Appendix D

Biodiversity Development Assessment Reports

- **Option 1 – Existing Power Line Route Corridor**
- **Option 2 – Alternative Power Line Route Corridor**
- **Increased Turbine Envelope**

Biodiversity Development Assessment Report

FLYERS CREEK WIND FARM TRANSMISSION LINE – OPTION 1

OCTOBER 2018

Document Verification

Project Title: Flyers Creek Wind Farm Transmission Line – Option 1

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Final v1.1	10/10/18	Mitch Palmer (BAAS17051)	Freya Gordon	Dave Maynard (BAAS17026)
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ACRONYMS AND ABBREVIATIONS

BAM	Biodiversity Assessment Method
BBAI	Bird and Bat Impact Assessment
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BDAR	Biodiversity Development Assessment Report
BOM	Australian Bureau of Meteorology
CEEC	Critically Endangered Ecological Community
DBH	Diameter at Breast Height
DP&E	Department of Planning and Environment (NSW)
EEC	Endangered Ecological Community
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
FM Act	*Fisheries Management Act 1994* (NSW)
GHG	Greenhouse Gases
ha	hectares
HBT	Hollow-bearing Tree
km	kilometre
kv	kilovolt
LRET	Large-scale renewable energy target
m	M
MNES	Matters of National environmental significance under the EPBC Act (*c.f.*)
NSW	New South Wales
REAP	Regional Environmental Action Plan (NSW)
OEH	Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water (NSW)
SSD	State Significant Development
SEARS	Secretary's Environmental Assessment Requirements
SAII	Serious and Irreversible Impact
SEPP	State Environmental Planning Policy (NSW)
sp/spp	Species/multiple species
TEC	Threatened Ecological Community

EXECUTIVE SUMMARY

Flyers Creek Wind Farm Pty Ltd (Flyer Creek Wind Farm) is planning for the construction and operation of the Flyers Creek Wind Farm, 21 km south of Orange. Planning Modification 4 was lodged (8th August 2018) with the Department of Planning and Environment (DPE), which includes;

- Reinstatement of a 132 kilovolt (kV) transmission line from the on-site substation to a connection point on the Essential Energy (EE) (Orange North to Cadia) transmission line, north of the development site.
- An increase in the wind turbine envelope or rotor swept area (RSA) so as to accommodate newer, more efficient turbine models now available, slightly increasing turbine (blade length and hub height) RSA to 15,394 m2 and brings the minimum RSA to 20 m above ground as opposed to the previous 30m.

The proposed 132 kV transmission line will be approximately 14 km in length and have an expected easement maximum width of 45 m. This Biodiversity Development Assessment Report (BDAR) has been prepared by NGH Environmental on behalf of the proponent, Flyer Creek Wind Farm. Potential bird and bat impacts resulting from the increase of the turbine envelope or RSA have been separately assessed in a Bird and Bat Assessment Impact (BBAI) undertaken by Brett Lane and Associates (BLA) and reported separately.

The proposed transmission line is classified as State Significant Development (SSD) under the State and Regional Development State Environmental Planning Policy (SEPP). The Biodiversity Assessment Methodology (BAM) is the required assessment methodology for SSDs that trigger the NSW Biodiversity Offsets Scheme, under the NSW *Biodiversity Conservation Act 2016 (BC Act).* This report follows the field work methodologies and assessment format required by the BAM.

Comprehensive mapping and field surveys were completed in accordance with the requirements of the BAM. The proposal involves the removal of the following native vegetation:

- Clearing of approximately 1.51 ha of PCT 277 *Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion* resulting in the generation of 16 Ecosystem Credits
- Clearing of approximately 3.5 ha of PCT 1330 *Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion* resulting in the generation of 35 Ecosystem Credits.
- Maximum linear removal of 3.85 ha of Box Gum Grassy Woodland Endangered Ecological Community listed within the BC Act
- The potential removal of 15 habitat trees and the removal of 1 paddock tree generating one (1) ecosystem credits.

One species credit species, the Squirrel Glider (*Petaurus norfolcensis*), was observed within the development site during the site surveys. Two hollow bearing trees that provide breeding habitat may be impacted within vegetation zones for this species. Habitat for another candidate species, the Gang-gang Cockatoo (*Callocephalon fimbriatum*) was identified within the development site. Although unlikely to be present, this species was unable to surveyed for in the recommended survey period. Hollow bearing trees that may provide breeding habitat would be impacted within vegetation zones for this species. Therefore, 14 species credits were generated for both the Squirrel Glider and the Gang-gang Cockatoo.

One threatened flora species, *Eucalyptus canobolensis*, was observed within the development site, although would not be directly impacted by the proposal. Mitigation measures are recommended to ensure indirect impacts are avoided.

An additional assessment of impacts on NSW listed entities also listed under the EPBC Act, was completed. These impacts have been assessed in accordance with the EPBC guidelines and are not considered likely to be significant. No referral is considered necessary to the Federal Department of Environment.

Biodiversity impacts have been assessed at a worst-case scenario, based on an indicative easement (development site) which will be reduced upon final design. Consideration has been given to avoiding and minimising impacts to biodiversity where possible at this stage. Site selection options have been assessed against key environmental, social and economic criteria. Mitigation and management measures will be put in place to adequately address impacts associated with the proposal, both direct and indirect.

Following final detailed design of the Flyers Creek Wind Farm transmission line, the BDAR and associated ecosystem credit calculations will be updated to account for the reduced impacts with offset obligations retired accordingly.

1 INTRODUCTION

Flyers Creek Wind Farm Pty Ltd (Flyer Creek Wind Farm) is planning for the construction and operation of the Flyers Creek Wind Farm, 21 km south of Orange. Planning Modification 4 was lodged with the Department of Planning and Environment (DPE), which includes;

- Reinstatement of a 132 kilovolt (kV) transmission line from the on-site substation to a connection point on the Essential Energy (EE) (Orange North to Cadia) transmission line, north of the development site.
- An increase in the wind turbine envelope so as to accommodate newer, more efficient turbine models now available, increasing turbine dimensions (blade length and hub height).

This Biodiversity Development Assessment Report (BDAR) assesses the impacts of the proposal using the Biodiversity Assessment Method (BAM). This BDAR only assesses the ecological impacts associated with the reinstatement of the transmission line. Potential bird and bat impacts resulting from the increase of the turbine envelope have been separately assessed in a Bird and Bat Assessment Impact (BBAI) undertaken by Brett Lane and Associates (BLA) and reported separately, however prescribed impacts resulting from the increase in turbine envelope are briefly discussed in Section 7.3.

The proposed 132 kV transmission line will be approximately 14 km in length and have an expected easement maximum width of 45 m. The proposed Flyers Creek Wind Farm transmission line (the proposal) is classified as State Significant Development (SSD) under the State and Regional Development State Environmental Planning Policy (SEPP). NGH Environmental has prepared this report on behalf of the proponent (Flyers Creek Wind Farm Pty Ltd).

The following terms are used in this document:

- **Development footprint** – The area of land that is directly impacted by the proposal. This includes the transmission line footprint, switching station and associated construction areas (i.e. compounds, stockpiles). The development footprint is a maximum of 45 m wide and approximately 14 km long. This equates to approximately 63 ha.
- **Development site** – The development site is a 100 m wide route corridor, within which, and following detailed design, the development footprint will be sited and areas of land that are subject to the proposed development. This equates to approximately 140 ha is the study area for the BDAR.
- **Subject land** – All land within the affected lot boundaries.
- **Buffer area** – All land within 500 m of the outside edge of the boundary of the development site.

1.1 THE PROPOSAL

The proposed 132 kV transmission line;

- Will be approximately 14 km in length
- Have poles approximately 24 m in height
- Have a total expected easement width of 45 m for overhead line construction
- Have a total expected easement width of 6m for underground line construction

The route of the transmission line will travel across improved grazing pasture from the proposed substation westwards, traverse Errowanbang Rd and then travel along Panuara Rd reserve before heading north along Cadia Rd reserve and travelling adjacent to Cadia Road within NSW Forestry Corporation state forest.

It should be noted that a transmission line was previously approved as part of the original project approval and then removed at Modification 2 due to land access issues. The approved route is slightly different to that being proposed in this Modification.

The site map in Figure 1-1 to Figure 1-4 illustrates the indicative layout, including a concept development footprint.

1.2 THE DEVELOPMENT SITE

1.2.1 Site location

The proposal site is described as the area around Flyers Creek, along Cadia Road and Panuara Road, 21 km south of Orange and 15 km west of Millthorpe, within both Cabonne and Blayney Shire Local Government Areas. (Figure 1-1). The subject land and development footprint comprise of Lots 8 and 180 DP 750358, Lot 1 DP 1191442, that are privately owned by landholders as well as Lot 103 DP 1040753, Lots 21 and 22 DP 1078095, Lots 8 and Lot 7 DP 1040755 that are owned and managed by NSW Forestry Corporation and Lot 101 DP881593 and Lot 52 DP 39600 that are Crown Land. The subject land and development footprint also include the Blayney Shire and Cabonne Council road reserves.

1.2.2 Site description

The majority of the development site has been cleared of native vegetation and cultivated for agriculture, which is the dominant land use in the area, as well as large areas set aside for the timber industry. Specific to the subject land, this has included:

1. Extensive clearing of native vegetation.
2. Paddocks sown with forage crops and improved pasture.
3. Extensive pine plantations for use in the timber industry.
4. Previous alteration of drainage lines through clearing cropping and damming.

A large proportion of the development site is owned by State Forest and is comprised of Radiata Pine plantations. Remnant native woodlands occur along the road reserve of Cadia Road and Panuara Road and small sections within the pine plantation.

The majority of the Southern section of the development site runs through private property and has been extensively cleared for improved pasture and forage cropping for grazing of sheep and cattle. Some scattered trees of Yellow Box (*Eucalyptus melliodora*) and Blakely's Red Gum (*Eucalyptus blakeyi*) remain within the paddocks as isolated paddock trees or small patches within the paddock. Planted corridors of native vegetation, comprising trees and shrubs of local provenance such as Yellow Box, Long-leaf Box (*Eucalyptus goniocalyx*) and Acacia species occur alongside Cadia Road in the Southern sections of the transmission line route.

