia longifolia*
Wild Rosemary	*Cassinia quinquefaria*
Rock Fern	*Cheilanthes sieberi*
Common Everlasting	*Chrysocephalum apiculatum*
Yellow Buttons	*Chrysocephalum semipapposum*
Small-leaved Clematis	*Clematis microphylla*
Australian Bindweed	*Convolvulus erubescens*
Bear's Ears	*Cymbonotus lawsonianus*

Common name	Scientific name
Barbed Wire Grass	*Cymbopogon refractus*
Native Carrot	*Daucus glochidiatus*
Broom Bitter Pea	*Daviesia genistifolia*
Slender Tick-trefoil	*Desmodium varians*
Blue Flax-Lily	*Dianella revoluta*
Kidney Weed	*Dichondra repens*
Showy Parrot-Pea	*Dillwynia sericea*
Climbing Saltbush	*Einadia nutans*
Common Wheat Grass	*Elymus scaber*
Blakely's Red Gum	*Eucalyptus blakelyi*
Apple Box	*Eucalyptus bridgesiana*
Red Stringybark	*Eucalyptus macrorhyncha*
Yellow Box	*Eucalyptus melliodora*
Bundy	*Eucalyptus nortonii*
Red Box	*Eucalyptus polyanthemos*
Scribbly Gum	*Eucalyptus rossii*
Caustic Spurge	*Euphorbia drummondii*
Native Cherry	*Exocarpus cupressiformis*
Rough Bedstraw	*Galium gaudichaudii*
Native Geranium	*Geranium solanderi*
Twining Glycine	*Glycine clandestina*
Common Raspwort	*Gonocarpus tetragynus*
Ivy Goodenia	*Goodenia hederacea*
Cut-Leaved Goodenia	*Goodenia pinnatifida*
Hoary Guinea Flower	*Hibbertia obtusifolia*
Grey Guinea Flower	*Hibbertia rupicola*
Stinking Pennywort	*Hydrocotyle laxiflora*
Small-leaved Pennywort	*Hydrocotyle peduncularis*
Native St John's Wort	*Hypericum gramineum*
Australian Indigo	*Indigofera australis*
Red-Anther Wallaby Grass	*Joycea pallida*
Pinrush	*Juncus filicaulis*
Burgan	*Kunzea ericoides*
Scaly Buttons	*Leptorhynchos squamatus*
Silver Tea-tree	*Leptospermum multicaule*
Hairy Beard-Heath	*Leucopogon microphyllus*
Wattle Mat-rush	*Lomandra filiformis* subsp. *coriacea*

Common name	Scientific name
Wattle Mat-rush	*Lomandra filiformis* subsp. *filiformis*
Spiny-head Mat-rush	*Lomandra longifolia*
River Bottlebrush	*Melaleuca paludicola*
Bottlebrush	*Melaleuca* sp.
Weeping Grass	*Microlaena stipoides*
Woody-Root Oxalis	*Oxalis perennans*
Hairy Panic	*Panicum effusum*
Slender Knotweed	*Persicaria decipiens*
Creeping Knotweed	*Persicaria prostrata*
Curved Rice-flower	*Pimelia curviflora*
River Tussock-grass	*Poa labillardieri*
Snowgrass	*Poa sieberiana*
Narrow-leaved Pomaderris	*Pomaderris angustifolia*
Birch Pomaderris	*Pomaderris betulina*
Woolly-headed Pomaderris	*Pomaderris eriocephala*
Swamp Dock	*Rumex brownii*
Wallaby Grass	*Rytidosperma* sp.
Sheep's Burnet	*Sanguisorba minor*
Cotton Fireweed	*Senecio quadridentatus*
Narrawa Burr	*Solanum cinereum*
Smooth Solengyne	*Solenogyne dominii*
Creamy Candles	*Stackhousia monogyna*
Prickly Starwort	*Stellaria pungens*
Nodding Blue Lily	*Stypandra glauca*
Pink Five-Corners	*Styphelia triflora*
Kangaroo Grass	*Themeda triandra*
Narrow-leaved New Holland Daisy	*Vittadinia muelleri*
Native Bluebell	*Wahlenbergia communis*
Sprawling / Common Bluebell	*Wahlenbergia gracilis*