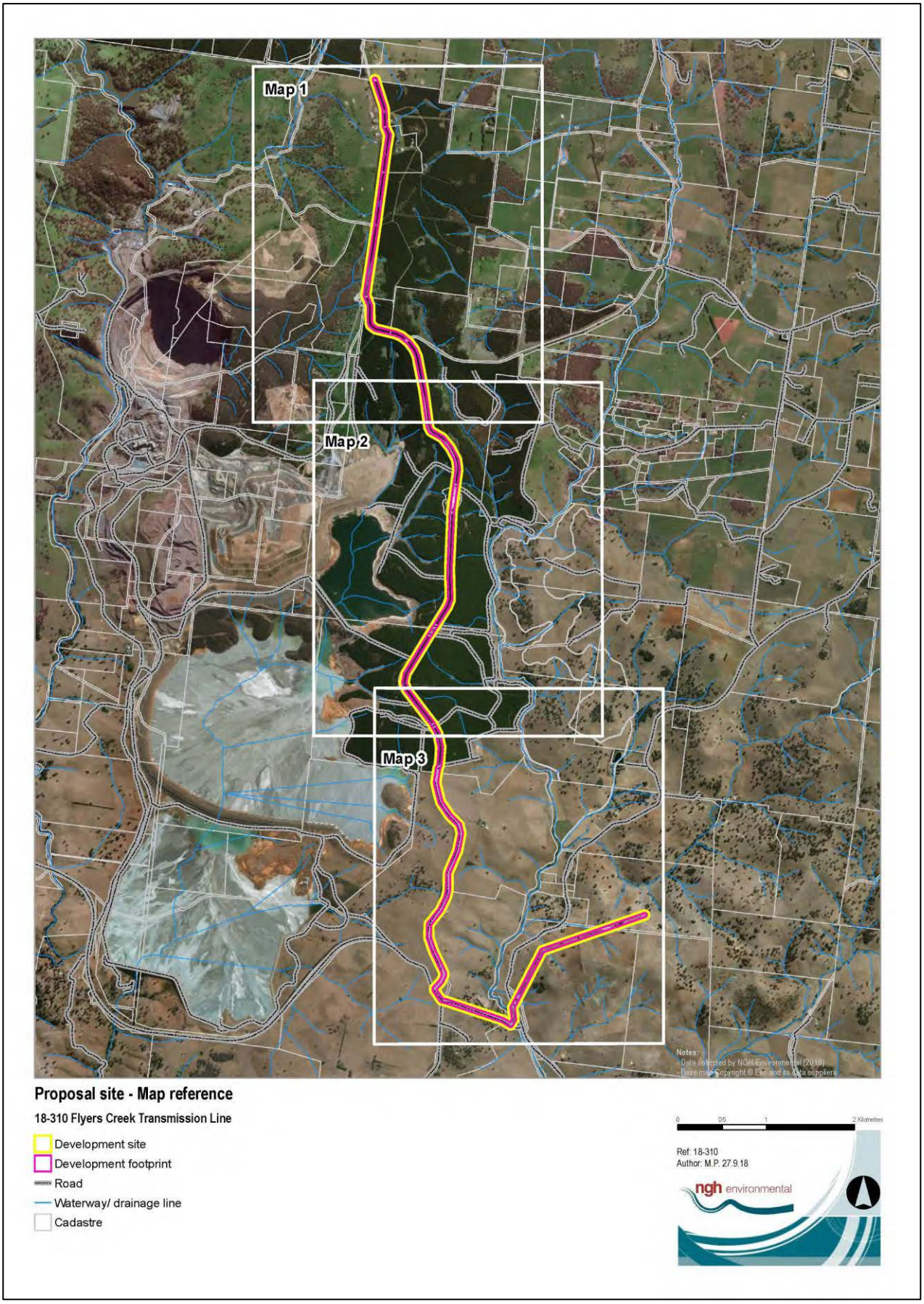

Figure 1-1 Site Map Overview

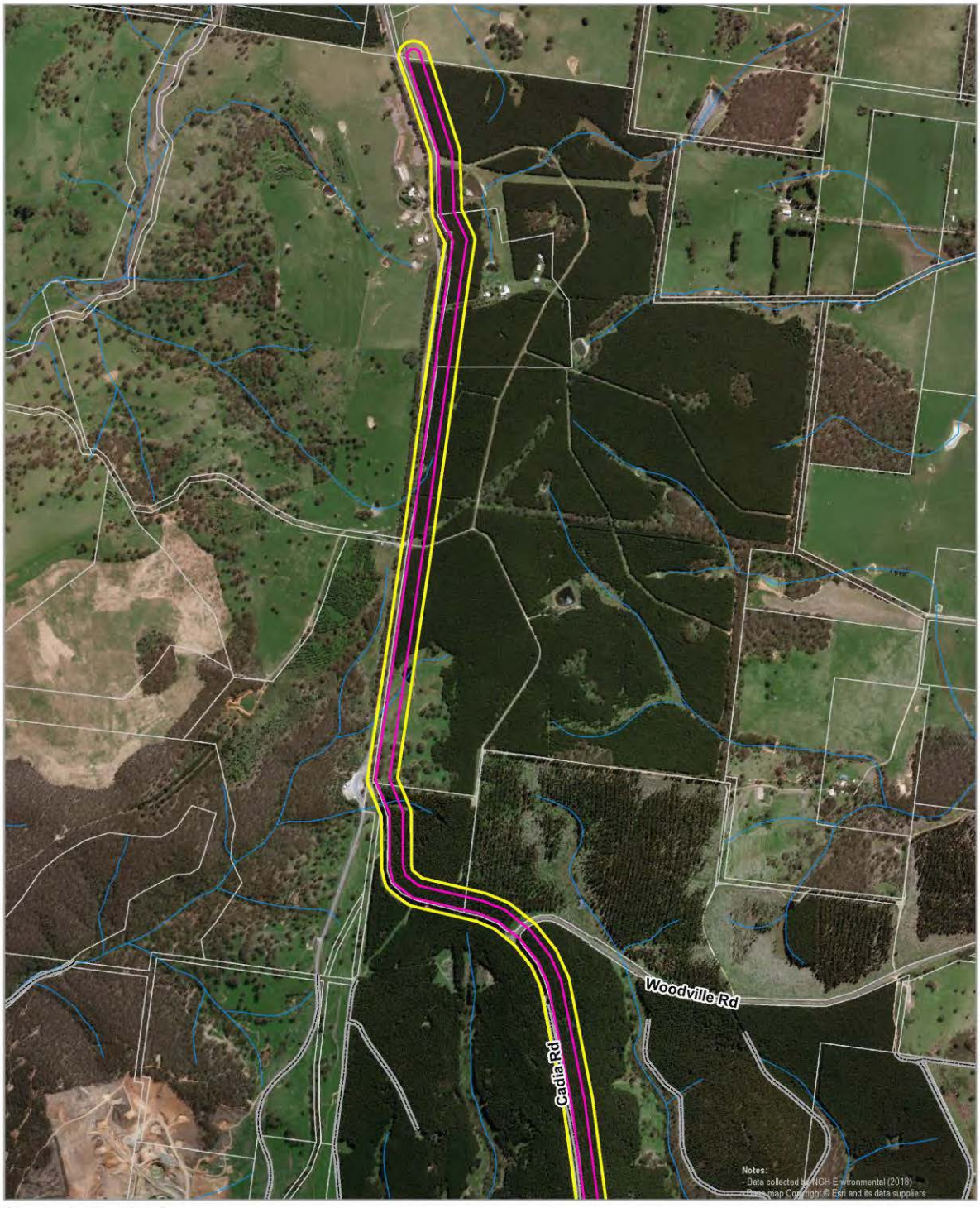

Figure 1-2 Site Map 1 Northern

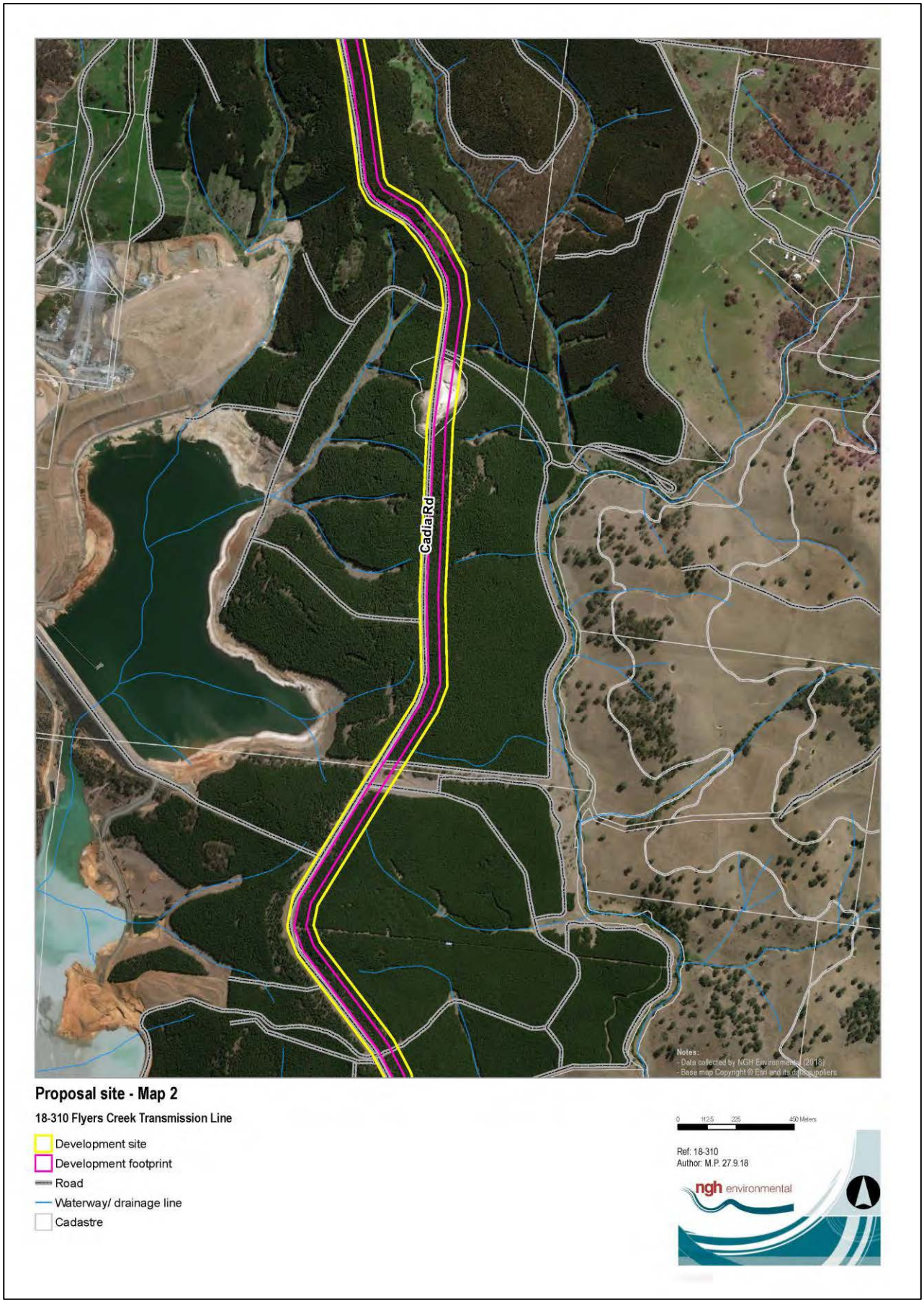

Figure 1-3 Site Map 2 Central

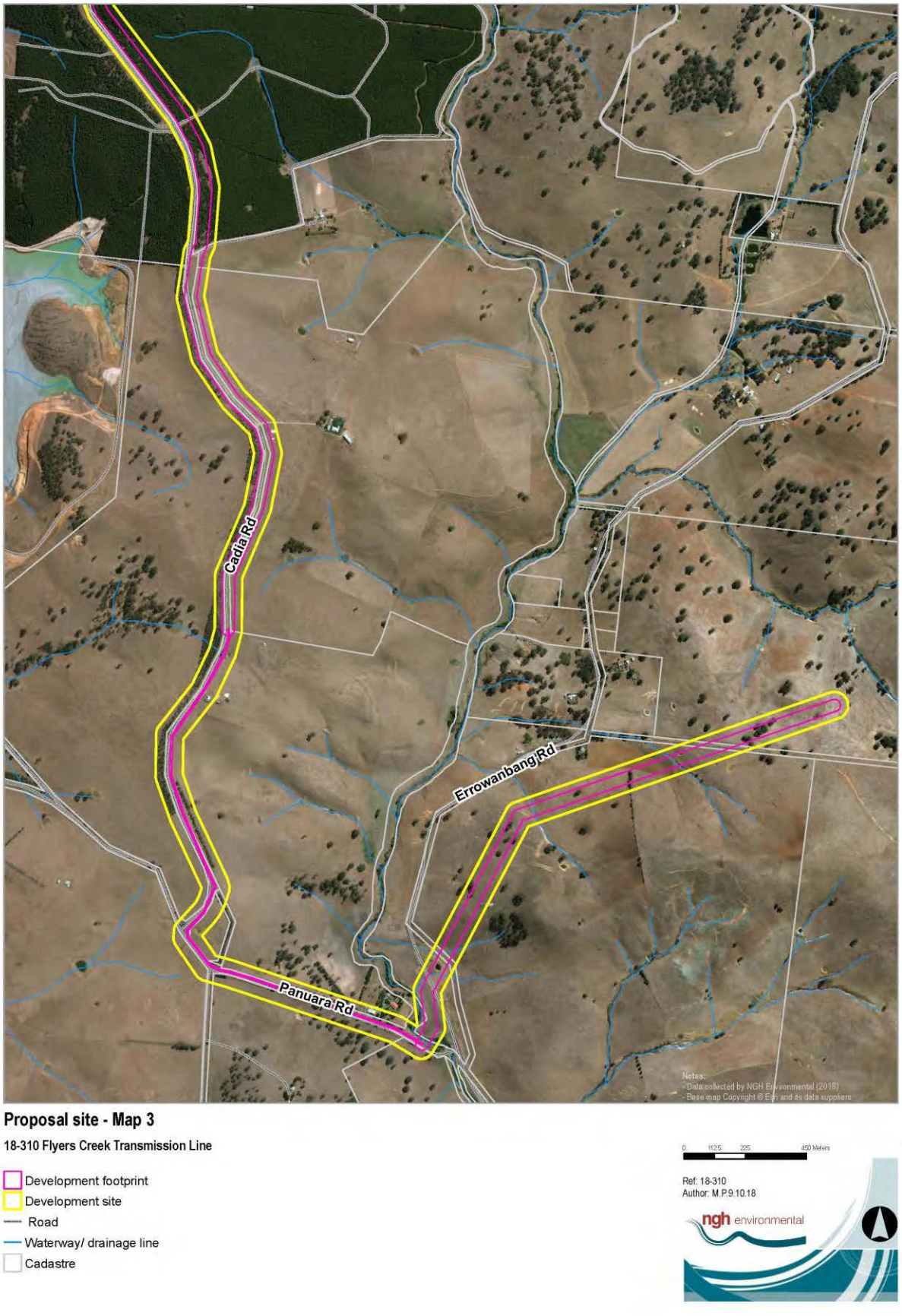

Figure 1-4 Site Map 2 Southern

1.3 STUDY AIMS

This BDAR has been prepared by NGH Environmental on behalf of Flyers Creek Wind Farm to assess the construction of a 132 kV transmission line as part Flyers Creek Wind Farm planning modification 4. As previously mentioned, potential bird and bat impacts resulting from the increase of the turbine envelope have been separately assessed in a BBAI undertaken by BLA and reported separately, however prescribed impacts resulting from the increase in turbine envelope are briefly discussed in Section 7.3.

The Project Approval, as currently modified, contains a number of conditions regulating biodiversity matters. These include conditions D1, D2, D3, D4, D5, D6 and F21(f). These are summarised below.

- D1 - The proponent must ensure that:
    - No EEC is cleared for the project unless the Secretary agrees otherwise,
    - Minimise the clearing of native woodland vegetation, scattered paddock trees and fauna habitat (Including rocky outcrops) within the approved disturbance footprint.
- D2 - Tree trunks and major branches from cleared trees should be used to the fullest extent practicable, to enhance habitat in rehabilitated areas or derived native grasslands and details included in the Construction Flora and Fauna Management Plan.
- D3 - No more than 10 hollow bearing trees should be removed unless the secretary agrees otherwise
- D4 - Prior to the commencement of construction, the proponent shall prepare and submit for the approval of the secretary a Bird and Bat Adaptive Management Plan.
- D5 - Prior to the commencement of construction, the proponent must:
    - Update the baseline mapping of the vegetation and key habitat within the final disturbance area, and
    - Calculate the biodiversity offset credit liability in accordance with the NSW Biodiversity Offsets Policy for Major Projects
- D6 - Within two years of the commencement of construction, the proponent must retire the required biodiversity credits to the satisfaction of OEH. The retirement of the credits must be carried out in accordance with the NSW Biodiversity Offsets Policy for Major Projects.
- F21(f) - A construction flora and fauna management plan to detail how construction impacts on ecology will be minimised and managed.

As the *Biodiversity Conservation Act 2016* (BC Act) has commenced and transitional arrangements for Major Projects ceased, the aim of this BDAR is to address the requirements in accordance with Section 7.17 of the BC Act. Responses from the Office of Environment and Heritage (OEH) indicated the BAM must be used to assess impacts to biodiversity in accordance with the BC Act and documented in a BDAR.

This BDAR also addresses the assessment requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), refer to Section 7.4.

1.4 SOURCE OF INFORMATION USED IN THE ASSESSMENT

The following information sources were used in this BDAR:

- Proposal layers, construction methodology and concept designs provided by Flyers Creek Wind Farm Pty Ltd.
- Australian Government's Species Profiles and Threats (SPRAT) database http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl
- NSW OEH's Threatened Species Profiles http://www.environment.nsw.gov.au/threatenedspeciesapp/
- DPI profiles of threatened species, population, and ecological communities
- Commonwealth Department of Environment and Energy Protected Matters Search Tool

  Accessed online at http://environment.gov.au/epbc/protected-matters-search-tool
- Australia's IBRA Bioregions and sub-bioregions. Accessed September 2018 http://environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps
- Department of Environment and Climate Change NSW (DECC) (2002). Descriptions for NSW (Mitchell) Landscapes, Version 2.
- NSW OEH's Biodiversity Assessment Method (BAM) calculator (http://www.environment.nsw.gov.au/bbccapp/ui/mynews.aspx).
- NSW OEH's BioNet threatened biodiversity database

  Accessed online via login at http://www.bionet.nsw.gov.au/.
- NSW OEH Threatened Species Profiles Accessed September 2018

  http://www.environment.nsw.gov.au/threatenedSpeciesApp/ and

  www.environment.nsw.gov.au/AtlasApp/UI_Modules/
- OEH BioNet Vegetation Classification Database (OEH 2017)

  Accessed online via login at http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx
- OEH VIS Mapping

  Accessed online at http://www.environment.nsw.gov.au/research/VISmap.htm
- Office of Environment and Heritage (OEH) (2017). Biodiversity Assessment Method.
- NSW Government SEED Mapping

  https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU
- NSW Biodiversity Values Map https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap

1.5 CONSULTATION

Consultation with relevant departments is shown in Table 1-1.

Table 1-1 Consultation with relevant departments.

Date	Contact	Reason	Response
24/09/18	Shannon Simpson, OEH Ecosystem Assessment Project Officer	Mapped Important areas for the Swift Parrot and Regent Honeyeater	Development site fell outside draft mapped important areas for both the Swift parrot and Regent honeyeater.

2 LANDSCAPE FEATURES

2.1 IBRA BIOREGIONS AND SUBREGIONS

Bioregions are large, geographically distinct areas of land with common characteristics such as geology, landform patterns, climate, ecological features, and flora and fauna communities. The development site is located within the South-Eastern Highlands IBRA bioregion. Prior to European development, diverse vegetation communities occurred across the bioregion, including those consisting of Yellow Box, Red Box (*Eucalyptus polyanthemos)* and Blakely's Red Gum (*Eucalyptus blakelyi)*, with areas of White Box (*Eucalyptus albens)* on the lower slopes.

As the IBRA subregion impacted is the South-Eastern Highlands IBRA bioregion, this was entered into the BAM Calculator for the proposal.

2.2 NSW LANDSCAPE REGION

The vast majority of the development site occurs within the Canobolas Sheet Basalts Mitchell landscape however small sections of the development site occur within Mandurama Slopes, Carcoar Intrusives and Canobolas Slopes.

2.3 NATIVE VEGETATION

As determined by GIS mapping from aerial imagery and Central Tableland NSW Vegetation Mapping available, about 133.69 ha of native vegetation (woody and non-woody) occurs in the 500 m linear buffer area. The vegetation in the buffer area includes grassy woodland communities varying in dominance of Yellow Box, Blakely's Red Gum, Long-leaved box and Apple box (*Eucalyptus bridgesiana*).

2.4 CLEARED AREAS AND EXOTIC FORESTRY PLANTATIONS

Cleared areas in the development site are primarily sown exotic pastures and cropping for agriculture (Figure 2-1). This vegetation provides limited fauna habitat for native species, however common species including parrots, raptors, and introduced species such as foxes and rabbits may utilise the area for foraging.

A large proportion of the development site is comprised of forestry pine plantations with dense stands of Radiata pine (**Pinus radiata*) with an understory of predominately bare ground covered by pine needles (Figure 2-2), however there are some patches of Blackberry (**Rubus fruticosus*) occurring throughout the plantation.

About 1373 ha of non-native vegetation occurs within the linear buffer area and about 107.40 ha occurs within the development site (81%).

Figure 2-1 Example of cleared areas within the development site

Figure 2-2 Example of pine plantations within the development site

2.5 RIVER AND STREAMS

One stream occurs within the development site. Flyers Creek is a fifth order stream under the Strahler stream classification system (Strahler, 1952). The riparian vegetation has been subject to modification due to historical agricultural land use with banks dominated by exotic vegetation such as Willows (**Salix sp.*), Blackberry (**Rubus fruticosus* spp. agg.) and exotic annuals.

Unnamed drainage lines occur on occasion throughout the development site. These first order streams (Strahler, 1952) have been extensively modified through internal roads, and periodic cultivation.

2.6 WETLANDS

No farm dams or wetlands occur in to the development site. A large dam that occurs in adjacent Cadia gold mine land is approximately 300 m west of the development site at its closest point. The nearest important wetland listed under the EPBC Act is Hattah-Kulkyne Lakes, which occurs 600 – 700 km upstream of the locality.

2.7 CONNECTIVITY FEATURES

The majority of the development site is well connected in terms of vegetation that would allow movement of species throughout the area, however the majority of this is through forestry pine plantations. The pine plantation provides little in terms of optimal habitat but would allow species to move throughout the areas into the small patches of better condition native vegetation. Along with roadside vegetation along Cadia Road, this planted vegetation may provide connectivity for disturbance tolerant and mobile species to traverse the landscape. In the southern area of the development site, remnant vegetation mostly occurs as isolated patches and paddock trees.

2.8 AREAS OF GEOLOGICAL SIGNIFICANCE

No karsts, caves, crevices or cliffs or other areas of geological significance occur in or adjacent to the development site. Small rock outcrops occur throughout the site mostly consisting of imbedded rock and scattered loose rock.

Figure 2-3 Example of small rocky outcrops within the development site

2.9 AREAS OF OUTSTANDING BIODIVERSITY VALUE

No areas of outstanding biodiversity value occur within the development site.

2.10 SITE CONTEXT COMPONENTS

Method applied

The proposal conforms to the definition of a *linear-based development* under the BAM. The linear-based development assessment methodology has been used in this BAM assessment.

Percent Native Vegetation Cover

The Percent Native Vegetation Cover within the 500m buffer area (Figure 2-4) surrounding the development site prior to the development was calculated to be 8.87%. This was entered into the BAM calculator for the proposal. This Percent Native Vegetation was calculated by estimating the area of native vegetation (woody and non-woody) within the 500 m buffer area. Areas of native vegetation were calculated using GIS mapping and aerial photography. The total area of the 500 m buffer area is 1507.35 ha. The area of native vegetation within the buffer area is estimated to be 133.69 ha. This puts the native vegetation cover into the cover class of <10%.

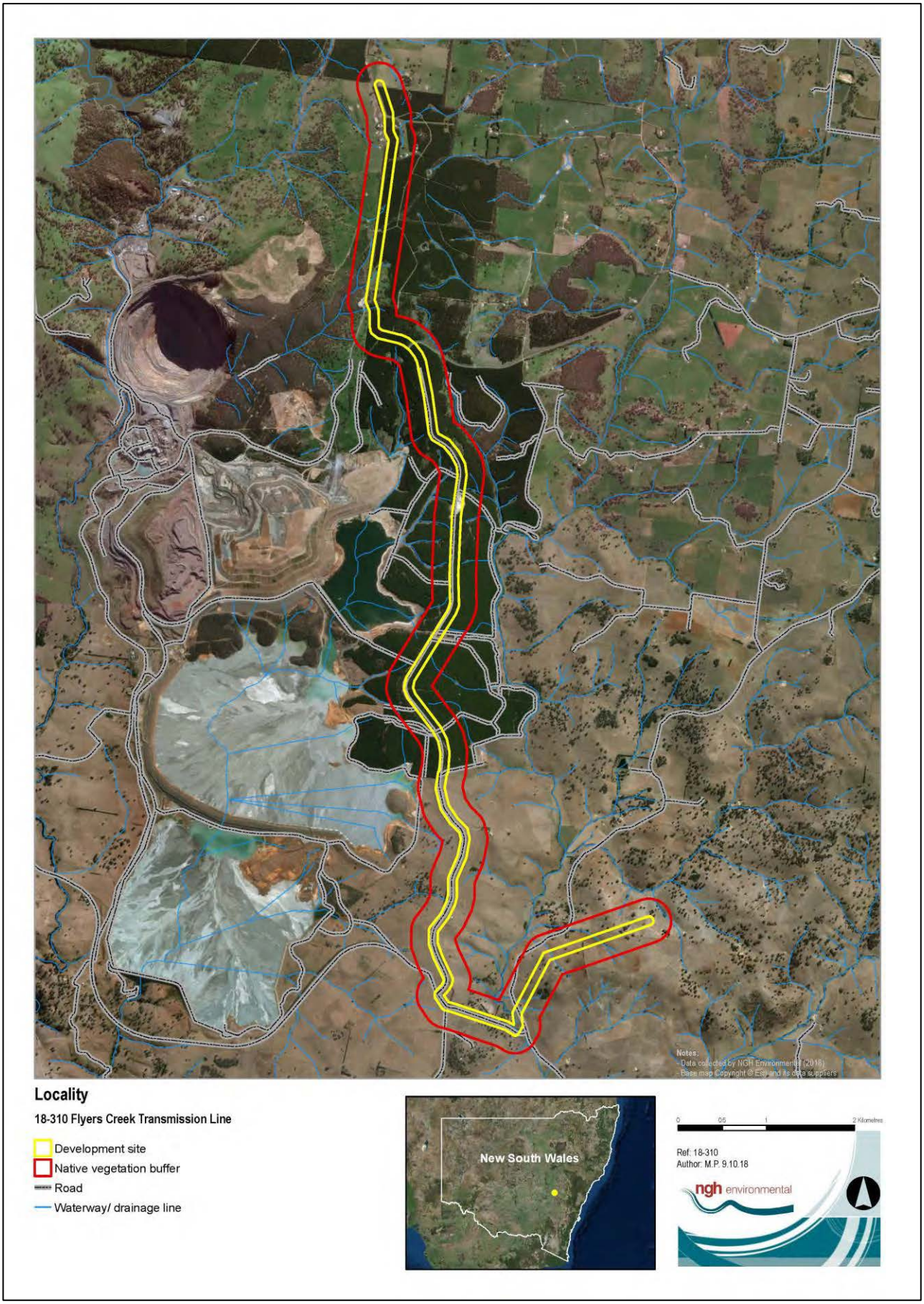

Figure 2-4 Location and native vegetation buffer

3 NATIVE VEGETATION

3.1 NATIVE VEGETATION EXTENT

About 24.57 ha of native vegetation occurs within the development site (Figure 3-1). This is comprised of:

- About 10.83 ha of small remnant clumps of Box Gum Grassy Woodland dominated by Yellow Box occur along the road reserve of Cadia Road and surrounded by a forestry pine plantation. These small native woodland areas comprised of a mix of Eucalypts such as Apple Box, Broad-leaved Peppermint (*Eucalyptus dives*), Long-leaf Box and Red Stringybark (*Eucalyptus macrorhyncha*).
- About 6.57 ha of scattered trees comprising Yellow Box and Blakely's Red Gum remain as isolated paddock trees or small patches within cleared paddocks and also along Panuara Rd (Note: a number of large trees have been removed along Panuara Rd following the original field surveys assumed to be by the relevant council).
- 7.6 ha of planted corridors of native vegetation, predominantly on the western side of Cadia Road acting as visual barriers for the Cadia gold mine and paddock wind breaks, comprising trees and shrubs of local provenance such as Yellow Box, Long-leaf Box and Acacia species and occur in the Southern sections of the transmission line route. These corridors would not be directly impacted.

About 1047.40 ha occurs as non-native vegetation within the development site. This vegetation is comprised of Radiata Pine (**Pinus radiata*) within the forestry pine plantation as well as of sown exotic pastures including; Phalaris *(*Phalaris aquatica.),* Barley Grass (**Hordeum leporinum*), Medics (**Medicago sp.)* and Clover (**Trifolium sp.).*

One (1) paddock tree occurs within the development site (Figure 3-1). Paddock trees were defined as:

- a tree or a group of up to three trees less than 50 m apart from each other, and
- over an exotic groundcover, and
- more than 50 m away from any other living tree greater than 20 cm diameter at breast height, and
- on category 2 land surrounded by category 1 land (as defined by the BAM, 2017)

+Stage release of the regulatory land mapping is occurring under the *Local Land Services Act 2016* (LLS Act). Stage 1b has not been yet been published. During the transitional period, land categories are to be determined in accordance with the definitions of regulated land in the LLS Act. In this case, the paddock trees are located on land with native vegetation present since January 1990, surrounded by land that has been cleared of native vegetation since January 1990.

Paddock trees throughout the development site were assessed under the streamlined assessment module – clearing paddock trees (Appendix 1 of the BAM) and incorporated into this report. They are considered both in terms of ecosystem credits and as habitat for threatened species and any credits generated are additional to those created by applying the full BAM.

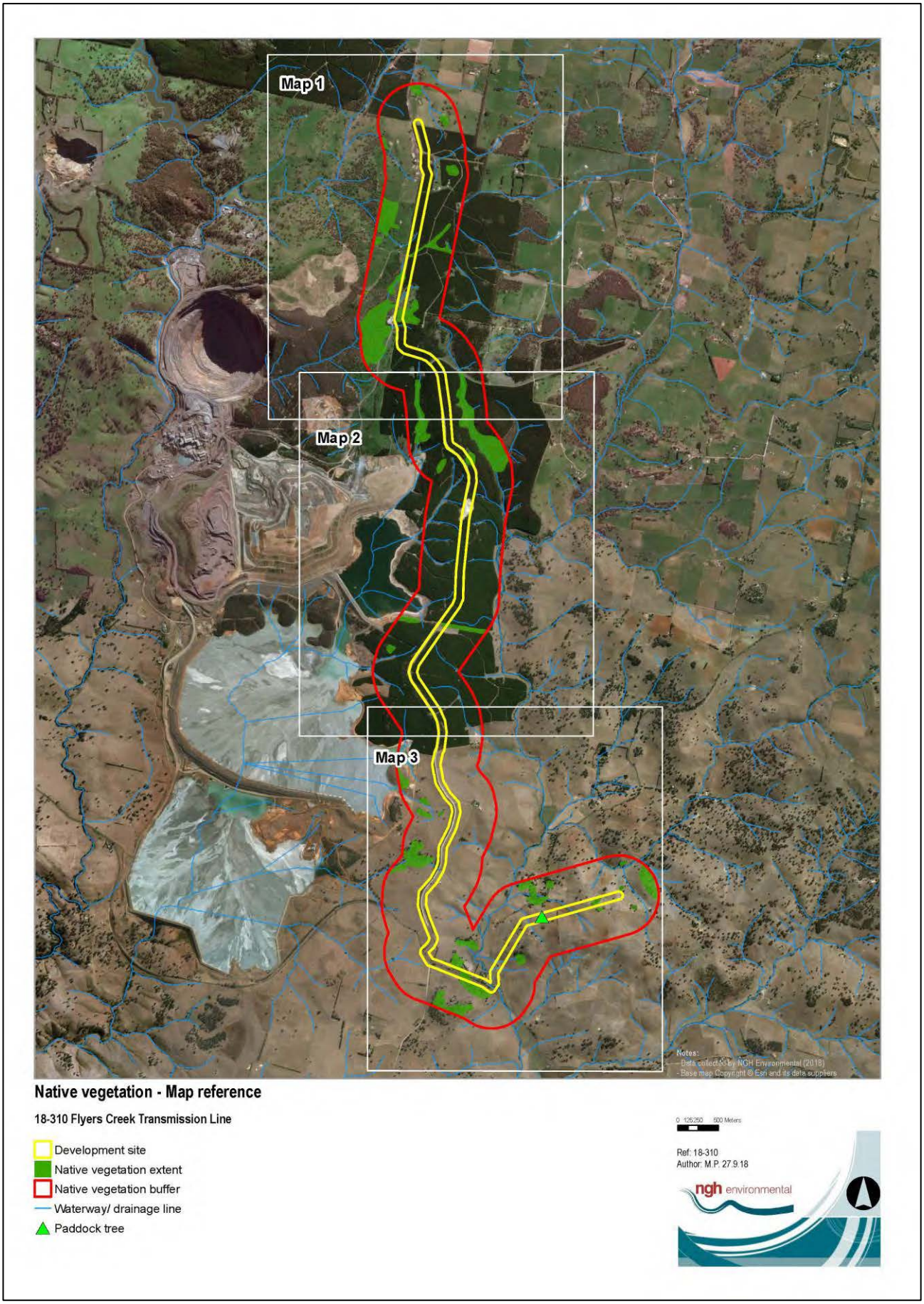

Figure 3-1 Native vegetation extent within the development site.

3.2 PLANT COMMUNITY TYPES

3.2.1 Methods to assess Plant Community Types

Review of existing information

A search was undertaken of the OEH BioNet Vegetation Classification Tool (BioNET) database and the NSW Seed Mapping Portal to access existing vegetation mapping information within the development site. Relevant mapping of the development site included OEH (2017) Central Tablelands NSW Preliminary State Vegetation Type Map. This identified seven main Plant Community Types (PCTs) within and surrounding the development site including:

- PCT 266: *White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion*.
- PCT 277: *Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion*
- PCT 287: *Long-leaved Box - Red Box - Red Stringybark mixed open forest on hills and hillslopes in the NSW South Western Slopes Bioregion*
- PCT 731: *Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion*
- PCT 796: *Derived grassland of the NSW South Western Slopes*
- PCT 1101: *Ribbon Gum - Snow Gum grassy open forest on flats and undulating hills of the eastern tableland, South Eastern Highlands Bioregion*
- PCT 1330: *Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion*

Floristic survey

A site overview was undertaken on the 6th and 7th June 2018. The entire subject land was surveyed by two ecologists. The aim of the survey was to confirm the PCTs present in the development site, along with their condition and extent. Random meander searches were conducted to gain an overview of the plant species present and determine variation within vegetation types. Potential PCTs were identified using the BioNet based on the native species present, landform, physiography and location in the IBRA subregion. The PCTs were then stratified into areas of similar condition class to determine vegetation zones for each PCT.

Detailed floristic surveys were undertaken on the 12th to 14th September by two ecologists. The surveys were undertaken using the methodology presented in the BAM (2017). The required number of vegetation integrity plots of 20 m by 50 m were established in each vegetation zone. Data was collected on the composition, structure and function of the vegetation. Personnel undertaking the field work have been trained and accredited under the BAM (Appendix A).

3.2.2 PCTs identified in the development site

Two PCTs were identified within the development site including:

- PCT 1330: *Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion*
- PCT 277: *Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion*

Descriptions of the PCTs identified are provided in Table 3-1 to Table 3-2.

Table 3-1 Description of PCT 1330 within the development site.

PCT 1330 Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion		
Vegetation formation	Grassy Woodlands	
Vegetation class	Southern Tablelands Grassy Woodlands	
Vegetation type	**PCT ID**	1330
	Common Community Name	Yellow Box - Blakely's Red Gum grassy woodland on the tablelands
Approximate extent within the development site	10.83 ha occurs within the development site: 1.64 ha Good Condition (Figure 3-2) 6.54 ha Moderate Condition (Figure 3-3) 2.65 ha Low Condition (Figure 3-4)	
Species relied upon for PCT identification	***Species name***	***Relative abundance***
	Yellow Box *(Eucalyptus melliodora)*	30%
	Apple Box (*Eucalyptus bridgesiana*)	20%
	Long-leaved Box (*Eucalyptus goniocalyx*)	10%
	Broad-leafed Peppermint (*Eucalyptus dives*)	5%
	Red Stringybark (*Eucalyptus macrorhyncha*)	5%
Justification of evidence used to identify the PCT	Yellow Box (*E. melliodora*) is the dominant overstory alongside numerous other Eucalyptus species including Apple Box (E. *bridgesiana),* Long-leaved Box *(E. goniocalyx)*, Broad-leaved Peppermint (*Eucalyptus dives*), Red Stringybark (*E. macrorhyncha*), Ribbon Gum (E. *viminalis*) and Candlebark (*E. rubida*) within this vegetation community. The native understorey varies but includes Silver Wattle (*Acacia dealbata*), Knife Wattle (*Acacia cultriformis*), Sifton Bush (*Cassinia arcuata*) and Peach Heath (*Lissanthe strigosa*) Groundcover is highly modified due to previous disturbance and roadside edge effects however native species include Pennywort (*Hydrocotyle laxiflora*), Weeping Grass (*Microlaena stipoides*), Kangaroo Grass (*Themeda triandra*), Ivy Goodenia (*Goodenia hederacea*) and Bidgee-widgee (*Acaena novae-zelandiae*). Four vegetation integrity plots were undertaken in this community (FC1, FC2, FC3 and FC4). Two (2) Silver-leaved Candlebark (*Eucalyptus canobolensis*) individuals, listed as Vulnerable under the BC Act and Endangered under the EPBC Act, were observed within this PCT and within the development site. PCT 1330 is considered to be the most appropriate PCT based on: • Dominated by Yellow Box and Apple Box • Occurs at higher altitudes (above 850 m ASL) in conjunction with high altitude species observed such as Ribbon Gum, Broad-leaved Peppermint and Candlebark • Occurs within the Orange IBRA subregion Based on these factors, PCT 1330 was selected for this vegetation community.	

PCT 1330 Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	
TEC Status	This vegetation community forms part of the Threatened Ecological Community (TEC) – White Box – Yellow Box – Blakely's Red Gum Woodland listed under the BC Act. This vegetation community is also listed as Critically Endangered under the EPBC Act.
Estimate of percent cleared	94%
Examples	 Figure 3-2 Example of PCT 1330 moderate-good condition

PCT 1330 Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion

Figure 3-3 Example of PCT 1330 moderate condition with *E. canobolensis* to the left of the photo

Figure 3-4 Example of PCT 1330 low condition

Table 3-2 Description of PCT 277 within the development site.

PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion		
Vegetation formation	**Grassy woodlands**	
Vegetation class	Western Slopes Grassy Woodlands	
Vegetation type	**PCT ID**	277
	Common Community Name	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes
Approximate extent within the development site	6.57 ha occurs within the development site (Figure 3-5 and Figure 3-6).	
Species relied upon for PCT identification	***Species name***	***Relative abundance***
	Blakley's Redgum (*Eucalyptus blakeyi*)	30%
	Yellow Box *(Eucalyptus melliodora)*	20%
	White Box (*Eucalyptus albens*)	5%
Justification of evidence used to identify the PCT	Three vegetation integrity plots (FC5, FC7 and FC8) were completed for this community. The overstory is co-dominated by Blakey's Red-gum and Yellow Box with occasional White Box observed. Midstorey is absent and groundcover is highly degraded with low native flora species abundance. This community is considered slightly different to that of PCT 1330 as it occurs at slightly lower altitudes (around 600-700 m ASL) and does not have the presence of the higher altitude species as observed within PCT 1330. PCT 277 is considered to be the most appropriate PCT within the cleared southern sections of the proposal site based on: • The co-dominance of Blakley's Red-gum and Yellow Box • This community grading into PCT 266 down on the lower undulating hills • Location within the Orange IBRA subregion • OEH mapping showing this PCT as potential in the area Based on these factors, PCT 277 was selected for this community.	
TEC Status	This vegetation community forms part of the TEC – White Box – Yellow Box – Blakely's Red Gum Woodland listed Endangered under the BC Act. The vegetation community is listed as Critically Endangered under the EPBC Act however due to the condition of the vegetation community within the development site, does not conform as a Matter of National Environmental Significance (MNES) (see Section 5.2)	
Estimate of percent cleared	94%	

PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

Examples

Figure 3-5 Example of PCT 277

Figure 3-6 Example of planted vegetation within PCT 277

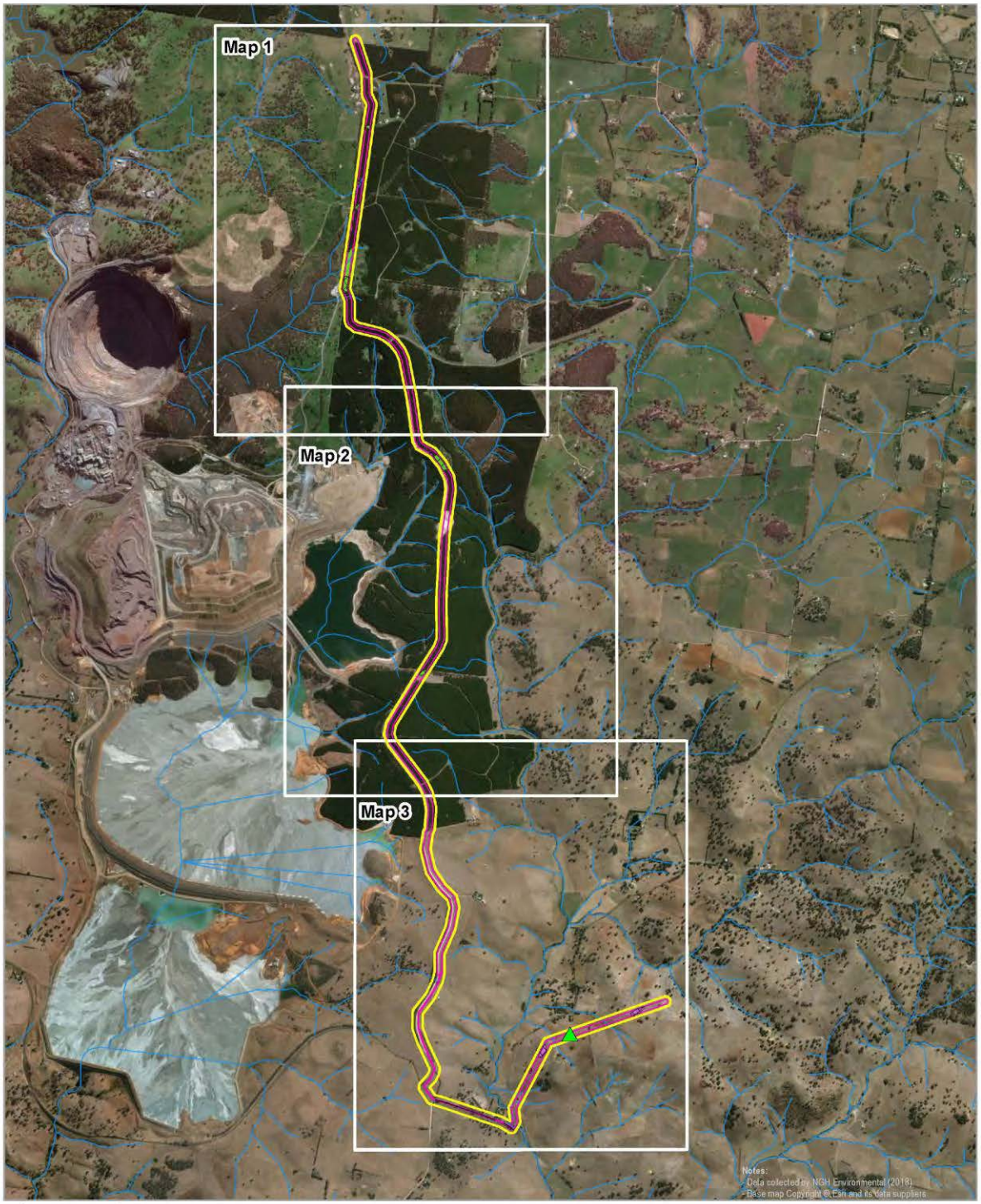

Figure 3-7 PCTs and TECs at the overview

Figure 3-8 PCTS and TEC Northern

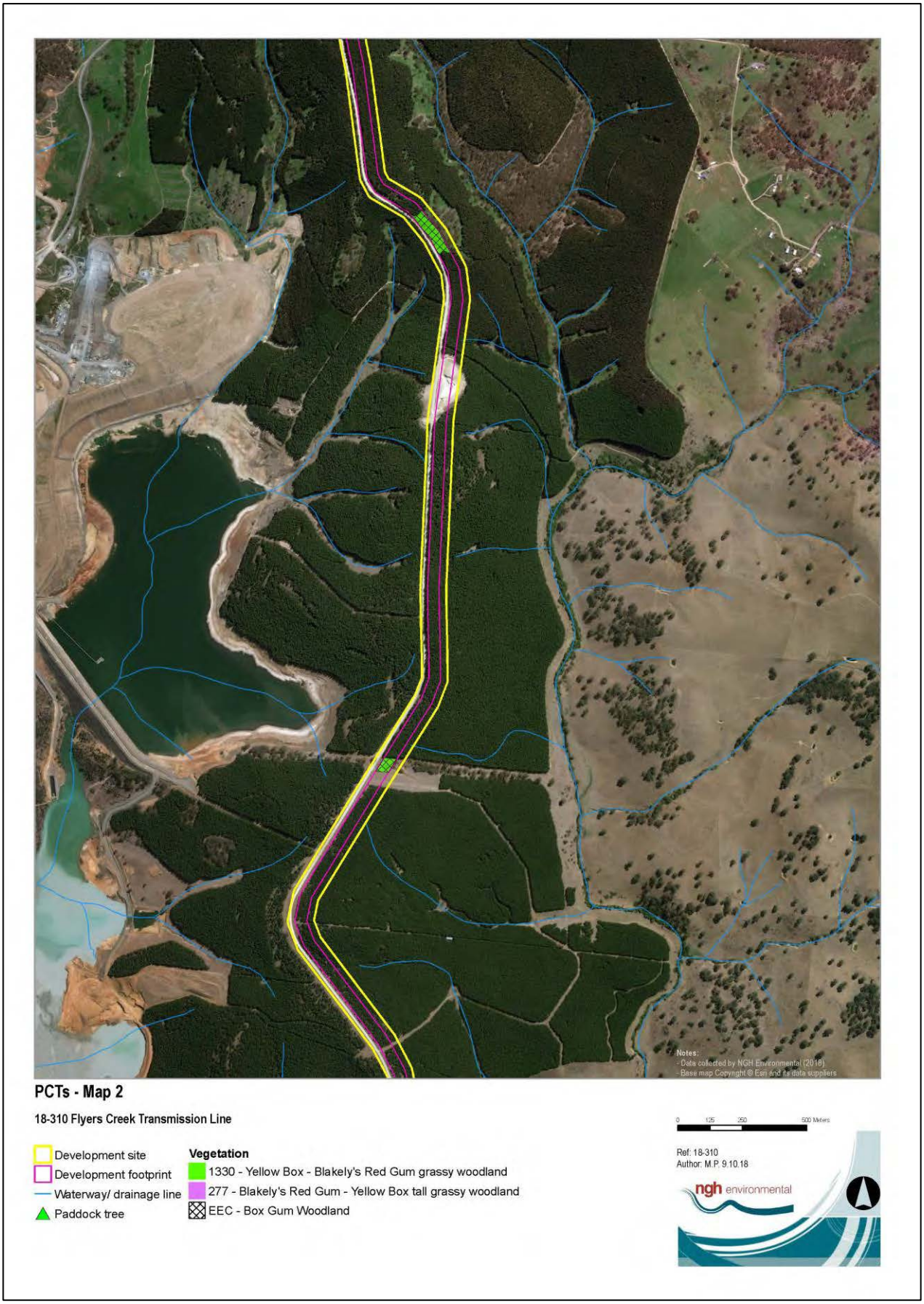

Figure 3-9 PCTS and TEC Central

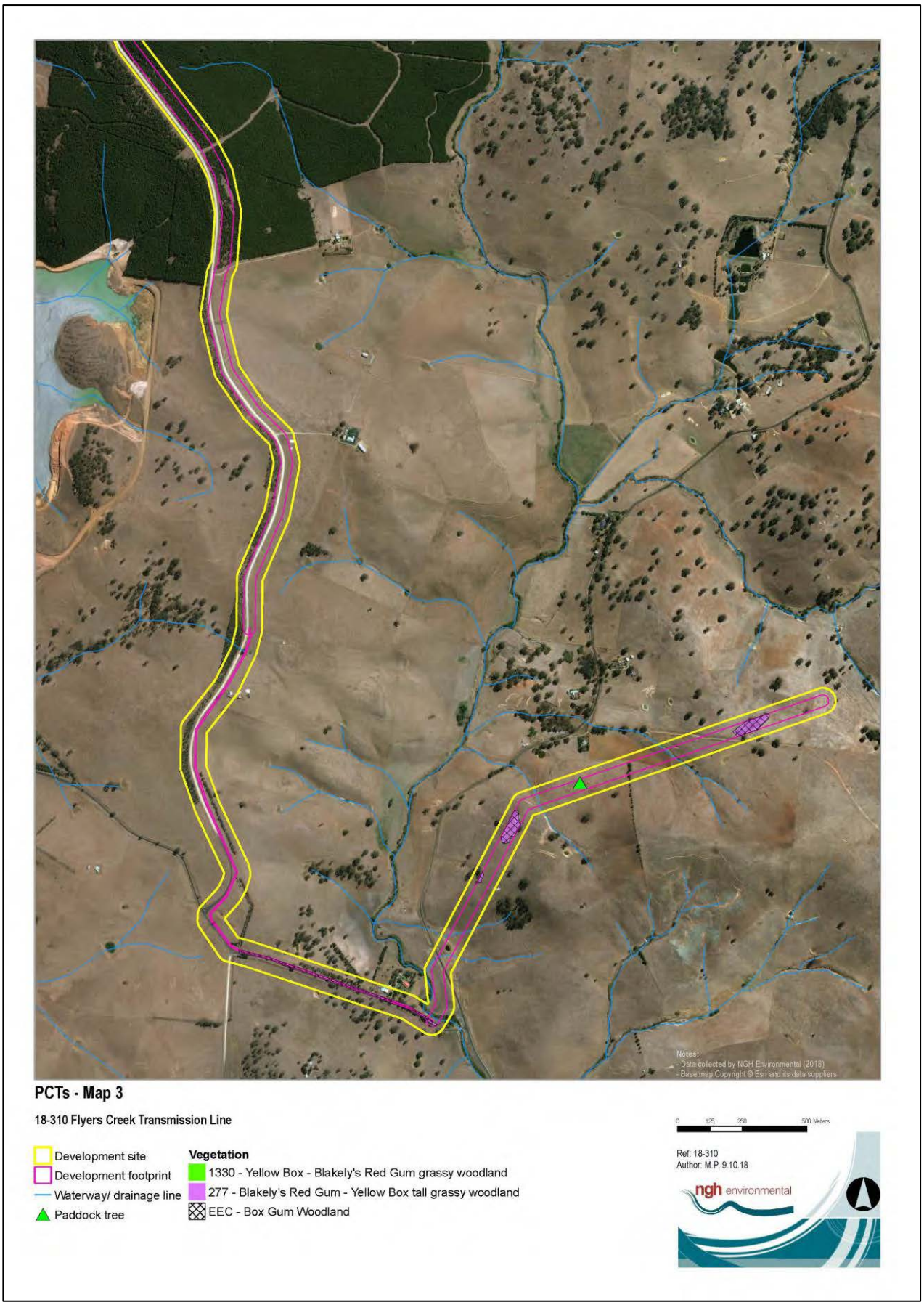

Figure 3-10 PCTS and TEC Southern

3.3 VEGETATION INTEGRITY ASSESSMENT

3.3.1 Vegetation zones and survey effort

The random meander, overview inspection and detailed floristic plots have been used to assist the delineation of vegetation zones. Two PCTs were identified in the development site. Each PCT was stratified into zones representing a similar broad condition state. These zones were based on the overstory condition, understorey condition and observed land management practices described in Table 3-3 and shown in Figure 3-11 to Figure 3-14.

3.3.2 Paddock trees

One paddock tree (Class 3), a *E. blakelyi* individual, occurs in the development site within the exotic vegetation in Zone 8. Threatened species that would use the paddock trees are assumed to be the same threatened species that are returned by the BAM Calculator for the vegetation zones. Where targeted fauna surveys were required by the BAM calculations, the paddock tree was also included in the surveys. Assessments of threatened species that would use this paddock tree as habitat has been incorporated into this BDAR under Sections 4 and 5.

All paddock trees were mapped in the field using a handheld GIS Tablet. The Diameter at Breast Height (DBH) of the tree was assessed and assigned a paddock tree class relevant to the large tree benchmark. The large tree benchmark for PCT 277 is 50 cm DBH. The paddock tree was visually assessed from the ground to determine whether any hollows were present.

The paddock tree occurring in the development site is shown in Figure 3 11 and details provided in Appendix E.

Table 3-3 Vegetation zones for the development site

Zone ID	PCT ID	Stratification unit condition	Area impacted (ha)	Survey effort (# plots)	Zone size (ha)	Patch size class (ha)	Example
1	**277**	**Moderate** This zone occurs within the southern portion of the development site. The overstory is dominated by Yellow Box and Blakely's Redgum. No midstorey is present and groundcover consists of exotic flora including Phalaris (*Phalaris aquatica*), Rye Grass (*Lolium perenne*), Barley Grass (*Hordeum leporinum*) and Common Storksbill (*Erodium cicutarium*). Due the intact overstory, this vegetation zone	1.51	3 (FC5, FC7 and FC8)	6.58	< 5	

Zone ID	PCT ID	Stratification unit condition	Area impacted (ha)	Survey effort (# plots)	Zone size (ha)	Patch size class (ha)	Example
		forms part of the White Box Yellow Box Blakey's Red Gum Woodland EEC listed under the BC Act.					
2	**1330**	**Poor** Contains no overstory species and is dominated by exotic flora and high threat weeds (*Rubus fruticosus*) Due to the level of degradation of this zone, this vegetation zone does not form part of the White Box Yellow Box Blakey's Red Gum Woodland EEC listed under the BC Act.	1.17	1 (FC2)	2.65	5-24	

Zone ID	PCT ID	Stratification unit condition	Area impacted (ha)	Survey effort (# plots)	Zone size (ha)	Patch size class (ha)	Example
3	**1330**	**Moderate** This zone occurs within the northern section of the development site surrounding by pine plantation. The overstory is dominated by Yellow Box, Apple Box and Long-leaved Box. Midstorey is sparse and the groundcover is heavily modified by exotic flora. This vegetation zone forms part of the White Box Yellow Box Blakey's Red Gum Woodland EEC listed under the BC Act.	1.61	2 (FC3, FC4)	6.54	5-24	

Zone ID	PCT ID	Stratification unit condition	Area impacted (ha)	Survey effort (# plots)	Zone size (ha)	Patch size class (ha)	Example
4	**1330**	**Moderate-Good** This zone occurs within the northern section of the development site surrounded by pine plantation. The overstory is dominated by Yellow Box, Apple Box and Long-leaved Box. Red Stringybark and Broad-leaved Peppermint were observed within this zone. This zone has an intact midstorey and contains a mix of native and exotic flora within the groundcover. This vegetation zone forms part of the White Box Yellow Box Blakey's Red	0.73	1 (Reference FC1)	1.65	25-100	

Zone ID	PCT ID	Stratification unit condition	Area impacted (ha)	Survey effort (# plots)	Zone size (ha)	Patch size class (ha)	Example
		Gum Woodland EEC listed under the BC Act.					
5	**277**	**Planted native vegetation** These areas are comprised of planted native species for visual screening and wind break purposes and consist of species local to the area such as Mixed Eucalypts (Yellow Box, Long-Leaved Box, Broad-leaved Peppermint) and mixed Acacia shrubs (*Acacia paradoxa, A. implexa* and *A. dealbata*). This vegetation zone forms part of the White Box Yellow Box Blakey's Red Gum Woodland EEC	0.01 (0.6 mapped)	-	7.16	< 5	

Zone ID	PCT ID	Stratification unit condition	Area impacted (ha)	Survey effort (# plots)	Zone size (ha)	Patch size class (ha)	Example
		listed under the BC Act.					
6	**n/a**	**Exotic vegetation - pasture** Within cleared areas, vegetation dominated by Phalaris, Rye Grass, Barley Grass and Common Storksbill. This area is excluded from the assessment due to the lack of native vegetation.	16.21	3 (FC6, FC9, FC10)	45.46	-	

Zone ID	PCT ID	Stratification unit condition	Area impacted (ha)	Survey effort (# plots)	Zone size (ha)	Patch size class (ha)	Example
7	**n/a**	**Exotic vegetation – Pine plantation** Within areas of pine plantation, areas are dominated by Radiata Pine with a high abundance of Blackberry. This area is excluded from the assessment due to the lack of native vegetation.	31.70	-	58.51	-	

Zone ID	PCT ID	Stratification unit condition	Area impacted (ha)	Survey effort (# plots)	Zone size (ha)	Patch size class (ha)	Example
8	**n/a**	**Paddock trees** One paddock tree, *E. blakelyi*, surrounded by exotic vegetation	n/a	Paddock tree assessment	n/a	-	

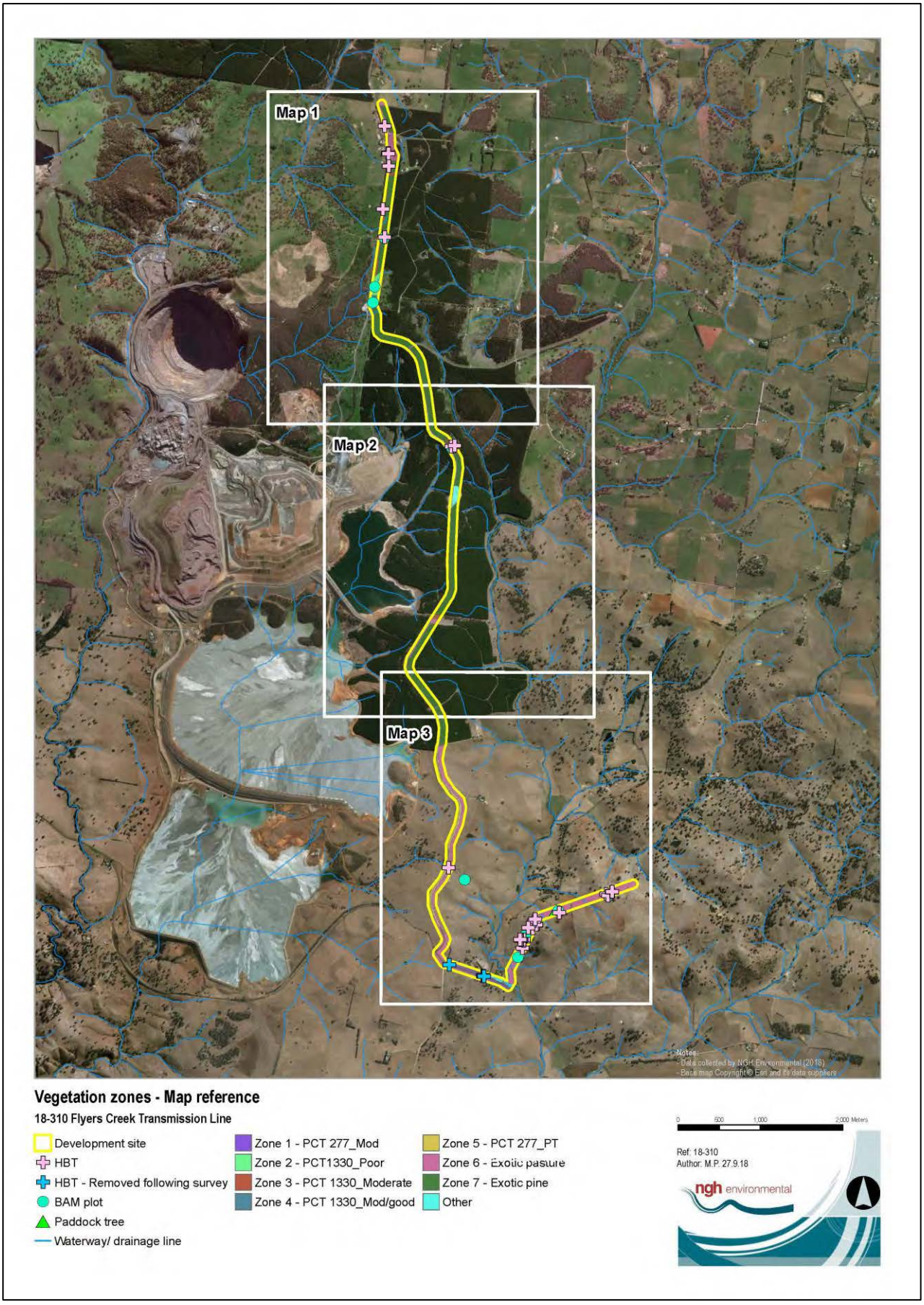

Figure 3-11 Vegetation zones overview

Figure 3-12 Vegetation Zones northern

Figure 3-13 Vegetation zones central

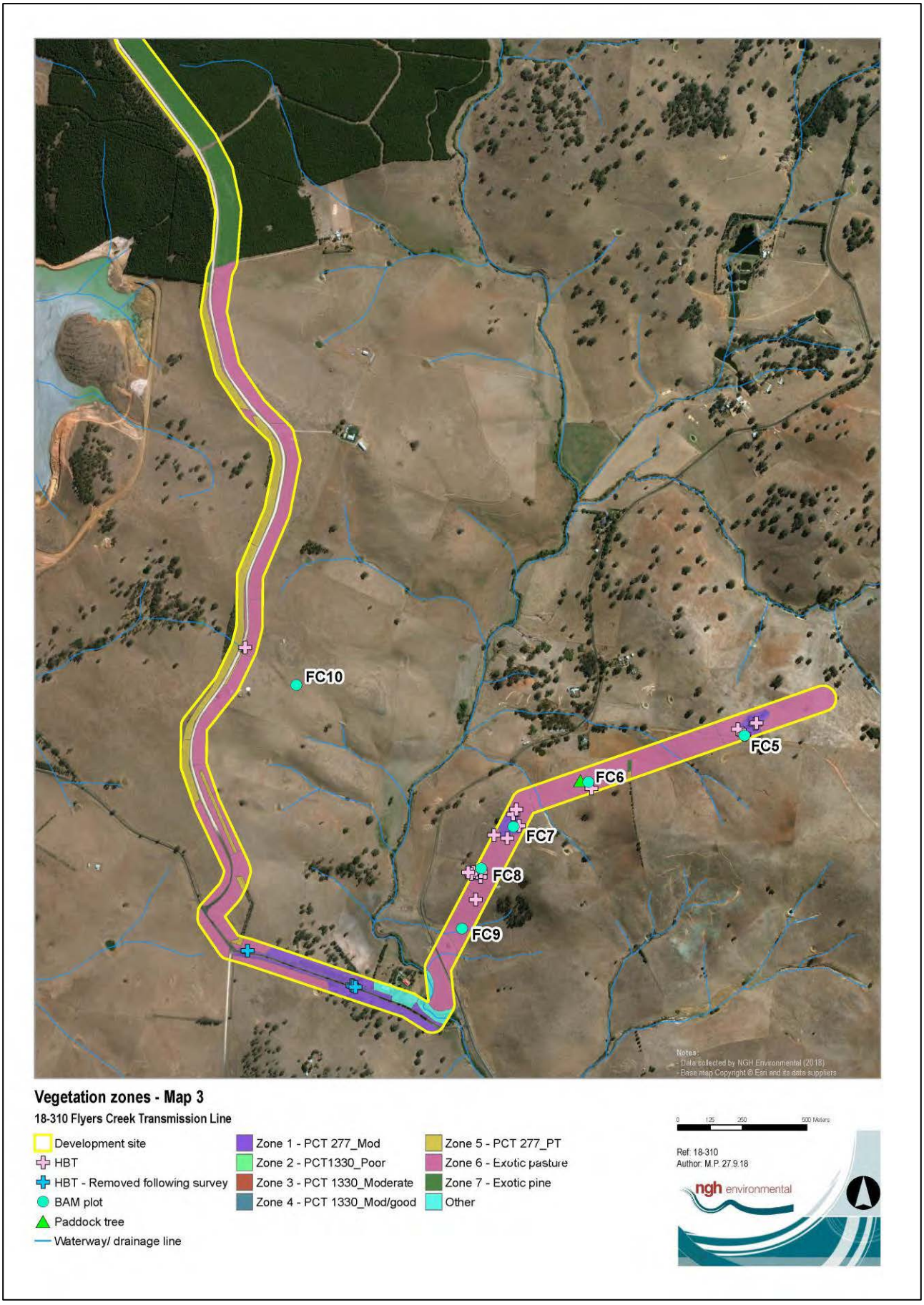

Figure 3-14 Vegetation zones southern

3.3.3 Vegetation integrity assessment results

There is potential for some flora species to have not been recorded during the survey due to the timing of the survey as well as due to persistent dry conditions prevalent in the months prior to the survey, however was considered suitable in order to gather representative data of each vegetation zone. The results of the plot field data and photos of each plot can be found in Appendix B.