Appendix C. Fauna Species Recorded

Class	Common name	Scientific name	BC Act status
Amphibia	Common Eastern Froglet	*Crinia signifera*	Protected
Amphibia	Spotted Marsh Frog	*Limnodynastes tasmaniensis*	Protected
Amphibia	Southern Banjo Frog	*Limnodynastes dumerilii*	Protected
Arachnida	Black Rock Scorpion	*Urodacus manicatus*	Protected
Aves	Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	Protected
Aves	Brown Thornbill	*Acanthiza pusilla*	Protected
Aves	Eastern Spinebill	*Acanthorhynchus tenuirostris*	Protected
Aves	Red Wattlebird	*Anthochaera carunculata*	Protected
Aves	Wedge-tail Eagle	*Aquila audax*	Protected
Aves	**Dusky Woodswallow**	***Artamus cyanopterus***	**Vulnerable**
Aves	Sulphur-crested Cockatoo	*Cacatua galerita*	Protected
Aves	Horsfield's Bronze-cuckoo	*Chalcites basalis*	Protected
Aves	Australian Wood Duck	*Chenonetta jubata*	Protected
Aves	Australian Raven	*Corvus coronoides*	Protected
Aves	Laughing Kookaburra	*Dacelo novaeguineae*	Protected
Aves	White-faced Heron	*Egretta novaehollandiae*	Protected
Aves	Galah	*Eolophus roseicapilla*	Protected
Aves	Eastern Yellow Robin	*Eopsaltria australis*	Protected
Aves	Brown Falcon	*Falco berigora*	Protected
Aves	Nankeen Kestrel	*Falco cenchroides*	Protected
Aves	Australian Magpie	*Gymnorhina tibicen*	Protected
Aves	Superb Fairy-wren	*Malurus cyaneus*	Protected
Aves	Superb Lyrebird	*Menura novaehollandiae*	Protected
Aves	Rainbow Bee-eater	*Merops ornatus*	Protected
Aves	Leaden Flycatcher	*Myiagra rubecula*	Protected
Aves	Red-browed Finch	*Neochmia temporalis*	Protected
Aves	White-eared Honeyeater	*Nesoptilotis leucotis*	Protected
Aves	Rufus Whistler	*Pachycephala rufiventris*	Protected
Aves	Spotted Pardalote	*Pardalotus punctatus*	Protected
Aves	Tree Martin	*Petrochelidon nigricans*	Protected
Aves	**Scarlet Robin**	***Petroica boodang***	**Vulnerable**
Aves	Common Bronzewing	*Phaps chalcoptera*	Protected
Aves	Noisy Friarbird	*Philemon corniculatus*	Protected
Aves	Grey Fantail	*Rhipidura albiscapa*	Protected
Aves	Willie Wagtail	*Rhipidura leucophrys*	Protected
Aves	Pied Currawong	*Strepera graculina*	Protected

Class	Common name	Scientific name	BC Act status
Aves	Common Starling	*Sturnus vulgaris*	-
Aves	Double-barred Finch	*Taeniopygia bichenovii*	Protected
Aves	European Blackbird	*Turdus merula*	-
Mammalia	Rusa Deer	*Cerva timorensis*	-
Mammalia	Eastern Grey Kangaroo	*Macropus giganteus*	Protected
Mammalia	**Eastern Bent-wing Bat**	***Miniopterus schreibersii oceanensis***	**Vulnerable**
Mammalia	White-striped Mastiff Bat	*Austronomus australis*	Protected
Mammalia	Southern Freetail Bat	*Mormopterus ridei*	Protected
Mammalia	Gould's Wattled Bat	*Chalinolobus gouldii*	Protected
Mammalia	Chocolate wattled Bat	*Chalinolobus morio*	Protected
Mammalia	Large Forest Bat	*Vespadelus darlingtoni*	Protected
Mammalia	Little Forest Bat	*Vespadelus vultumus*	Protected
Mammalia	European Rabbit	*Oryctolagus cuniculus*	-
Mammalia	Common Wombat	*Vombatus ursinus*	Protected
Reptilia	Boulenger's Skink	*Morethia boulengeri*	Protected
Reptilia	Three-toe Skink	*Saiphos equalis*	Protected

Appendix D. Likelihood of Occurrence

Key for below table

EPBC Act:

CE - critically endangered

E - endangered

V - vulnerable

CD - conservation dependent

BC Act:

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

E1 - endangered species (Schedule 1, Part 2)

E2 - endangered population (Schedule 1, Part 2, Division 4)

E4 - presumed extinct (Schedule 3, Part 1)

V1 - vulnerable species (Schedule 2, Part 3)

Note: The brief species distribution and habitat descriptions provided in the below table are sourced / appropriated 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.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Birds				
Anthochaera phrygia Regent Honeyeater	CE	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 It is possible that the species may visit the subject land to forage. The subject land does not contain nesting resources or foraging resources of potential significance to the species.
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 along roadsides and on golf courses. The south-eastern population migrates north in autumn.	**Confirmed** Species was recorded in the study area during field surveys.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
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 of significance for this species on the subject land.
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 of significance for this species on the subject land.
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 Southern Tablelands region, however they have been observed on occasion to breed in Box-Gum Woodland and other similar lowland habitat around Canberra (R. Speirs pers. obs., M. Mulvaney pers. comm.).	Low It is possible that the species may visit the subject land to forage. The subject land does not contain nesting resources or foraging resources of potential significance to the species.