The plot data from vegetation integrity survey plots undertaken were entered into the BAM calculator by accredited assessor (Mitch Palmer- BAAS17051). The results of the vegetation integrity assessment are summarised in Table 3-4 for the vegetation zones that are impacted.

Table 3-4 Table of current vegetation integrity scores for each impacted native vegetation zone within the development site.

Zone ID	Composition score	Structure score	Function score	Vegetation Integrity Score
1. **277 _mod**	10.7	17.5	41.9	**19.6**
2 **1330_poor**	12.4	13.9	0.1	**2.5**
3 **1330_moderate**	14.8	41.1	36.1	**28**
4 **1330_mod/good**	29.3	46.9	26.9	**33.3**
5 **277_PT (planted)**	100	100	32.2	**68.5**

Note – Benchmark data was utilised for composition and structures scores within zone 5, 277 PT, however the function score was estimated based on the age of plantings (i.e. no hollow-bearing trees etc.).

4 THREATENED SPECIES

4.1 ECOSYSTEM CREDIT SPECIES

The following ecosystem credit species were returned by the calculator as being associated with the PCTs present on the development site (Table 4-1). These species are assumed to occur on site and contribute to ecosystem credits.

Table 4-1 Ecosystem credit species

Ecosystem credit species	Vegetation type(s)	NSW Listing Status	National Listing Status
Anthochaera phrygia Regent Honeyeater (Foraging)	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Critically Endangered	Critically Endangered
Callocephalon fimbriatum Gang-gang Cockatoo (Foraging)	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Calyptorhynchus lathami Glossy Black-Cockatoo (Foraging)	PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Chthonicola sagittata Speckled Warbler	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Circus assimilis Spotted Harrier	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Vulnerable	Not listed
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies)	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Daphoenositta chrysoptera Varied Sittella	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Dasyurus maculatus Spotted-tailed Quoll	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Vulnerable	Endangered

Ecosystem credit species	Vegetation type(s)	NSW Listing Status	National Listing Status
	PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion		
Glossopsitta pusilla Little Lorikeet	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Grantiella picta Painted Honeyeater	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Vulnerable
Haliaeetus leucogaster White-bellied Sea-Eagle (Foraging)	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Hieraaetus morphnoides Little Eagle (Foraging)	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Lathamus discolor Swift Parrot (Foraging)	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Endangered	Critically Endangered
Lophoictinia isura Square-tailed Kite (Foraging)	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Vulnerable	Not listed
Melanodryas cucullata cucullata Hooded Robin (south-eastern form)	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Melithreptus gularis gularis Black-chinned Honeyeater (eastern subspecies)	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Miniopterus schreibersii oceanensis	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Vulnerable	Not listed

Ecosystem credit species	Vegetation type(s)	NSW Listing Status	National Listing Status
Eastern Bentwing-bat (Foraging)	PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion		
Neophema pulchella Turquoise Parrot	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Ninox connivens Barking Owl (Foraging)	PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Ninox strenua Powerful Owl (Foraging)	PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Petaurus australis Yellow-bellied Glider	PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Petroica boodang Scarlet Robin	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Petroica phoenicea Flame Robin	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Phascolarctos cinereus Koala (Foraging)	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Vulnerable
Polytelis swainsonii Superb Parrot (Foraging)	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Vulnerable
Pomatostomus temporalis temporalis Grey-crowned Babbler (eastern subspecies)	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Vulnerable	Not listed
Pteropus poliocephalus	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Vulnerable	Vulnerable

Ecosystem credit species	Vegetation type(s)	NSW Listing Status	National Listing Status
Grey-headed Flying-fox (Foraging)	PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion		
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Stagonopleura guttata Diamond Firetail	PCT 277- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed
Varanus rosenbergi Rosenberg's Goanna	PCT 1330- Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	Vulnerable	Not listed

4.1.1 Species excluded from the assessment

No ecosystem credit species were excluded from the assessment; all are assumed to occur and contribute to ecosystem credits.

4.2 SPECIES CREDIT SPECIES

4.2.1 Candidate species to be assessed

The BAM Calculator predicted the following species credit species to occur at the development site (Table 4-2). Species excluded based on the absence of suitable habitat within the development site are highlighted in Table 4-2.The potential for indirect habitats on all species is considered in Section 7.2.

Table 4-2 Summary of species credit species

Species Credit Species	Habitat components and geographic restrictions.	Sensitivity to gain class	NSW listing status	National listing status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
FAUNA							
Anthochaera phrygia Regent Honeyeater (Breeding)	Mapped Important areas (OEH)	High Sensitivity to Potential Gain	Critically Endangered	Critically Endangered	Outside mapped important areas (OEH)	Excluded	Not mapped as an important habitat area (Section 1.5)
Aprasia parapulchella Pink-tailed Legless Lizard	Rocky areas or within 50 m of rocky area	High	Vulnerable	Vulnerable	Non-optimal habitat within the development site	Included	Survey required and undertaken
Burhinus grallarius Bush Stone-curlew	Fallen/standing dead timber including logs	High	Endangered	Not Listed	Small areas of suitable habitat	Included	Survey required and undertaken
Callocephalon fimbriatum Gang-gang Cockatoo (Breeding)	Living or dead tree with hollows greater than 10 cm diameter and greater than 9 m above ground.	High	Vulnerable	Not Listed	Suitable Hollow-bearing Trees (HBTs) present within development site	Included	Assumed present
Calyptorhynchus lathami Glossy Black-Cockatoo (Breeding)	Living or dead tree with hollows greater than 15 cm diameter and greater than 5 m above ground.	High	Vulnerable	Not Listed	Suitable Hollow-bearing Trees (HBTs) present within development site	Included	Survey required and undertaken
Cercartetus nanus Eastern Pygmy-possum	Relies on hollow bearing for breeding and nesting as well as banksia, eucalypts and callistemon for foraging.	High	Vulnerable	Not Listed	Suitable Hollow-bearing Trees (HBTs) present within development site but minimal foraging habitat and patch size	Excluded	No suitable habitat in development site due to the absence of preferred and abundant foraging species.

Species Credit Species	Habitat components and geographic restrictions.	Sensitivity to gain class	NSW listing status	National listing status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
Chalinolobus dwyeri Large-eared Pied Bat	Within two kilometers of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometers of old mines or tunnels.	Very High	Vulnerable	Not Listed	No suitable habitat in development site	Excluded	No suitable habitat in development site
Haliaeetus leucogaster White-bellied Sea-Eagle (Breeding)	Living or dead trees within 1 km of rivers, lakes, large dams or creeks, wetlands and coastlines (Bionet).	High	Vulnerable	Not Listed	Large waterbody within 1 km of development site	Included	Survey required and undertaken
Hieraaetus morphnoides Little Eagle	Nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	High	Vulnerable	Not Listed	Large waterbody within 1km of development site	Included	Survey required and undertaken
*Lathamus discolo*r Swift Parrot	Mapped Important areas (OEH)	Moderate	Endangered	Critically Endangered	Outside mapped important areas (OEH)	Excluded	Outside mapped important area (OEH)
Litoria booroolongensis Booroolong Frog	Riffles, cobble banks and other rock structures within stream margins.	High	Endangered	Endangered	No suitable habitat in development site	Excluded	No suitable habitat in development site
Lophoictinia isura Square-tailed Kite (Breeding)	Nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	High	Vulnerable	Not listed	Large waterbody within 1 km of development site	Included	Survey required and undertaken
Miniopterus schreibersii oceanensis Eastern Bentwing-bat (Breeding)	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	Very High	Vulnerable	Not listed	No suitable habitat in development site	Excluded	No suitable habitat in development site

Species Credit Species	Habitat components and geographic restrictions.	Sensitivity to gain class	NSW listing status	National listing status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
Myotis macropus Southern Myotis	Hollow-bearing trees within 200 m of riparian zone. Bridges, caves or artificial structures within 200 m of riparian zone	High	Vulnerable	Not Listed	No suitable habitat in development site.	Excluded	No suitable habitat in development site.
Ninox connivens Barking Owl (Breeding)	Hollow-bearing trees. Woodland and open forest, including fragmented remnants and partly cleared farmland. Known in subregion.	High	Vulnerable	Not listed	Survey required to identify	Included	Survey required and undertaken
Ninox strenua Powerful Owl (Breeding)	Hollow-bearing trees	High	Vulnerable	Not listed	Survey required to identify	Included	Survey required and undertaken
Petaurus norfolcensis Squirrel Glider	Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e. no more than 50 m apart).	High	Vulnerable	Not listed	Suitable HBTs present in development site	Included	Survey required and undertaken
Phascogale tapoatafa Brush-tailed Phascogale	Hollows with entrances 2.5 - 4 cm wide	High	Vulnerable	Not listed	Suitable HBTs present in development site	Included	Survey required and undertaken
Phascolarctos cinereus Koala (Breeding)	Areas identified via survey as important habitat based on density of Koalas and quality of habitat.	High	Vulnerable	Vulnerable	Survey required to identify	Included	Survey required and undertaken

Species Credit Species	Habitat components and geographic restrictions.	Sensitivity to gain class	NSW listing status	National listing status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
Polytelis swainsonii Superb Parrot (Breeding)	Living or dead *E. blakelyi, E. melliodora, E. albens, E. camaldulensis, & E. polyanthemos* with hollows greater than 5 cm diameter; greater than 4 m above ground or trees with a DBH of greater than 30 cm.	High	Vulnerable	Vulnerable	Suitable HBTs present in development site	Included	Survey required and undertaken
Pteropus poliocephalus Grey-headed Flying-fox (Breeding)	Breeding camps. Breeding camps will need to be identified by survey	High	Vulnerable	Vulnerable	Survey required to identify	Included	Habitat assessment undertaken
FLORA							
Swainsona recta Small Purple-pea	Predominantly grassy woodlands, but sometimes extends into grassy open forest, usually with tree cover including Blakely's Red Gum, Yellow Box, and White Box. Known in subregion.	Moderate	Endangered	Endangered	Suitable habitat of native understory within Zone 3 and 4	Included	Within Geographic Distribution
Swainsona sericea Silky Swainson-pea	Box-gum woodland in southern tablelands and South West Slopes. Sometimes in association with cypress pines. Known in subregion.	High	Vulnerable	Not Listed	Suitable habitat of native understory within Zone 3 and 4	Included	Within Geographic Distribution

4.2.2 Exclusions based on habitat features

Under Section 6.4.1.17 of the BAM, a species credit species can be considered unlikely to occur on a development site (or within specific vegetation zones) if following field assessment, it is determined that the habitat is substantially degraded such that the species is unlikely to utilise the development site (or specific vegetation zones). These species are identified in Table 4-3 along with justification regarding the habitats present.

Table 4-3 Species credit species excluded based on habitat

Species Credit Species	Zones excluded	Reason for exclusion
Swainsona recta *Swainsona sericea*	Zone 1: PCT 1330_Poor Zone 2: PCT 277_Moderate Zone 5: PCT 277_PT	These zones have undergone significant understory disturbance through cropping and heavy grazing. The understory is dominated by bare ground and exotic species such as *Phalaris sp*, *Hordeum sp.*, *Erodium sp*. The habitat is sufficiently degraded for native understory species and these species are unlikely to occur in these zones.
Chalinolobus dwyeri Large-eared Pied Bat *Cercartetus nanus* Eastern Pygmy-possum *Litoria booroolongensis* Booroolong Frog *Miniopterus schreibersii oceanensis* Eastern Bentwing-bat (Breeding) *Myotis macropus* Southern Myotis *Pteropus poliocephalus* Grey-headed Flying-fox (Breeding)	All zones	These zones are excluded, as there is no suitable habitat that occurs within the impacted native vegetation zones. The species are unlikely to utilise these zones on a regular basis for breeding due to a lack of relevant critical habitat required for that species i.e. caves or riffles within creeks or a lack or preferred foraging habitat, in the case of the Eastern pygmy possum. Habitat assessment of the likelihood of a breeding camp for the Grey-headed Flying fox was undertaken and considered unlikely due to the presence and dominance of non-optimal exotic pine vegetation and the lack of good condition riparian vegetation. Additionally, surveys undertaken in June, August and September did not locate any evidence of camps within the development site.

4.2.3 Candidate species requiring confirmation of presence or absence

The species listed in Table 4-4 are considered to have habitats present at the development site. One threatened species, the Squirrel Glider (*Petaurus norfolcensis*) was detected on site. One fauna species, Gang-gang Cockatoo, is assumed to be present on the site as surveys were unable to be undertaken during the appropriate survey period. Surveys have been conducted for the remaining candidate species. Details of the survey methodologies and results are provided for each surveyed species below.

Targeted survey locations are mapped on Figure 4-1.

Species polygons have been defined for the species present on the site as mapped on Figure 4-1 to Figure 4-4.

Table 4-4 Summary of species credit species surveyed at the development site

Species Credit Species	Biodiversity risk weighting	Survey Period	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count
FAUNA					
Aprasia parapulchella Pink-tailed Legless Lizard	2.00	Sep – Nov	Surveyed September 2018	No	0 ha Non-optimal habitat within rocky outcrops
Burhinus grallarius Bush Stone-curlew	2.00	All	Surveyed August and September 2018	No	0 ha Not recorded during survey
Callocephalon fimbriatum Gang-gang Cockatoo (Breeding)	2.00	Mar -Aug	Not Surveyed Assumed Present	Yes	0.24 ha PCT 277 moderate 0.06 ha PCT 1330 Moderate
Calyptorhynchus lathami Glossy Black-Cockatoo (Breeding)	2.00	Mar -Aug	Surveyed August 2018	No	0 ha Not recorded during survey
Haliaeetus leucogaster White-bellied Sea-Eagle (Breeding)	3.00	July - Dec	Surveyed August 2018	No	0 ha Not recorded during survey No breeding habitat to be impacted.
Hieraaetus morphnoides Little Eagle	1.5	Aug-Oct	Surveyed August and September 2018	No	0 ha No breeding habitat to be impacted.
Lophoictinia isura Square-tailed Kite (Breeding)	1.5	Sept-Dec	Surveyed September 2018	No	0 ha Not recorded during survey
Ninox connivens Barking Owl (Breeding)	2.00	May-Dec	Surveyed August and September 2018	No	0 ha Not recorded during survey
Ninox strenua Powerful Owl (Breeding)	2.00	May-Aug	Surveyed August 2018	No	0 ha Not recorded during survey
Petaurus norfolcensis Squirrel Glider	2.00	All	Surveyed August and September 2018	Yes	0.82 ha PCT 1330 moderate

			One individual detected on site		
Phascogale tapoatafa Brush-tailed Phascogale	2.00	All	Surveyed August and September 2018	No	0 ha Not recorded during survey
Phascolarctos cinereus Koala (Breeding)	2.00	All	Surveyed September 2018	No	0 ha Not recorded during survey
Polytelis swainsonii Superb Parrot (Breeding)	2.00	Sep - Nov	Surveyed September 2018	Yes	0 ha Not recorded during survey
FLORA					
Swainsona recta Small Purple-pea	1.00	Sep - Nov	Surveyed September 2018	No	0 ha Not recorded during survey
Swainsona sericea Silky Swainson-pea	2.00	Sep - Feb	Surveyed September 2018	No	0 ha Not recorded during survey

4.3 THREATENED SPECIES SURVEY

Targeted surveys were undertaken over a number of days in different months. A general biodiversity survey was undertaken on the 6th and 7th June 2018. Threatened Fauna Surveys and Nocturnal Surveys were undertaken on the 27th and 28th August 2018, and 12th and 13th September 2018. Threatened Flora surveys were undertaken within suitable habitat on the 13th and 14th September 2018. Weather conditions recorded for these dates from the Bureau of Meteorology (BOM) at the Orange Weather Station are as follows:

Date	Maximum Temperature (°C)	Minimum Temperature (°C)	Rainfall (mm)	Max Wind Gust (km/h)
6th June 2018	13.8	5.0	0	19
7th June 2018	14.1	5.4	2.2	17
27th August 2018	11.9	2.2	4.4	30
28th August 2018	10.7	-1.7	0	33
12th September 2018	20.7	7.5	0	52
13th September 2018	17.8	3.1	0	26
14th September 2018	18.9	2.1	0	37

Diurnal Birds (Glossy Black Cockatoo, White-bellied Sea-Eagle, Little Eagle, Square-tailed Kite and Superb Parrot)

SURVEY EFFORT

A woodland bird census was completed during general survey on the 6th and 7th June 2018. Opportunistic surveys were undertaken throughout the site visit including traversing the site by car and on foot. Opportunistic sightings of birds were also recorded during all field surveys.

Targeted hollow-bearing tree surveys were carried out on the 6th and 7th June 2018 to identify trees with suitable breeding habitat. Surveys for large stick nests were undertaken 27th and 28th August 2018, and 12th and 13th September 2018. All paddock trees within the development footprint were surveyed for the presence of hollows. The number, size and height of hollows were recorded for each tree along with any evidence of use. Hollows were categorised as small (< 10 cm), medium (10 – 20 cm), and large (> 20 cm).

Targeted surveys were completed for the Glossy Black Cockatoo on the 27th and 28th August 2018. Suitable hollow-bearing trees as well as the number of hollows suitable were assessed for evidence of Glossy Black Cockatoo breeding.

Targeted surveys were completed for the Superb Parrot on the 12th and 13th September 2018. Four (4) 20 minute point surveys were completed each evening over the two days as well as assessment of suitable hollow bearing trees that may be utilised for breeding.

Surveys for the Gang-gang Cockatoo were unable to be undertaken during the recommended survey time, however, a survey of hollow bearing trees that may contain suitable habitat was undertaken.

SURVEY RESULTS

None of the targeted candidate diurnal avifauna species or evidence of breeding (i.e. large stick nests for raptors) were observed during the surveys.

Hollow-bearing trees were identified within the development footprint (Appendix D). These were identified as potential breeding habitat for the Gang-gang cockatoo. Suitable breeding habitat for this species includes living or dead trees with hollows greater than 10 cm diameter and greater than 9 m above ground (BioNet 2018).

The development would impact one paddock tree containing suitable hollows that may be utilised for various threatened species. In accordance with the BAM paddock trees assessed under the streamlined paddock tree assessment are not considered as species credit polygons.

Suitable hollow-bearing trees for the Gang-gang Cockatoo were observed within Zone 1 (0.24 ha PCT277_moderate) and Zone 3 (0.06 PCT1330_moderate). As hollow-bearing trees within these zones may be removed, values were entered into the BAM Calculator. Values were based around average canopy widths of 15 m x 15 m per hollow-bearing tree.

A full list of bird species observed during the surveys is shown in Appendix E.

Nocturnal birds (Bush Stone-Curlew, Barking Owl, Powerful Owl)

SURVEY EFFORT

A targeted species was completed on the nights of 27th and 28th August 2018 at seven sites along the proposed transmission line route for a total of approximately three (3) person hours per night. Additionally, further surveys were undertaken in patches of woodland on the nights of the 12th and 13th September for approximately one (1) person hour per night. Spotlighting in addition to call playback with a megaphone

and Bluetooth speakers were used from the vehicle and whilst walking through patches along planted vegetation, remnant vegetation, and isolated paddock trees, followed by a period of listening for responses in accordance with OEH threatened species guidelines.

SURVEY RESULTS

No threatened birds were seen or heard during the survey. It was noted that the common Boobook responded to call payback within zone 3 during most survey nights. It is not considered that breeding of the surveyed species occurs within the development site.