Species Name	EPBC Act Status	BC 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. On the Southern Tablelands of the NSW and the ACT 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 occurs between March and August.	Low It is possible that the species may visit the subject land, however the subject land does not contain nesting resources or foraging resources of potential significance to the species.
Chthonicola sagittata Speckled Warbler	-	V1	The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat includes scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area. The diet consists of seeds and insects, with most foraging taking place on the ground around tussocks and under bushes and trees. Pairs are sedentary and occupy a breeding territory of about ten hectares, with a slightly larger home-range when not breeding. The rounded, domed, roughly built nest of dry grass and strips of bark is located in a slight hollow in the ground or the base of a low dense plant.	**Confirmed** EcoLogical Australia (2010) recorded the species within the study area. However, the subject land has been degraded to the extent that it does not contain nesting resources or foraging resources of potential significance to the species.
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies)	-	V1	In the region, Brown Treecreepers occur in dry woodlands and open forest below 1,000 metres. Brown Treecreepers also frequent paddocks and grasslands where there are sufficient logs, stumps and dead trees nearby. The species prefers relatively undisturbed woodland and dry open forest where the native understorey, especially grasses, has been preserved. The species usually prefers predominantly rough-barked trees such as Stringybarks and rough barked Boxes.	Low It is possible that the species may visit the subject land to forage. The subject land does not contain nesting resources or foraging resources of potential significance to the species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Daphoenositta chrysoptera Varied Sittella	-	V1	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 It is possible that the species may visit the subject land to forage. The subject land does not contain nesting resources or foraging resources of potential significance to the species.
Grantiella picta Painted Honeyeater	V	V1	The Painted Honeyeater is found in Queensland and New South Wales west of the Great Dividing Range, through to northern Victoria. The species displays some migratory movement and is occasionally found in the Northern Territory and is a vagrant to South Australia and the ACT. The species frequents eucalypt forests and woodlands, particularly those that are infested heavily with mistletoes.	**Confirmed** EcoLogical Australia (2010) recorded the species within the study area. However, the subject land has been degraded to the extent that it does not contain nesting resources or foraging resources of potential significance to the species.
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.	Low The subject land is likely to be part of the large foraging range of a pair of Little Eagles, however no indications of breeding activity (i.e. large stick nests) were observed on the subject land or nearby during the survey.
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 It is possible that the species may visit the subject land to feed on flowering eucalypts. The subject land does not contain foraging resources of potential significance to the species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Melanodryas cucullata cucullata Hooded Robin (southeastern form)	-	V1	The Hooded Robin occupies drier eucalypt forest, woodland and scrub, grasses and low shrubs, as well as cleared paddocks with regrowth or stumps. The species uses stumps, posts or fallen timber from which to locate prey on the ground. The species is found in woodland, often with scattered Yellow Box and/or Blakely's Red Gum, with long grass and low shrubs, or fallen logs.	Low It is possible that the species may visit the subject land to forage. The subject land does not contain nesting resources or foraging resources of potential significance to the species.
Petroica boodang Scarlet Robin	-	V1	The Scarlet Robin is found in south-eastern Australia (extreme south-east Queensland to Tasmania, western Victoria and south-east South Australia) and south-west Western Australia. In NSW it occupies open forests and woodlands from the coast to the inland slopes, breeding in drier eucalypt forests and temperate woodlands.	**Confirmed** Species was recorded foraging in the study area during field surveys.
Petroica phoenica Flame Robin	-	V1	The Flame Robin is found in south-eastern Australia, from the Queensland border to Tasmania, western Victoria and south-east South Australia. In NSW it breeds in upland moist eucalypt forests and woodlands, often on ridges and slopes, in areas of open understorey. The species migrates in winter to more open lowland habitats such as grassland with scattered trees and open woodland on the inland slopes and plains.	Low It is possible that the species may visit the subject land to forage. The subject land does not contain nesting resources or foraging resources of potential significance to the species.
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 There is no potential habitat of significance for this species on the subject land.

Species Name	EPBC Act Status	BC 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 was not observed on the subject land or nearby during the field surveys, however it is possible that the species may visit the subject land to forage. It is unlikely that Superb Parrots would breed in the remnant trees on the subject land. The subject land does not contain foraging resources of potential significance to the species.
Rostratula australis Australian Painted Snipe	V	E1	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. The species prefers freshwater wetlands, ephemeral or permanent, although it has been recorded in brackish waters.	Negligible There is no potential habitat of significance for this species on the subject land.
Stagonopleura guttata Diamond Firetail	-	V1	The Diamond Firetail is found in eastern Australia, from Eyre Peninsula, South Australia, to south-eastern Queensland. There has been a decline in density throughout the range, and many remaining populations may now be isolated. The species inhabits a wide range of eucalypt-dominated vegetation communities that have a grassy understorey, including woodland and mallee.	Low It is possible that the species may visit the subject land to forage. The subject land does not contain nesting resources or foraging resources of potential significance to the species.
Fish and Crustacea				
Maccullochella peelii Murray Cod	V	-	The Murray Cod's natural distribution extends throughout the Murray-Darling basin ranging west of the divide from south east Queensland, through NSW into Victoria and South Australia. The species is found in the waterways of the Murray– Darling Basin in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers, billabongs and large deep holes. Murray Cod is entirely a freshwater species and will not tolerate high salinity levels.	Negligible There is no potential habitat on the subject land for the species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
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 on the subject land for the species.
Bidyanus bidyanus Silver Perch	CE	V1	Silver perch are endemic to the Murray-Darling system (including all states and sub-basins). They show a general preference for faster-flowing water, including rapids and races, and more open sections of river, throughout the Murray-Darling Basin. Silver perch are a highly migratory freshwater fish. The extensive migration of adults, particularly during flooding, has long been recognised and is considered to be part of their spawning behaviour.	Negligible There is no potential habitat within the study area for this 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 Molonglo 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 The species is not known to occur near the study area, and the ephemeral creek systems are unlikely to provide potential habitat for the species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Litoria booroolongensis Booroolong Frog	E	-	The Booroolong Frog is restricted to tablelands and slopes in NSW and north-east Victoria at 200–1300 m above sea level. The species is predominantly found along the western-flowing streams and their headwaters of the Great Dividing Range, and a small number of eastern-flowing streams in the north end of its range. The Booroolong Frog occurs along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock structures within stream margins, or near slow-flowing connected or isolated pools that contain suitable rock habitats. Streams range from small slow-flowing creeks to large rivers in dissected mountainous country, tablelands, foothills and lowland plains. Primary habitat requirements for the Booroolong Frog are extensive rock bank structures along permanent rivers. The species can occur in cleared grazing land and pasture.	Negligible The species is not known to occur near the study area, and the ephemeral creek systems are unlikely to provide potential habitat for the species.
Litoria castanea Yellow-spotted Tree Frog	E	-	The Yellow-spotted Tree Frog previously had a disjunct distribution, being recorded on the New England Tablelands and on the Southern Tablelands from Lake George to Bombala. The species has only recently (2010) been rediscovered on the Southern Tablelands. Prior to this the species had not been recorded on the Southern Tablelands since the 1970s. Found in large permanent ponds, lakes and dams with an abundance of bulrushes and other emergent vegetation, it shelters during autumn and winter under fallen timber, rocks, other debris or thick vegetation.	Negligible The species is not known to occur near the study area, and the ephemeral creek systems are unlikely to provide potential habitat for the species.
Litoria raniformis Growling Grass Frog	V	E1	In NSW, the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. Usually found in or around permanent or ephemeral swamps or billabongs with an abundance of bulrushes and other emergent vegetation along floodplains and river valleys. The species has also been found in irrigated rice crops. Outside the breeding season animals disperse away from water and take shelter beneath ground debris such as fallen timber and bark, rocks, grass clumps and in deep soil cracks. The species previously occurred on the Southern Tablelands at a number of sites within the Murrumbidgee River corridor, however it is now widely considered to have become extinct on the Southern Tablelands.	Negligible The species is not known to occur near the study area, and the ephemeral creek systems are unlikely to provide potential habitat for the species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Insects				
Synemon plana Golden Sun Moth	CE	E1	The Golden Sun Moth's NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. The species occurs in Natural Temperate Grasslands and Box-Gum Grassy Woodland in which the groundcover is dominated by Wallaby Grasses (*Rytidosperma* spp.). It is believed that the females lay up to 200 eggs at the base of the Wallaby Grass tussocks. After hatching, the larvae tunnel underground where they remain feeding on the roots of Wallaby Grass tussocks. The species is also known to feed on the introduced species (and Weed of National Significance), Chilean Needle Grass *Nassella neesiana*.	Negligible There is no potential habitat on the subject land for the species.
Mammals				
Chalinolobus dwyeri Large-eared Pied Bat	V	V1	The Large-eared Pied Bat appears to exist in a number of small populations throughout its range. Very few maternity sites are known. The species requires a combination of sandstone cliff/escarpment to provide roosting habitat that is adjacent to higher fertility sites, particularly box gum woodlands or river/rainforest corridors which are used for foraging.	Low The species is not known to occur near the study area and was not recorded during ANABAT bat surveys.