Nocturnal mammals (Squirrel Glider, Brush-tailed Phascogale and Koala)

SURVEY EFFORT

Targeted spotlighting surveys were undertaken on the evenings of the 27th and 28th August 2018 and the 12th and 13th September for approximately two (2) person hours per night. A 100-watt spotlight was used in both vehicle-based and foot surveys within remnant woodland patches and isolated paddock trees prior to nocturnal owl call playback surveys. Targeted searches for Koalas during the day were undertaken on the 13th September 2018 for approximately two (2) person hours. Mature feed trees via Spot Assessment Technique (SAT) were searched for signs of Koalas such as scats and scratches.

SURVEY RESULTS

No Koalas (or signs of Koalas) were observed during the surveys. This species is considered unlikely to occur within the development site.

One individual Squirrel Glider was observed within Zone 3 (PCT 1330 Moderate) on the 27th August 2018 within an immature *E. melliodora*. As such, values of habitat (0.82 ha Zone 3) within the observed location were entered into the BAM Calculator. Follow up surveys did not further detect this individual or any other signs of Squirrel Glider presence. It is also noted that numerous Sugar Glider alarm calls were heard in the same location as the Squirrel glider observation on the 13th September in response to the presence of a Southern Boobook coming into the area during call playback surveys.

Reptiles (Pink-tailed Legless Lizard)

SURVEY EFFORT

Areas of rocky outcrop were assessed and surveyed for approximately 30 minutes at each site within and surrounding the development site. This included traversing the rocky outcrop area and randomly turning and inspecting loose rocks and partially embedded rock that occurred before being placed back into their original position.

SURVEY RESULTS

The vast majority of the rocky outcrops consist of embedded rock and occasional loose rock within paddocks containing improved pastures species with little or no native grasses or forb presence. This was considered non-optimal habitat for the Pink-tailed Legless Lizard. Of the areas surveyed, one common species, Eastern Three-toed Earless Skink (*Hemiergis talbingoensis*), was observed. Small areas of rock outcrop were observed within remnant woodland areas and surveyed accordingly. No threatened species were observed during the survey and due to the absence of preferred habitat, this species is considered unlikely to occur within the development site.

Threatened Forbs (Small Purple-pea *Swainsona recta,* Silky swainson-pea *Swainsona sericea*)

SURVEY EFFORT

Suitable habitat for these species occurs in the small remnant patches within Zone 3 (PCT 1330 Moderate) and Zone 4 (PCT 1330 moderate/good). Areas of suitable habitat within the development site were surveyed using the parallel field traverse survey technique and during suitable survey periods in accordance with the NSW Guide to Surveying Threatened Plants (OEH 2016).

SURVEY RESULTS

No threatened forbs were detected within the survey area. Considering the extensive survey effort undertaken in suitable habitat during flowering season, they are not considered to occur within the development site.

Threatened Trees (Silverleaf Candlebark *Eucalyptus canobolensis*)

Although *E. canobolensis* was not identified as a species requiring targeted survey within the BAM calculator, two individuals were observed within the development site (Figure 4-2) however, outside of the development footprint. These individuals were recorded using GPS and mitigation measures (Section 8) would be implemented to ensure there are no direct or indirect impacts.

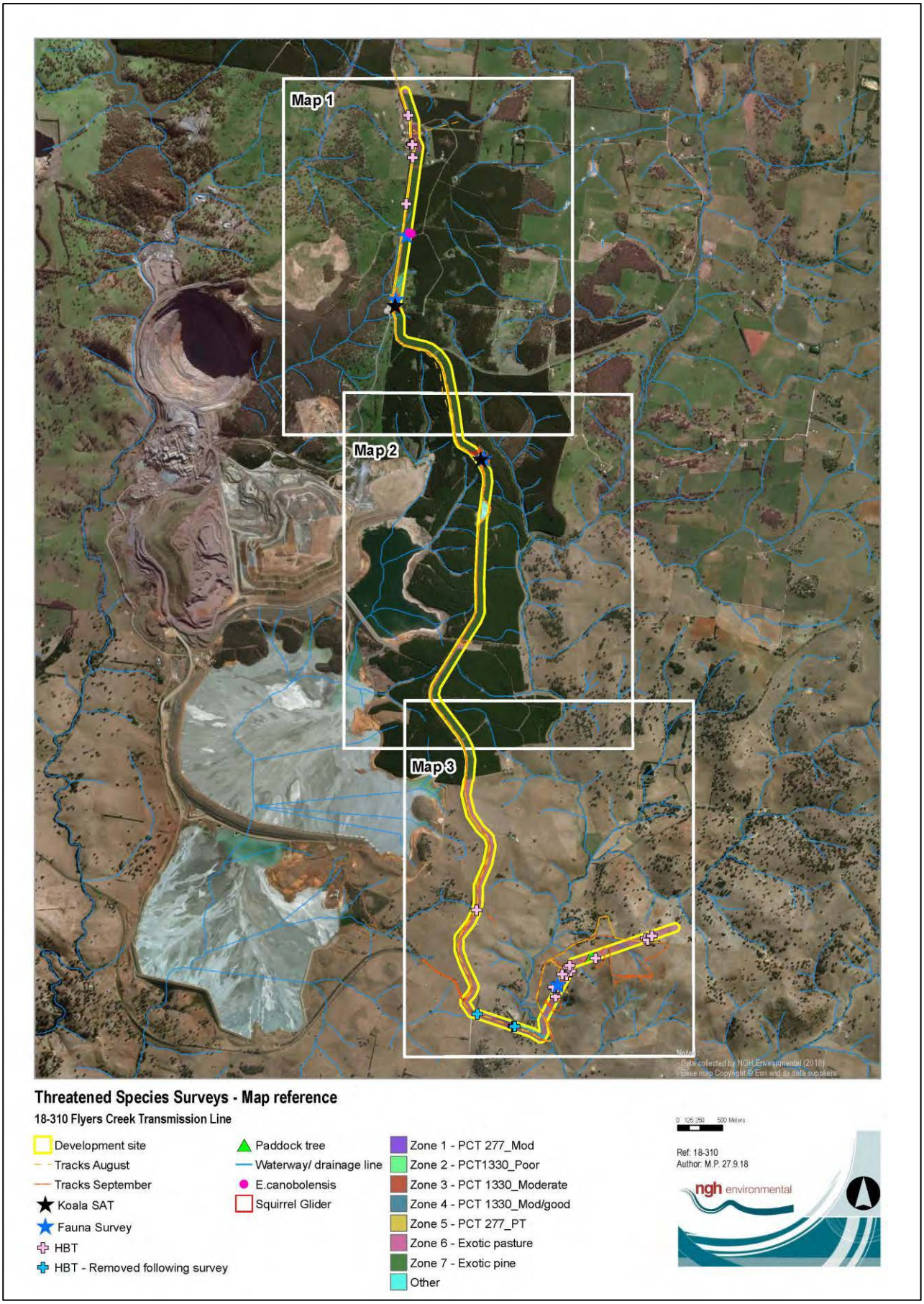

Figure 4-1 Targeted survey locations and threatened species polygons overview

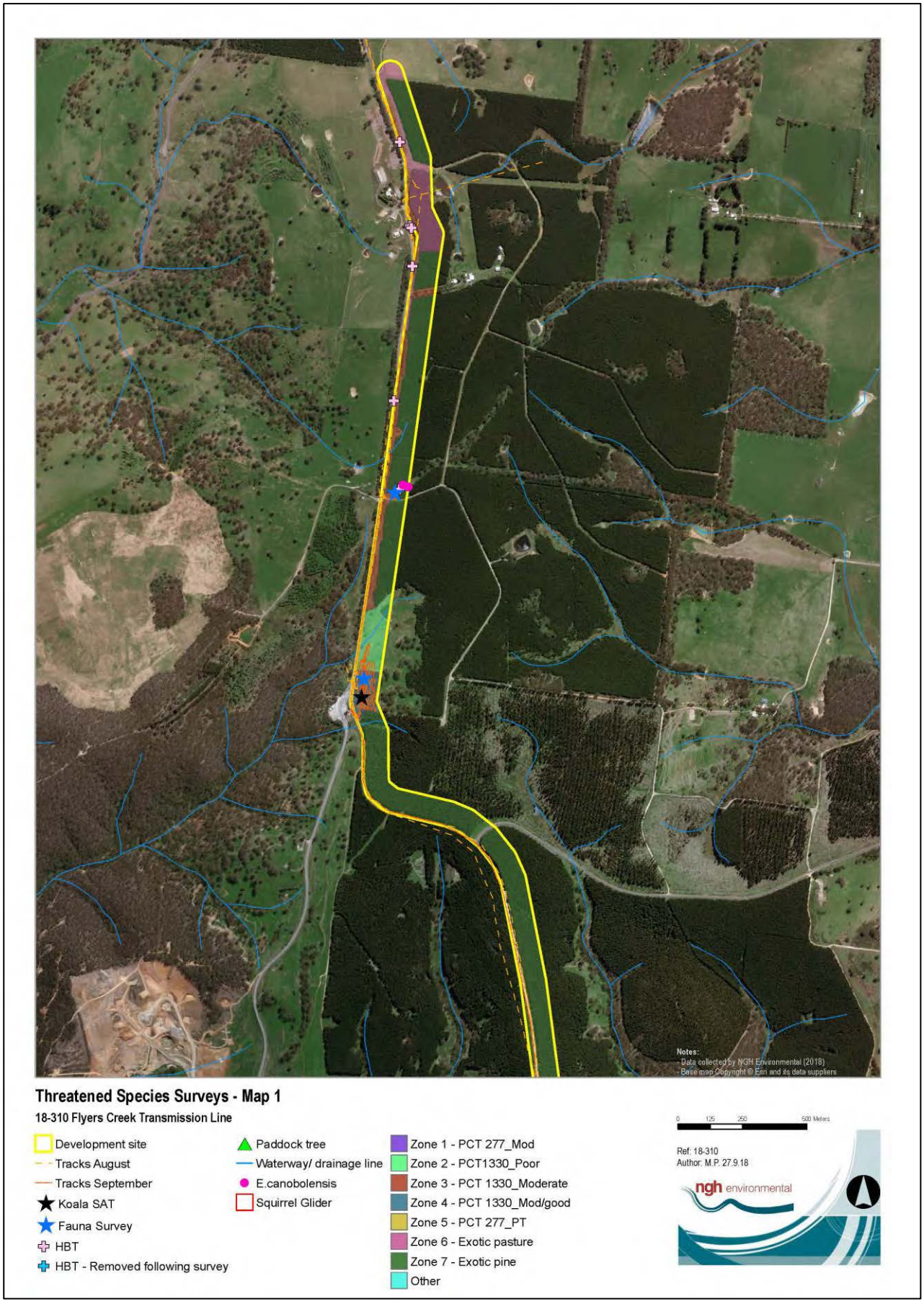

Figure 4-2 Targeted survey locations and threatened species polygons northern

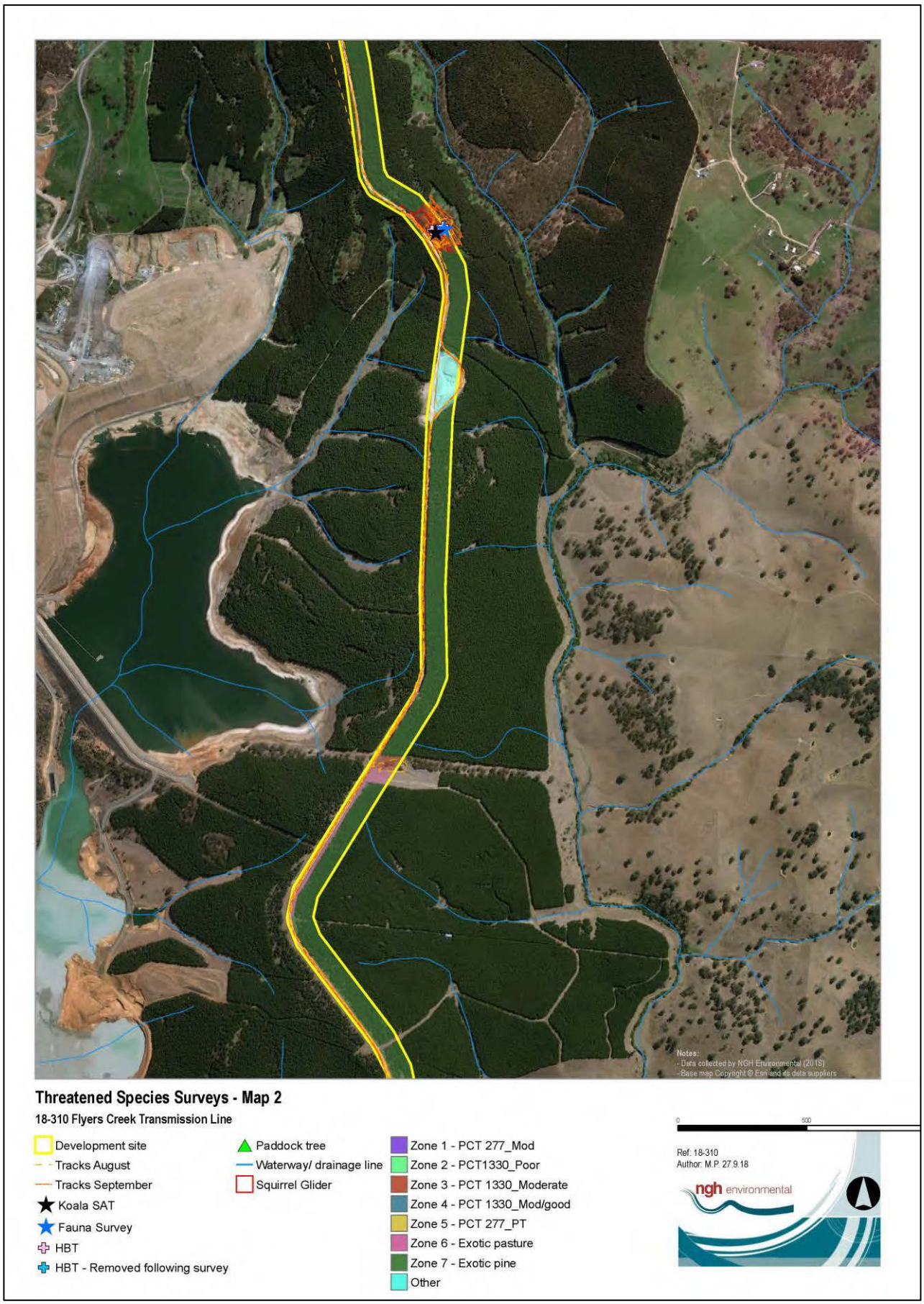

Figure 4-3 Targeted survey locations and threatened species polygons central

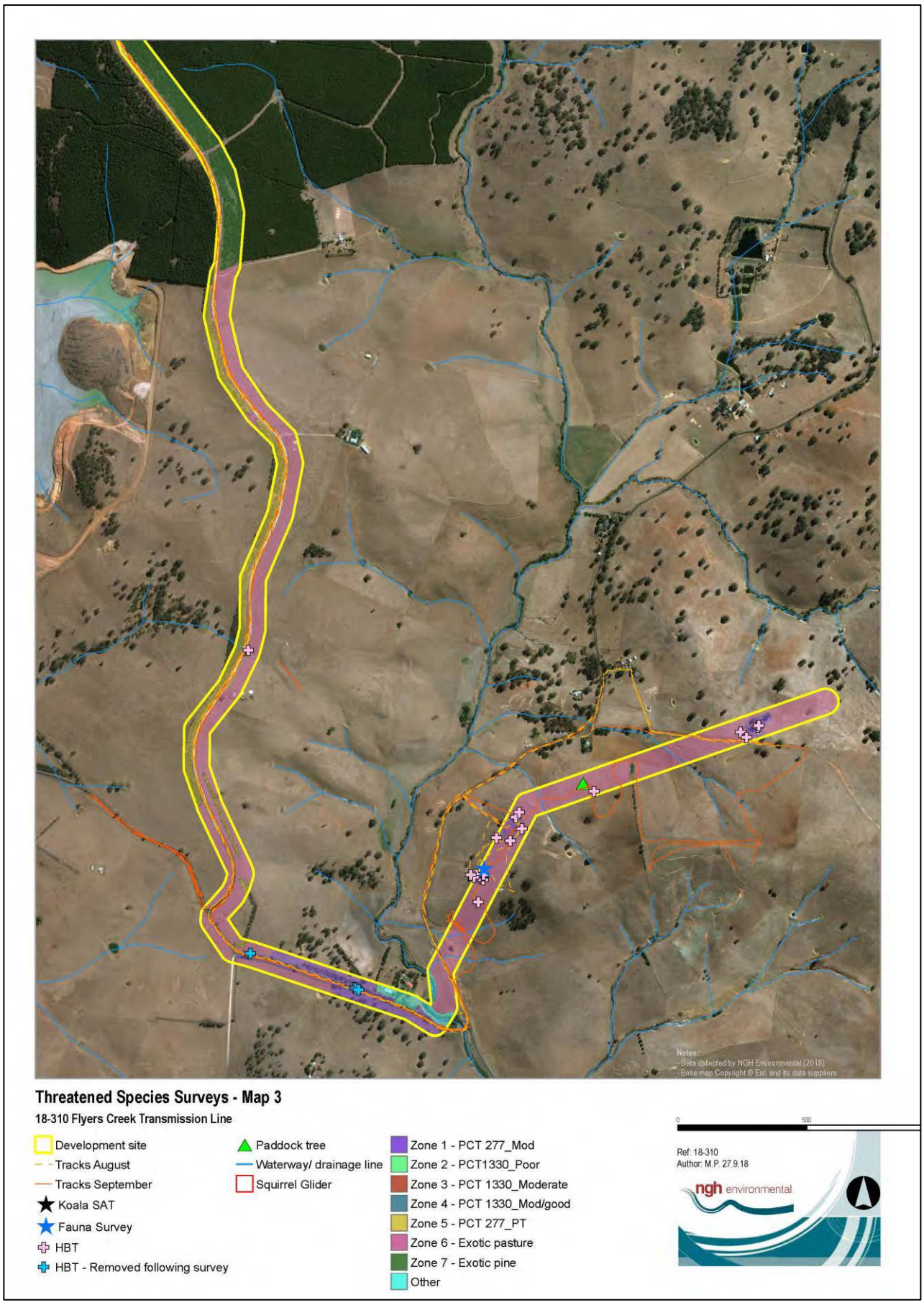

Figure 4-4 Targeted survey locations and threatened species polygons southern

4.4 ADDITIONAL HABITAT FEATURES RELEVANT TO PRESCRIBED BIODIVERSITY IMPACTS

4.4.1 Occurrences of karst, caves, crevices and cliffs

No Karsts, caves, crevices or cliffs occur within the development site.

4.4.2 Occurrences of rock

Isolated areas of rock outcrop were observed through the development site consisting of largely embedded rock and sporadic loose rock. The majority of these areas occur within heavily grassed and improved pasture paddocks with minimal native groundcover. Small isolated rock outcrops do occur on occasion within the remnant patches of woodland.