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 ha and 1000ha, while males have larger home ranges of between 2000 ha and 5000ha. Breeding occurs from May to August.	Low The degradation and proximity to human settlements make this site unlikely to contain nesting resources or foraging resources of potential significance to the species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Miniopterus schreibersii oceanensis Eastern Bent-wing 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** Species was confirmed foraging within the study area via ANABAT bat surveys. However, the subject land does not contain potential roosting and/or breeding habitat (caves, mines, water tunnels, etc.).
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 There is no suitable habitat on the subject land for the species, and the species is not known to occur in the locality.
Petrogale penicillata Brush-tailed Rock-wallaby	V	E1	In NSW they occur from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. They occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. They browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees.	Negligible There is no suitable habitat on the subject land for the species, and the species is not known to occur in the locality.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
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.	Low The species is known to occur in the locality and could forage within the more intact portions of the study area (i.e. PCT1093 Zone 1 and PCT1334 Zone 1). However, no evidence of the Koala was detected (e.g. scats, scratch marks). In addition, the vegetation within the subject land (i.e. the proposed development footprint) has been degraded to the degree that it is unlikely to provide habitat of significance for the species.
Pteropus poliocephalus Grey-headed Flying Fox	V	V1	The Grey-headed Flying Fox occurs in the coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. Whilst Brisbane, Newcastle, Sydney and Melbourne are occupied continuously, the species is widespread throughout their range during summer. In autumn the species occupies coastal lowlands and is uncommon inland. In winter the species congregates in coastal lowlands north of the Hunter Valley and is occasionally found on the south coast of NSW and on the northwest slopes (associated with flowering eucalypts of these areas). The Grey-headed Flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands. The Grey-headed Flying-fox roosts in aggregations of various sizes on exposed branches. Roost sites are typically located near water, such as lakes, rivers or the coast. The roost at Commonwealth Park in Canberra is the only known roost in the ACT region.	Low It is possible that the species may visit the subject land to forage. The subject land does not contain nesting resources or foraging resources of potential significance to the species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
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. Thought to lay eggs within the ant nests under rocks that it uses as a source of food and shelter and 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 rock with shallow embedment in the soil surface.	Negligible An extensive rock turning survey did not record the species in the subject land or study area.
Delma impar Striped Legless Lizard	V	V1	The Striped Legless Lizard is patchily distributed in grasslands of south-eastern NSW, the ACT, north-eastern, central and south-western Victoria, and south-eastern South Australia. 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. They have also been found in several secondary grassland sites, generally within two kilometres of primary grassland.	Negligible The study area does not support potential habitat for this species.
Tympanocryptis pinguicolla Grassland Earless Dragon	E	E	In the Canberra-Monaro region the Grassland Earless Dragon is restricted to Natural Temperate Grassland that is dominated by perennial tussock-forming species. It is known to make use of grass tussocks as well as small holes in the ground that are also used by invertebrates such as wolf spiders and crickets. The species is known to occur in suitable native grassland habitat in the Majura and Jerrabomberra valleys in the ACT and at 'Letchworth' near Queanbeyan in NSW.	Negligible The study area does not support potential habitat for this species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Varanus rosenbergi Rosenberg's Goanna	-	V1	Rosenberg's Goanna is a medium to large monitor species occurring in southern parts of Western Australia and South Australia, with isolated populations in Victoria and New South Wales. In NSW it has been recorded from coastal areas around Sydney and further south, and west to Mount Victoria and the Namadgi and Kosciusko national parks. The species is found in a range of habitats including coastal heaths, humid woodlands and both wet and dry sclerophyll forests, preferring eucalyptus woodlands and heathland. Termite mounds are a critical habitat component and are used for egg incubation.	Low The species is known to occur in the locality and could forage within the more intact portions of the study area (i.e. PCT1093 Zone 1 and PCT1334 Zone 1). These intact areas contain termite mounds, which are a vital nesting resource for the species. In contrast, the vegetation within the subject land (i.e. the proposed development footprint) has been degraded to the degree that it is unlikely to provide habitat of significance for the species. This is reflected in the paucity of termite mounds in the subject land.
Plants				
Acacia bynoeana Bynoe's Wattle	V	E1	Bynoe's wattle is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. The species is currently known from about 30 locations, with the size of the populations at most locations being very small (1-5 plants). The species occurs in heath or dry sclerophyll forest on sandy soils. It seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple.	Low The species is not known to occur in the locality and was not recorded during surveys.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Caladenia actensis Canberra Spider Orchid	CE	E	This orchid is endemic to the ACT and is only known from two populations on the western lower slopes of Mount Ainslie and Mount Majura. It was previously recorded at Aranda and Campbell, but no longer exists at those locations. The Canberra Spider Orchid grows on shallow, gravelly, brown clay loam soils. The species occurs amongst a groundcover of grasses, forbs and low shrubs, often among rocks. It grows on the transition zone (ecotone) between grassy woodland and dry sclerophyll forest.	Negligible There is no potential habitat in the study area for the species.
Calotis glandulosa Mauve Burr-daisy	V	V	Occurs at higher altitudes between Eden and Dubbo where it grows in grassland and sclerophyll forest. The main distribution is in the Monaro and Kosciuszko regions. The species is found in montane grasslands in the Australian Alps and subalpine grassland (dominated by Poa spp.), Natural Temperate Grassland and Snow Gum Woodlands on the Monaro and Shoalhaven area. The species appears to be a coloniser of bare ground, which explains why it is often seen on roadsides. Apparently common on roadsides in parts of the Monaro but does not persist in heavily-grazed pastures. Dispersed by the sticky burrs.	Negligible The vegetation within the subject land has been heavily grazed and degraded to the degree that it is unlikely to provide potential habitat for the species.
Caladenia tessellata Thick-lipped Spider-orchid	V	E1	Known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. It was also recorded in the Huskisson area in the 1930s. The species occurs on the coast in Victoria from east of Melbourne to almost the NSW border. Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil.	Negligible The vegetation within the subject land has been heavily grazed and degraded to the degree that it is unlikely to provide potential habitat for the species.
Dodonaea procumbens Trailing Hop-bush	V	V	Trailing Hop-bush is found in the dry areas of the Monaro, between Michelago and Dalgety where it occurs mostly in Natural Temperate Grassland or Snow Gum *Eucalyptus pauciflora* Woodland. A single known population occurs at Lake Bathurst (the northern-most occurrence of the species) where it occurs adjacent to the lake bed in grassland dominated by Corkscrew Grass *Austrostipa scabra* and Curly Sedge *Carex bichenoviana*. The species grows on sandy-clay soils in open bare patches where there is little competition from other species. The species often occurs on roadside batters and does not persist in heavily grazed pastures.	Negligible The species is not known to occur in the locality and was not recorded during surveys.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
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 The species was not recorded during surveys.
Eucalyptus macarthurii Camden Woollybutt / Paddys River Box	E	E1	The species is currently recorded from the Moss Vale District to Kanangra Boyd National Park. In the Southern Highlands it occurs mainly on private land, often as isolated individuals in, or on the edges, of paddocks. Isolated stands occur in the north west part of the range on the Boyd Plateau. The only known record in the conservation estate is within Kanangra Boyd National Park. The species occurs on grassy woodland on relatively fertile soils on broad cold flats.	Negligible The species is not known to occur in the locality and was not recorded during surveys.
Haloragis exalata subsp. *Exalata* Wingless Raspwort / Square Raspwort	V	V1	Square Raspwort occurs in 4 widely scattered localities in eastern NSW. It is disjunctly distributed in the Central Coast, South Coast and North Western Slopes botanical subdivisions of NSW. Square Raspwort appears to require protected and shaded damp situations in riparian habitats. Flowering specimens in NSW are recorded from November to January.	Negligible The species is not known to occur in the locality and was not recorded during surveys.
Kunzea cambagei Cambage Kunzea	V	V1	*Kunzea cambagei* occurs in the western and southern parts of the Blue Mountains, NSW, with four main populations with 20–150 individuals. *Kunzea cambagei* occurs in wet heath and woodland on coarse sandy soil on sandstone and quartzite.	Negligible The species is not known to occur in the locality and was not recorded during surveys.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Lepidium hyssopifolium Basalt Peppercress	E	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. Recently recorded localities have predominantly been in weed-infested areas of heavy modification, high degradation and high soil disturbance such as road and rail verges, on the fringes of developed agricultural land or within small reserves in agricultural land. Many populations are now generally found amongst exotic pasture grasses and beneath exotic trees.	Low The species is not known to occur in the locality and was not recorded during surveys.
Lepidium ginninderrense Ginninderra Peppercress	V	E	The species is known from two natural sites in northern ACT, both within Natural Temperate Grassland.	Negligible There is no potential habitat in the study area for the species.
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 in less modified areas. 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.	**Confirmed** EcoLogical Australia (2010) recorded the species within the study area but not within the subject land (i.e. proposed development footprint).
Pelargonium subsp. *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 in the subject land for the species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Pomaderris pallida Pale Pomaderris	V	V1	Pale Pomaderris has been recorded from near Kydra Trig, north-west of Nimmitabel, Tinderry Nature Reserve, and the Queanbeyan River. A record from Byadbo in Kosciuszko National Park has not been relocated. The main distribution is along the Murrumbidgee in the ACT. It was recorded recently in eastern Victoria. This species usually grows in shrub communities surrounded by Brittle Gum *Eucalyptus mannifera* and Red Stringybark *E. macrorhynca* or Black Cypress *Callitris endlicheri* woodland.	Low The species is known to occur in the locality. However, the it is conspicuous when present and was not recorded during surveys.
Prasophyllum petilum Tarengo Leek Orchid	E	E1	When first described in 1991, the Tarengo Leek Orchid was known only from the Hall Cemetery in the ACT. It has since been found at four sites in New South Wales: Captains Flat Cemetery, Ilford Cemetery, Steves Travelling Stock Route (TSR) at Delegate and the Tarengo TSR near Boorowa. The Tarengo Leek Orchid occurs on relatively fertile soils in grassy woodland or natural grassland. The three cemetery sites originally contained grassy woodland, dominated by Snow Gum *Eucalyptus pauciflora* and Black Gum *E. aggregata* at Captains Flat, and Blakely's Red Gum *E. blakelyi* and Yellow Box *E. melliodora* at Hall and Ilford. Both Tarengo TSR and Steves TSR are natural grasslands. The species is intolerant of grazing and this is considered to be the key reason it has been found only within cemeteries and TSRs, land from which grazing has been restricted.	Negligible The vegetation within the subject land has been degraded to the extent that it is unlikely to provide potential habitat for the species.
Pultenaea pedunculata Matted Bush-pea	-	E1	In NSW, the species is represented by only three disjunct populations: in the Cumberland Plains in Sydney, the coast between Tathra and Bermagui, and the Windellama area south of Goulburn (where it is locally abundant). The Matted Bush-pea occurs in a range of habitats. NSW populations are generally among woodland vegetation, but plants have also been found on road batters and coastal cliffs. It is largely confined to loamy soils in dry gullies in populations in the Windellama area. The ability of stems to creep and root from the nodes has made this species a very good coloniser of bare ground in many parts of its range.	Low The species is not known to occur in the locality and was not detected during surveys.