Figure 4-5 Example of rocky outcrop within cleared improved pasture paddocks

4.4.3 Occurrences of human made structures and non-native vegetation

No human-made structures that could be used by threatened species occur within the development site

Non-native vegetation within the development site consists of both cleared paddocks with improved pasture species such as Phalaris and Barley grass as well as large areas of Radiata pine plantation managed by Forestry NSW. Although Radiata pine plantations may allow for the movement of threatened fauna throughout the broader landscape and potentially foraging habitat for threatened microbats on occasion,

it is not considered that threatened fauna species would utilise the pine plantations regularly for foraging or breeding and would only be utilised for transient use. No threatened species are considered to rely on the non-native vegetation within the development site.

4.4.4 Hydrological processes that sustain and interact with the rivers, streams and wetlands

Flyers Creek is a fifth order stream under the Strahler stream classification system (Strahler 1952) and is located within the southern end of the development site. The riparian vegetation has been subject to modification due to historical agricultural land use with banks dominated by exotic vegetation such as Willows (**Salix sp*.), Blackberry (**Rubus fruticosus*) and exotic annuals, however visual observations of the water quality at the time of the field surveys was appeared clear and good.

Unnamed drainage lines occur on occasion throughout the development site. These first order streams (Strahler 1952) are ephemeral and have been extensively modified through internal roads and periodic but regular cultivation. It is not anticipated that these drainage lines and Flyers Creek would be impacted or have broader impacts for environments that sustain and interact with the rivers, streams and wetlands either on or offsite.

5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

An EPBC protected matters search tool (PMST) report was undertaken on 12 June 2018 (10 km buffer of the development site) to identify Matters of National Environmental Significance (MNES) that have the potential to occur within the development site (refer to Appendix C). Those relevant to biodiversity include:

- Wetlands of International Importance
- Threatened Ecological Communities
- Threatened species
- Migratory species

The potential for these MNES to occur at the site are discussed below.

5.1 WETLANDS OF INTERNATIONAL IMPORTANCE

Four wetlands of international importance were identified. All four occur over 600 km from the development site and are not connected to the development site. The nearest of these (600-700 km upstream) is Hattah-Kulkyne Lakes.

5.2 THREATENED ECOLOGICAL COMMUNITIES

Three TECs were identified in the PMST report. One of these TECs could potentially occur in the development site based on the presence of Yellow Box and Blakley's Red Gum trees which are characteristic of the TEC listed as:

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived native grassland – Critically Endangered

An assessment of whether the PCTs within the development site met the condition threshold for each of the EPBC listed communities was undertaken.

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived native grassland

Small remnant isolated patches of remnant Blakely's Red Gum and Yellow Box Woodland occurs surrounded by forestry pine plantation within the northern section of the development site. The southern section of the development site contains largely cleared agricultural areas containing remnant Yellow Box and Blakley's Redgum clumps and paddock trees. This vegetation was not considered to form part of the federally listed ecological community due to insufficient native species cover and richness in the ground layer and limited patch size as per the EPBC White Box- Yellow Box- Blakey's Redgum grassy woodland and derived native grassland guidelines.

5.3 THREATENED SPECIES

Thirty threatened species were returned from the PMST report. Of these, six are considered to have the potential to utilise habitat within the development site on occasion. Whilst all have been considered and assessed, bold entries can be considered to have been adequately surveyed during onsite surveys:

- Birds
    - Swift Parrot (*Lathamus discolor*)- CE

  - **Superb Parrot (*Polytelis swainsonii*) – V**
- Mammals
  - **Koala (*Phascolarctos cinereus*) – V**
  - Spotted-tailed Quoll (*Dasyurus maculatus*) – E
- Reptiles
  - **Pink-tailed Worm-lizard (*Aprasia parapulchella*) – V**
- Flora
  - **Silver-leaf Candlebark (*Eucalyptus canobolensis*) – E**
  - **Small Purple-pea (*Swainsona recta*) – E**

5.4 MIGRATORY SPECIES

Eleven listed migratory species were returned from the PMST report (Appendix F). None of these species are considered likely to occur at the site on a regular basis or rely on the habitats present.

6 AVOID AND MINIMISE IMPACTS

6.1 AVOIDING AND MINIMISING IMPACTS ON NATIVE VEGETATION AND HABITAT

6.1.1 Site selection – consideration of alternative locations/routes

Flyer Creek Wind Farm has analysed various routes and locations for the transmission line, onsite substations and connection to existing Essential Energy transmission lines from the approved Wind Farm development site. A preferred transmission line for the project was approved within the original project approval, however due to land access issues, a modification application to withdraw the approved route (modification 2) was granted and an alternative route provided (modification 4). The preliminary transmission route corridor (100m) was designed to minimise environmental impacts, potential impacts to the community as well as keep costs limited by reducing the length of the transmission line and the infrastructure required.

A secondary option, option 2, is currently subject to a separate assessment and BDAR. Option 2 is the preferred route in terms of further minimising impacts to biodiversity along Panuara Rd, however due current land access issues, Option 2 may not be able to proceed.

The proposed site (Option 1) was selected because;

- The land has been heavily disturbed from past and current agricultural activities.
- Low ecological constraints, predominantly cleared land consisting of exotic improved pastures and large exotic Radiata pine forestry plantations, therefore minimising native vegetation removal to the minimum extent necessary.
- The development site is not subject to land hazards such as flooding or bush fire and is not known to hold land contamination.
- The development site occurs on undulating land with no significant impacts to waterways.
- Provides a more direct route than previously designed, limiting potential impacts
- The proposal is unlikely to generate land use conflicts with surrounding land uses.

The assessed transmission easement route corridor allows for flexibility in the detailed design of the transmission line, allowing Flyer Creek Wind Farm to avoid or effectively mitigate the ecological constraints that have been identified during the biodiversity assessment process i.e. hollow-bearing trees. The final easement corridor for overhead line construction will be 45m within the 100m development site. Additionally, as indicated Figure 3-10, it is proposed an underground section along Panuara Rd and the southern portion of Cadia Rd will be utilised to minimise impacts roadside vegetation containing Box-gum woodland EEC and impacts to nearby landowners. The development site is considered to be a suitable location for the proposal.

6.1.2 Proposal components – consideration of alternate modes or technologies

The LRET and REAP outline the commitment by both Australia and NSW to reduce GHG emissions and set targets for increasing the supply of renewable energy. Other forms of large-scale renewable energy accounted for in the LRET include wind, hydro, biomass, and tidal energy. The feasibility of wind, solar, biomass, hydro and tidal projects depend on the availability of energy resources and grid capacity.

The Wind Farm project design has been developed based on a number of considerations including energy resource analyses, access to suitable lands, likely equipment specifications, environmental studies and feasibility studies as well as issues raised during the community consultation program. Works for connection of the Flyers Creek Wind Farm to the grid are considered as an integral part of the development activities. As previously mentioned, the assessed easement can be flexible to minimising impacts on site constraints.

6.1.3 Proposal planning phase – detailed design

The easement has been mapped and assessed accordingly as a 'worst-case' scenario based on an indicative easement route. During the detailed design process, the transmission line will be designed to minimise impacts to biodiversity, particular in regard to the required removal of hollow-bearing trees.

6.2 AVOIDING AND MINIMISING PRESCRIBED BIODIVERSITY IMPACTS

The BC Regulation (clause 6.1) identifies actions that are prescribed as impacts to be assessed under the biodiversity offsets scheme: The following prescribed impacts are relevant to the proposal:

- Impacts of development on the connectivity on different areas of habitat of threatened species that facilitates the movement of those species across their range.
- Impacts of development on the connectivity on movement of threatened species that maintains their life cycle.
- Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities.
- Impacts of vehicle strikes on threatened species or on animals that are part of a TEC.
- Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation.
- Impacts of development on the habitat of threatened species or ecological communities associated with rocks.

How these prescribed impacts have been avoided and minimised by the proposal is detailed below.

6.2.1 Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range.

The development footprint was designed to avoid impacts to native vegetation, and where impacts were unavoidable, impacts were minimised. Although vegetation greater than 3 m in height would be impacted to maintain clearance from conductors, impacts to groundcover and native shrubs less than 3 m would be restricted to areas of pole construction only and would be retained elsewhere along the easement. The linear nature of the development footprint does not significantly affect the existing landscape connectivity within the development site. Fragmentation of vegetation across the landscape is minimised as the proposed transmission line route runs adjacent to Cadia Rd as well as across already heavily fragmented and disturbed landscape in the southern areas where land has been extensively cleared. Threatened fauna, particularly avifauna and microbats, known or having the potential to occur within the development site are considered highly manoeuvrable allowing these species to take necessary evasive action upon operation of the transmission line. Mitigation measures would be implemented to further minimise the risk of collision with the transmission line (Section 8).

Although the proposal requires the removal of small linear areas of native woodland, as well as exotic pine plantation, it is considered that the proposal would not impact the ability of threatened species to move across the landscape upon operation.

6.2.2 Impacts of development on the connectivity on movement of threatened species that maintains their lifecycle.

As discussed in Section 6.2.1 , the linear nature of the development footprint does not significantly affect the existing landscape connectivity within the development site. Fragmentation of vegetation across the landscape is minimised as the proposed transmission line route runs adjacent to Cadia Rd as well as across already heavily fragmented and disturbed landscape in the southern areas where land has been extensively cleared. Connectivity throughout the landscape would be maintained and therefore threatened species, as well as migratory species that rely on seasonal movements to maintain their lifecycle would not be significantly impacted.

Eucalyptus canobolensis individuals recorded within the development site are not located within the development footprint and therefore would not be directly impacted. Mitigation measures would be implemented to ensure indirect impacts would not occur to these individuals and therefore impacts upon their ability to maintain their lifecycle.

A worst-case scenario has been considered in terms of assessing impacts within the development footprint. Upon final design and exact location of infrastructure within the assessed easement, it is possible to avoid or further minimise impacts on areas that may provide breeding habitat for threatened species. These include areas containing hollow-bearing trees which provide threatened species habitat.

6.2.3 Impacts of development on water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities.

The development footprint was designed to avoid impacts to the dams surrounding the development site. There would be no direct impacts to Flyers Creek however no threatened species are likely to be reliant on this habitat given the poor quality.

Hydrological processes across the site would not be modified and current drainage across the site would be maintained. Sediment and erosion and pollution control measures will be put in place during construction to maintain water quality moving outside of the development footprint. No indirect impacts to the dams or rivers downstream are likely.

6.2.4 Impacts of vehicle strikes on threatened species or on animals that are part of a TEC.

Large portions of the development site run adjacent to Cadia Rd and Panuara Rd and as such, the risk of vehicle strike is already present from existing rural and mine associated traffic. An increase in vehicle traffic during construction and required maintenance may slightly increase the risk of vehicle strike on threatened species occurring in or near the development site.

No barriers to movement would be created that could funnel any threatened species into these transport corridors.

6.2.5 Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation.

The development footprint was designed to avoid impacts to native vegetation, however in doing so will impact on about 31.7 ha of Radiata pine forestry plantation that is within the development footprint. Threatened fauna species are unlikely to rely on this habitat however may utilise it for movement on occasion. Additionally, the proposal will impact on about 16.21 ha of cleared improved pasture consisting of species such as Phalaris (*Phalaris aquatica*), Barley Grass (*Hordeum leporinum*), Clover (*Trifolium sp.)* and Medic (*Medicago sp.)* species. Although these areas may be used on occasion for movement of species, they provide little foraging and breeding opportunities for native flora and fauna species within the region. As, discussed in Section 6.2.1, due to the linear areas being removed and amount of non-native vegetation remaining around the development site, it is considered that the proposal would not impact the potential habitat that non-native vegetation may provide.

6.2.6 Impacts of development on the habitat of threatened species or ecological communities associated with rocks

Rocky outcrops are sparsely located throughout the development site and broader landscape consisting of tertiary basalts and sediments common through the Mt Canobolas geological region. The rock outcrops largely consist of embedded rock within the cleared paddocks and woodland areas with small amounts of loose rock scattered throughout cleared improved pasture paddocks. Species such as Pink-tailed Worm-lizard utilise areas of partially embedded and loose rock predominantly within native grassy groundcover, therefore rocky outcrops surveyed are considered non-optimal for this species. Although rocky outcrops occur within the assessed development easement or footprint, potential impacts to rocky outcrops would occur with pole construction only. As the poles constructed along the easement are spaced between 100-200 m apart, depending on the landscape position, rocky outcrops can be avoided where practicable.

7 IMPACTS UNABLE TO BE AVOIDED

7.1 DIRECT IMPACTS

The construction and operational phases of the proposal has the potential to impact biodiversity values at the site that cannot be avoided. This would occur through direct impacts such as habitat clearance and installation and ongoing existence of infrastructure as detailed in Table 7-1.

Table 7-1 Potential impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	Consequence
Direct impacts				
Habitat clearance for permanent and temporary facilities (e.g. transmission line, compound sites, stockpile sites, access tracks)	5.0 ha native vegetation (predominantly overstorey species) 31.7 ha of exotic pine plantation	One-off	Construction phase: Long term	• Direct loss of native flora and fauna habitat • Potential over-clearing of habitat outside proposed development footprint • Injury and mortality of fauna during clearing of fauna habitat and habitat trees • Disturbance to stags, fallen timber, and bush rock
Displacement of resident fauna	Unknown	Regular	Construction & Operational Phase: Long-term	• Direct displacement of native fauna • Potential decline in local fauna populations
Injury or death of fauna	Unknown	Irregular	Construction Phase: Short-term	• Direct loss of native fauna • Decline in local fauna populations
Removal of habitat features e.g. HBTs	15 HBTs	One-off	Construction Phase: long-term	• Direct loss of native fauna habitat • Injury and mortality of fauna during clearing of habitat features
Impacts to geological features	Areas of rocky outcrop	One-off	Construction Phase: Long term	• Disturbance of rocky outcrop habitat
Existence of permanent transmission line	Unknown	Constant	Operational Phase: long-term	• Modification of habitat beneath transmission line (mostly non-native) • Reduced fauna movements across landscape • Collision risks to birds and microbats

7.1.1 Loss in native vegetation

About 5.0 ha of native vegetation would be removed by the proposal. The changes in vegetation integrity scores as a result of clearing are documented for each vegetation zone in Table 7-2 below.

Table 7-2 Table of current and future vegetation integrity scores for each vegetation zone within the development site.

Zone ID	PCT	EEC and/or threatened species habitat?	Area (ha)	Current vegetation Integrity Score	Future vegetation Integrity Score
1	277_mod	White Box Yellow Box Blakely's Red Gum woodland EEC	1.5	19.6	0
2	1330_poor	Not EEC or Threatened species habitat	1.2	2.5	0
3	1330_moderate	White Box Yellow Box Blakely's Red Gum woodland EEC	1.6	28	0
4	1330_mod/good	White Box Yellow Box Blakely's Red Gum woodland EEC	0.7	33.3	0
5	277_PT	White Box Yellow Box Blakely's Red Gum woodland EEC	0.01	68.5	0
		TOTAL:	**5.0**		

7.1.2 Loss of species credit species habitat or individuals

The loss of species credit species habitat or individuals as a result of clearing is documented in Table 7-3 below.

Table 7-3 Summary of species credit species loss at the development site

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	1.5	0.3 ha
Squirrel Glider (*Petaurus norfolcensis*)	2	0.8 ha

7.1.3 Loss of Paddock Trees

One (1) Blakely's Redgum (*E. blakelyi*) individual occurs as a paddock tree within the development site. This paddock tree may be able to be avoided during fine design of the transmission line. Details of the paddock tree and each of the hollow-bearing trees within the development site are provided in Appendix D.

7.1.4 Loss of hollow-bearing trees

Thirty-two (32) hollow-bearing trees were recorded in the development site. Fifteen (15) of these (including the one paddock tree) and are assumed to being removed by the proposal (Table 7-4).

Table 7-4 Hollow bearing trees impacted by the proposal.

ZONE	HBTs within zone	HBTs impacted
Zone 1 PCT 277_mod	19	9
Zone2: PCT 1330_poor	0	0
Zone 3 PCT 1330_moderate	9	3

ZONE	HBTs within zone	HBTs impacted
Zone 4 PCT 1330_mod/good	0	0
Zone 5 PCT 277_PT	0	0
Zone 6 Exotic pasture	3	2
Zone 7 Exotic pine plantation	0	0
Zone 8 Paddock tree	1	1

7.2 INDIRECT IMPACTS

Indirect impacts of the proposal include soil and water contamination, creation of collision risk to fauna movement, or the generation of excessive dust, light or noise. Section 9.1.4.2 of the BAM identifies the specific indirect impacts that must be considered, which are included in Table 7-5 with the type, frequency, intensity, and duration of the indirect impacts that may occur as a consequence of the proposal. Given the current land management practices and degraded nature of the development site, indirect impacts that are unlikely to occur or be exacerbated as a result of the proposal include:

- Increased risk of starvation, exposure and loss of shade or shelter
- Trampling of threatened flora species
- Inhibition of nitrogen fixation and increased soil salinity
- Fertiliser drift
- Wood collection
- Bush rock removal and disturbance
- Increase in predatory species populations
- Increase in pest animal populations
- Disturbance to specialist breeding and foraging habitat.

Table 7-5 Potential indirect impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Indirect impacts (those listed below are included in the BAM)					
Inadvertent impacts on adjacent habitat or vegetation	Unknown	Rare	Construction Phase: Short-term	• White Box Yellow Box Blakely's Red Gum Woodland • *Eucalyptus canobolensis* • Squirrel glider	• Minor direct loss of native flora and fauna habitat • Low potential for injury and mortality of fauna during clearing of fauna habitat and habitat trees • Minor disturbance to stags, fallen timber, and bush rock • Increased edge effects The combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence
Reduced viability of adjacent habitat due to edge effects	Unknown	Constant	Operational Phase: Long-term	• White Box Yellow Box Blakely's Red Gum Woodland • *Eucalyptus canobolensis* • Squirrel glider	• Degradation of White Box Yellow Box Woodland EEC • Minor loss of native flora and fauna habitat The combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence
Reduced viability of adjacent habitat due to noise, dust or light spill	Unknown	Rare	Operational Phase: Short-term	• Squirrel glider • Gang-gang cockatoo	• May alter fauna activities and/or movements • Minor loss of foraging or breeding habitat The combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Transport of weeds and pathogens from the site to adjacent vegetation	Unknown	Irregular	Construction & Operational Phase: Long-term	• White Box Yellow Box Blakely's Red Gum Woodland • *Eucalyptus canobolensis*	• Degradation of White Box Yellow Box Blakley's Red Gum Woodland EEC through weed encroachment • Minor loss of native flora and fauna habitat. The combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence
Loss of breeding habitat	16 HBT	Constant	Construction Phase: Long-Term	• Squirrel glider • Gang-gang Cockatoo	• Minor loss of potential breeding habitat through potential removal of hollow bearing trees.
Earthworks and mobilisation of sediments	Unknown	Regular	Construction phase: Short term	• White Box Yellow Box Blakely's Red Gum Woodland • *Eucalyptus canobolensis*	• Erosion and sedimentation and/or pollution of soils, dams and downstream habitats. • Potential loss of ground cover resulting in unstable ground surfaces and sedimentation of adjacent waterways.
Rubbish dumping	Unknown	Regular	Construction & Operational Phase: Long term	• White Box Yellow Box Blakely's Red Gum Woodland	• Degradation of White Box Yellow Box Woodland EEC
Increase risk of fire	Unknown	Regular	Operational Phase: Long term	• White Box Yellow Box Blakely's Red Gum Woodland • *Eucalyptus canobolensis*	• Slight increase in the unlikely event of transmission line failure or damage causes in a bushfire resulting in biodiversity impacts and property damage

7.3 PRESCRIBED IMPACTS

The following prescribed biodiversity impacts are relevant to the proposal:

- Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range
- Impacts of development on the connectivity on movement of threatened species that maintains their life cycle
- Impacts of vehicle strikes on threatened species or on animals that are part of a TEC
- Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation.
- Impacts of development on the habitat of threatened species or ecological communities associated with rocks
- Impacts of wind turbine strikes on protected animals (in reference to increases turbine envelope in modification 4 only)

These are discussed in detail below and the necessary information required by Section 9.2 of the BAM provided.