Species Name	EPBC Act Status	BC 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.	Low The species is known to occur in the locality. However, the plant is conspicuous when present and was not detected during surveys.
Swainsona sericea Silky Swainson-pea	-	V1	Silky Swainson-pea is a low growing perennial, found from the Northern Tablelands to the Southern Tablelands and Monaro region as well as further inland on the slopes and plains. The species is found in Natural Temperate Grassland and Snow Gum Woodland on the Monaro, and in Box-Gum Woodland in the Southern Tablelands and South West Slopes.	Negligible The subject land is unlikely to provide potential habitat to the species due to land use history and degraded nature of the vegetation within the subject land.
Swainsona recta Small Purple-pea	E	E	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 subject land is unlikely to provide potential habitat to the species due to land use history and degraded nature of the vegetation within the subject land.
Thesium austral Austral Toadflax	V	-	Found in very small to large populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Austral Toadflax is a root parasite that takes water and some nutrients from other plants, especially Kangaroo Grass. It is often found in damp sites in association with Kangaroo Grass but it is also found on other grass species at inland sites. Occurs on clay soils in grassy woodlands or coastal headlands.	Negligible There is no potential habitat in the subject land for the species.

Appendix E. EPBC Act Significant Impact Criteria Assessment

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland

The *EPBC Act Matters of National Environmental Significance - Significant Impact Guidelines 1.1* (Commonwealth of Australia 2013) provide a number of criteria for use in determining whether an 'action' will have, or is likely to have, a significant impact upon an EPBC Act listed 'critically endangered or endangered ecological community'. An assessment of the proposed development against each of these criteria is provided below.

- *Is there a real chance or possibility that the action will reduce the extent of the ecological community?*

The proposed development will involve the clearance of 0.77 ha of EPBC Act Box-Gum Woodland which occurs within the subject land for the construction of approximately 220 lots and associated services and facilities. The development layout has also been designed in a manner that will minimise to the extent practicable, the impact on the areas EPBC Act Box-Gum Woodland which occur in the wider study area.

Given the above, after all avoidance and mitigation measures are considered, the unavoidable clearance of vegetation for the proposed action will result in a permanent reduction in the extent of the community of 0.77 ha.

- *Is there a real chance or possibility that the action will fragment or increase fragmentation of the ecological community, for example by clearing vegetation for roads or transmission lines?*

The subject land is largely comprised of disturbed land and exotic vegetation. The remaining patch of EPBC Act Box-Gum Woodland in the subject land is small and isolated from other nearby patches of the community. In contrast, the occurrence of EPBC Act Box-Gum Woodland in the study area and wider locality is well connected to larger expanses of the community. These areas will not be impacted by the proposed development.

As such, the removal of the 0.77 ha patch of EPBC Act Box-Gum Woodland associated with the proposed action is unlikely to further fragment the ecological community.

- *Is there a real chance or possibility that the action will adversely affect habitat critical to the survival of the ecological community?*

The small patch of Box-Gum Woodland within the subject land is not a significant remnant of the ecological community. The subject lands historic impacts (i.e. mining, quarrying, grazing/ agriculture) have resulted in the notable degradation of the subject land's ecological values. All areas of the subject land support at least a moderate level weed infestation, and the degree of this infestation will continually increase under a status quo management arrangement. This increase in weed infestation will likely lead to a future reduction in the area of the subject land which meets the criteria for the listed community in future, or prevent the patch from being a mappable feature. As noted above, the Box-Gum Woodland in subject land is poorly connected to other remnant vegetation and is unlikely to be of significant habitat value for fauna. The action will therefore not affect the survival of the ecological community.

- *Is there a real chance or possibility that the action will modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for the ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns?*

The direct impacts of the proposed development will not extend beyond the subject land. Weed monitoring and control will occur to manage the potential impacts of high threat weeds. Similarly, appropriate site-based sediment and erosion controls will be implemented to prevent sedimentation of receiving waterways beyond the development footprint.

Given the above, it is highly unlikely that the proposed development will modify or destroy abiotic factors necessary for the survival of the ecological community.

- *Is there a real chance or possibility that the action will cause a substantial change in the species composition of an occurrence of the ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting?*

The subject land is located on the edges of the urban matrix of Greenleigh and Karabar. It has been heavily disturbed by historic activities including mining, quarrying and grazing/agriculture. It is likely to be predominately inhabited by common native and exotic fauna, particularly birds. The proposed development is unlikely to adversely alter the species composition of the Box-Gum Woodland which surrounds the subject land or within any other patch.

- *Is there a real chance or possibility that the action will cause a substantial reduction in the quality or integrity of an occurrence of the ecological community, including, but not limited to:*

    - *assisting invasive species, that are harmful to the listed ecological community, to become established, or*

    - *causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community?*

Many of the exotic species which occur in the locality already occur throughout the subject land and broader study area. The proposed development is unlikely to result in the introduction and establishment of additional invasive weeds. The construction works for the proposed development may temporarily increase the occurrence of the weed species already present, however appropriate vehicle hygiene and ongoing weed management measures will be implemented to minimise the risk of weed introduction and spread (refer Section 3.1 of this BDAR).

Some exotic pest fauna species are likely to occur within the subject land and surrounds. The proposed development is highly unlikely to increase the incidence of these species given the proximity of the subject land to existing urban areas (i.e. Greenleigh and Karabar). Notably, the proposed development is not likely to introduce or increase the numbers of exotic avifauna present in the area.

It is likely that herbicides will be used within the subject land to control the existing weed infestation and improve the overall ecological condition of the subject land. These herbicides will be applied in a targeted manner to treat specific species. Weed control works will be undertaken by suitably qualified and experienced personnel. It is noted that such chemicals are currently widely used in the locality.

- *Is there a real chance or possibility that the action will interfere with the recovery of the ecological community?*

The action will result in a minor reduction in the extent of the community through the clearance of a small area occurring within subject land. This area is not of particular significance for the conservation of the community in the region, and therefore, the proposed impact is unlikely to interfere with the recovery of the ecological community.

Conclusion

The results of this assessment suggest that the proposed development is unlikely to have a significant impact upon the EPBC Act listed Box-Gum Woodland critically endangered ecological community. In light of the above, referral of the proposed action to the Commonwealth Minister for the Environment and Energy is unwarranted. Notwithstanding this, as the proposed development will remove 0.77 ha of this critically endangered ecological community, the proponent may wish to refer the proposed action to obtain legal certainty.