7.3.1 Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

The development site occurs within a highly altered landscape consisting predominately of cleared agricultural land and forestry pine plantations. The development site runs across rural land and adjacent to Cadia Rd and Panuara Rd providing minimal landscape connectivity due to the presence of small uncleared patches of remnant vegetation and planted vegetation in the southern portion of the development site. Isolated patches of overstory vegetation and paddock trees however provide stepping stones for highly mobile aerial species.

The northern portion of the development site is surrounded predominantly by forestry pine plantation which offers little in terms of foraging and breeding opportunities but does provide opportunity for movement through the landscape. As the development site is linear development with groundcover and shrubs less than 3 m being retained throughout most of the easement, overstorey vegetation and small amounts of groundcover and midstorey vegetation removed does not have a substantive impact on the movement of these species throughout the area.

There is an increased risk of collision upon operation of the transmission line. Avifauna and microbats that are known or have the potential to occur within the development site are considered highly manoeuvrable allowing these species to take necessary evasive action upon operation of the transmission line. Mitigation measures, such as visual markings, would be implemented to further minimise the risk of collision with the transmission line. Based on these factors, the proposal is unlikely to have a substantive impact on connectivity and movement of threatened species throughout the landscape.

7.3.2 Impacts of the development on movement of threatened species that maintains their life cycle

No known migratory routes occur within the development site. The development site occurs within a highly altered landscape consisting predominately of cleared agricultural land and forestry pine plantations and

threatened species that may move within or through the development site would be tolerant of existing disturbances.

One migratory species, the Swift Parrot, was identified as a potential candidate species in the BAM Calculator. The Swift Parrot breeds in Tasmania during Summer and the entire population migrates north to the mainland in winter (TSSC 2016). In NSW, the Swift Parrot migrates to the South Western Slopes and the coast to forage. Swift Parrots forage on winter flowering Eucalypt species and lerp infested Eucalypts. The Swift Parrot was not identified during the field survey and the development site does not fall within an area of mapped important habitat (OEH 2018). Given the relatively small amount of habitat to be removed and low quality of potential habitat, the development is unlikely to impact the movement of the Swift Parrot across its range.

The Squirrel glider was identified during the field surveys. The Squirrel glider is an arboreal and agile species that relies on hollow-bearing trees for shelter and breeding. The proposal involves the potential removal of 15 hollow-bearing trees, of which two (2) are located within the vegetation zone in which the Squirrel Glider was observed. However, due to the linear nature of the development footprint, vegetation containing suitable breeding habitat would be retained. Mitigation measures to time works to avoid clearing during the breeding season would minimise impacts to the life cycle of this species. As these species are capable and adept to climbing and gliding, the transmission line would not cross potential corridors for movement across the landscape to other breeding hollows which will still be maintained within the development site and surrounding areas.

The Gang-gang Cockatoo is a highly mobile species and can travel large distances via seasonal altitudinal migration from high forest vegetation to lower woodland slopes during winter. Suitable roosting habitat was identified in the development site in the form of hollow-bearing trees within vegetation zones and paddock trees. The proposal involves the removal of 15 hollow-bearing trees across a large-scale linear development site. Due to the linear nature of the development footprint, vegetation containing suitable roosting and breeding habitat would be retained where possible. Mitigation measures to time works to avoid clearing during the breeding season and migrating season would minimise impacts to the life cycle of this species. Movement and foraging habitat would still be maintained within the development site.

There is an increased risk of collision upon operation of the transmission line. Avifauna and microbats that are known or have the potential to occur within the development site are considered highly manoeuvrable allowing these species to take necessary evasive action upon operation of the transmission line. Mitigation measures, such as visual markings, would be implemented to further minimise the risk of collision with the transmission line. Based on these factors, the proposal is unlikely to impact on movement of threatened species that maintains their lifecycle

7.3.3 Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC

Cadia Rd and Panuara Rd are considered rural roads however due to the presence of the nearby Cadia Mine, traffic can be moderately increased at certain periods of the day based on mine personnel travelling to/from the mine site. There would be a temporary traffic increase during construction however this would not be substantially different to that of existing traffic movement and constraints.

The Squirrel glider is an arboreal mammal, rarely coming to the ground, and therefore is not considered to be at significant risk of vehicle collision.

Gang-gang Cockatoo were assumed to occur on site due to inadequate survey timing. Gang-gang Cockatoo are mainly arboreal but on occasion will come to ground to drink and/or forage on the ground for fallen

fruits and/or seeds. The Gang-gang Cockatoo may be found foraging along roadsides adjacent to the development site and be at risk of vehicle collision.

All threatened species at risk of vehicle strike are highly mobile and agile species. Mitigation measures will be implemented to enforce a speed limit during construction. It is unknown at this time if roads are required to widened or upgraded with passing bays. With the recommended mitigation measures, it is not likely that there would be any notable increase in the risk of vehicle strike relevant to those that already exist.

7.3.4 Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation

The proposal was designed to avoid impacts to native vegetation, however in doing so will impact on about 31.7 ha of Radiata pine forestry plantation that is within the development footprint. Additionally, the proposal will impact about 16.21 ha of cleared improved pasture. Generally, plantations may provide habitat for some native flora and fauna species that would not occur within cleared agricultural land, however population densities of native woodland and forest dwelling species are considered to be significantly lower than that of native woodland and forest areas. Due to pasture establishment, pasture management and grazing management, cleared areas containing exotic improved pasture species are considered to be non-optimal for many native threatened fauna and flora species. Although these areas, particularly areas of pine plantation, may be utilised for movement throughout the landscape, due to the amount of radiata pine vegetation being removed as opposed to that being retained in the landscape, as well as the linear nature of the development and non-optimal habitat, impacts resulting from the removal of non-native vegetation are considered to negligible.

7.3.5 Impacts of development on the habitat of threatened species or ecological communities associated with rocks

As discussed in Section 6.2.6, impacts to rocky outcrops within the development footprint would be restricted to areas of pole construction only. As poles are spaced apart depending on landscape position, rocky areas mapped would be incorporated into the final design of the pole locations and avoided where practicable. Additionally, species such as Pink-tailed Worm-lizard that utilise areas of partially embedded and loose rock predominantly within native grassy groundcover are not considered to be present within the development site due to the non-optimal habitat present within the development footprint.

7.3.6 Impacts of wind turbine strikes on protected animals

One of the key items within modification 4 in addition to the reinstatement of the transmission line was an increase to the approved turbine envelope, therefore increasing the blade length and hub height of the turbine. This has been addressed and adequately assessed separately within the BBAI. The BBAI states that the majority of the wind farm comprises of ridges predominantly void of tree cover, with only a small proportion of the proposed turbines likely to be within Superb Parrot habitat, activities of Superb Parrots within the wind farm site will be monitored through the implementation of the Bird and Bat Adaptive Management Plan (BBAMP) and incorporate a monitoring program that will cover the period of occupancy Superb Parrots are on the site and at a frequency that will provide adequate data on flight patterns to identify, and mitigate for, at risk behaviours following adaptive management practice. Additional consideration of impacts to the increased turbine envelope are not considered further within this BDAR.

7.4 IMPACTS TO MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

7.4.1 Threatened Ecological Communities

No commonwealth listed ecological communities were identified in the development site. Box-gum woodland within the development footprint has limited patch size and are degraded due to previous land use and invasion of exotic flora, therefore does not met the criteria of being a Matter of National Environmental Significance (MNES).

7.4.2 Threatened Species

One EPBC listed species, *Eucalyptus canobolensis,* consisting of two (2) individuals, were recorded during the field surveys. These individuals are located within the development site however outside of the development footprint. One fauna species, the Superb Parrot although not detected during field survey, are known to occur within the area and are considered to have the potential to occur within the development site.

EPBC Assessments of significance were completed for two threatened species, Superb Parrot and *Eucalyptus canobolensis* (Appendix H). These concluded that a significant impact was unlikely, on the basis that the proposal would not:

- Lead to a reduction of the size or area of occupancy of a population, or fragment or disrupt the breeding cycle of a population
- Affect habitat critical to the survival of these species
- Affect habitat or introduce disease such that these species would decline
- Introduce invasive species harmful to the species
- Interfere with the recovery of these species.

No referral to the federal DoEE is considered necessary for these species.

The EPBC Referral Guidelines for the Koala (DoE 2014) documents the 'Koala habitat assessment tool' to assist proponents in determining if a proposal may impact on habitat critical to the survival of the Koala. The tool is provided as Table 7-6 below as it applies to the proposal. Impact areas that score five or more using the habitat assessment tool contain habitat critical to the survival of the Koala. The assessment in Table 7-6 resulted in a score of 4 and as such habitat within the study area is not considered to be critical to the survival of the Koala. An assessment of significance is not required.

Table 7-6: Koala habitat assessment tool for inland areas (DoE 2014)

Attribute	Score	Inland	Applicable to the proposal?
Koala occurrence	+2 (high)	Evidence of one or more koalas within the last 5 years.	
	+1 (medium)	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 10 years.	
	0 (low)	None of the above.	✓

Attribute	Score	Inland	Applicable to the proposal?
			No records within 2 km within the last 10 years
Vegetation composition	+2 (high)	Has forest, woodland or shrubland with emerging trees with 2 or more known koala food tree species, **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	✓ Two food tree species present (Apple Box and Yellow Box)
	+1 (medium)	Has forest, woodland or shrubland with emerging trees with only 1 species of known koala food tree present.	
	0 (low)	None of the above.	
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 1000 ha.	
	+1 (medium)	Area is part of a **contiguous landscape** < 1000 ha, but ≥ 500 ha.	
	0 (low)	None of the above.	✓ Not part of a large contiguous landscape. Exotic pine plantations dominant.
Key existing threats	+2 (high)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence. Areas which score 0 for koala occurrence and have no dog or vehicle threat present	✓ No Koala occurrence and no dog or vehicle threat
	+1 (medium)	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence, **OR** Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.	
	0 (low)	Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present, **OR** Areas which score 0 for koala occurrence	

Attribute	Score	Inland	Applicable to the proposal?
		and have a significant dog or vehicle threat present.	
Recovery value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	+1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	✓ Study area is not considered a habitat refuge nor does it provide important connectivity to large areas surrounding a habitat refuge
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
Total	**4**	**Decision: Habitat not critical to the survival of the Koala—assessment of significance not required**	

7.4.3 Migratory species

Based on a habitat evaluation, no migratory species were identified as potentially occurring within the development site (Appendix G). The proposal is unlikely to impact on any EPBC listed migratory species.

7.5 LIMITATIONS TO DATA, ASSUMPTIONS AND PREDICTIONS

It is possible that some species were not recorded during the survey due to the timing of the survey outside their recommended survey period. Where survey effort or timing is not consistent with the BAM or relevant guidelines, this is stated explicitly in the assessment and measures identified to address the limitation; i.e. assumption of occurrence for species whose survey window could not be met.

The calculation of hollow-bearings trees, in particular the size and number of hollows, was made from ground level. It is possible that some hollows are present that were not visible from ground level, which may result in underestimates of the number of hollows (Gibbons and Lindenmayer 2000). However, it was noted where it was considered likely that hollows were present but not visible from ground level.

8 MITIGATING AND MANGING IMPACTS

8.1 MITIGATION MEASURES

A general summary of the key measures required to mitigate the impacts of the proposal are provided below. Mitigation measures proposed to manage impacts, including proposed techniques, timing, frequency, responsibility for implementing each measure, risk of failure and an analysis of the consequences of any residual impacts are provided in Table 8-1.

8.1.1 Impacts from the clearing of vegetation and habitats

1. Time works to avoid critical life cycle events
2. Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or wildlife handler
3. Relocate habitat features (fallen timber, hollow logs) from within the development site to an adjacent area.

8.1.2 Indirect impacts

1. Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed
2. Adaptive dust monitoring programs to control air quality
3. Temporary fencing to protect significant environmental features
4. Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas
5. Staff training and site briefing to communicate environmental features to be protected and measures to be implemented

8.1.3 Prescribed impacts

1. Sediment barriers and spill management protocols to control the quality of water runoff from the site into the receiving environment
2. Enforce speed limits during construction to reduce impacts of vehicle strikes on threatened fauna.
3. Clearly survey and mark environmental no-go areas during construction to prevent clearing within unauthorised areas and where threatened species occur (i.e. *E. canobolensis*).
4. Visual markers spaced evenly along sections of transmission line to lower the risk of collision and electrocution of avifauna and microbats.

Table 8-1 Mitigation measures proposed to avoid and minimise impacts on native vegetation and habitat

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Displacement of resident fauna through vegetation clearing and habitat removal						
Timing works to avoid critical life cycle events such as breeding or nursing	• Where practicable, hollow-bearing trees would not be removed during breeding and hibernation season (June to January) to mitigate impacts • If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken by an ecologist or suitably qualified person to ensure no impacts to fauna would occur	Construction	Regular	Contractor	Moderate	Species not detected during pre-clearing surveys may be impacted.
Instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events	• Pre-clearing checklist • Tree clearing procedure • Staged habitat removal • Unexpected threatened species finds procedure	Construction	Regular	Contractor	Moderate	Species not detected during pre-clearing surveys may be impacted.
Relocation of habitat features (fallen timber, hollow logs) from within the development site.	• Tree-clearing procedure including relocation of habitat features to adjacent area for habitat enhancement	Construction	Regular	Contractor	Low	None
Indirect impacts on native vegetation and habitat						
Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of	• Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing.	Construction	Regular	Contractor	Low	None

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	• No stockpiling or storage within dripline of any mature trees • In areas to clear adjacent to areas to be retained, chainsaws would be used rather than heavy machinery to minimise risk of unauthorised disturbance					
Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	• Construction Environmental Management Plan will include measures to avoid noise encroachment on adjacent habitats such as avoiding night works as much as possible.	Construction	Regular	Contractor	Low	None
Light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill	• Avoid Night Works • Direct lights away from vegetation	Construction/ Operation	Regular	Contractor	Low	None
Adaptive dust monitoring programs to control air quality	• Daily monitoring of dust generated by construction and operation activities • Construction would cease if dust observed being blown from site until control measures were implemented • All activities relating to the proposal would be undertaken with the objective of preventing visible dust emissions from the development site	Construction	Regularly	Contractor	Moderate	None
Hygiene protocols to prevent the spread of weeds or pathogens	• A Weed Management procedure would be developed for the proposal	Construction, Operation	Regular	Contractor	Moderate	Weed encroachment

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
between infected areas and uninfected areas	to prevent and minimise the spread of weeds. This would include: o Management protocol for declared priority weeds under the *Biosecurity Act 2015* during and after construction o Weed hygiene protocol in relation to plant, machinery, and fill • The weed management procedure would be incorporated into the Biodiversity Management Plan.					
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	• Site induction • Toolbox talks	Construction	Regular	Contractor	Moderate	Impacts to native vegetation or threatened species for Staff training not being followed
Preparation of a vegetation management plan to regulate activity in vegetation	• Preparation of a Construction Flora and Fauna Management Plan that would include protocols for: o Protection of native vegetation to be retained o Best practice removal and disposal of vegetation o Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist o Weed management	Construction	One-off	Contractor	Moderate	Impacts to native vegetation or threatened species from Construction Flora and Fauna Management Plan not being followed.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	o Unexpected threatened species finds • Rehabilitation of disturbed areas					
Prescribed biodiversity impacts						
Sediment barriers and spill management procedures to control the quality of water runoff released from the site into the receiving environment	• An erosion and sediment control plan would be prepared in conjunction with the final design and implemented • Spill management procedures would be implemented.	Construction	Regular	Contractor	Moderate	Indirect impacts may occur to waterways if erosion and sedimentation control plan not implemented.
Staff training and site briefing to communicate impacts of traffic strikes on native fauna.	• Awareness training during site inductions regarding enforcing site speed limits. • Site speed limits to be enforced to minimise fauna strike.	Construction and Operation	Regular	Contractor	Moderate	Fauna strikes from vehicles
Mark environmental no-go areas during construction to prevent clearing within unauthorised areas and of threatened species (*E. canobolensis*).	• Preparation of a Biodiversity management plan that would include protocols for: o Protection of native vegetation to be retained o Survey by an ecologist or suitably qualified person to identify the placement of exclusion fencing during construction to protect *E. canobolensis* individuals. o Best practice removal and disposal of vegetation	Construction	One-off	Contractor	Moderate	Impacts to native vegetation or threatened species for Biodiversity Management Plan not being followed.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	o Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist • Weed management					
Visual markers spaced even along sections of transmission line to lower the risk of collision and electrocution of avifauna and microbats	• Install line markers on powerlines within areas of native woodland and pine plantation	Construction	One-off	Contractor	Low	Fauna strikes

9 SERIOUS AND IRREVERSIBLE IMPACTS (SAII)

9.1 POTENTIAL SERIOUS AND IRREVERSIBLE IMPACT ENTITIES

The principles used to determine if a development will have serious and irreversible impacts, include impacts that:

- Will cause a further decline of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to be in a rapid rate of decline, or
- Will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very small population size, or
- Impact on the habitat of a species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very limited geographic distribution, or
- Impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.

9.1.1 Threatened ecological communities

One threatened ecological community listed as a potential SAII entity in the *Guidance to assist a decision-maker to determine a serious and irreversible impact* would be impacted by the proposal;

- White Box-Yellow Box- Blakely's Red Gum Woodland BC Act (Box-gum Woodland)

9.1.2 Threatened species

There are no SAII candidate species recorded at the development site.

9.1.3 Additional potential entities

No further species were considered to be potential SAII entities.

9.2 ASSESSMENT OF SERIOUS AND IRREVERSIBLE IMPACTS

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

An assessment of the impacts to Box-gum woodland was undertaken. Figure 3-7 to Figure 3-10 shows the location of the Box-gum Woodland within the development site.

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

Up to 24.57 ha of Box-gum Woodland occurs within the development site. The southern areas of Box-gum Woodland (6.57 ha) occur as scattered and isolated clumps of vegetation that have been heavily modified through agricultural land use and roadside edge effects. This consists of predominantly intact canopy species but highly modified exotic groundcover with an absent sub-layer. The construction of the transmission line has been designed to avoid areas where canopy species are present however, in some instances, canopy species within or near the development footprint may be required to be removed or trimmed. Approximately 1.51 ha may be impacted or modified within the southern section.

Approximately 8.18 ha of Box-gum woodland within the northern section of the development site consists of moderate to good condition vegetation however within small isolated patches surrounded by forestry pine plantation. An additional low condition patch (2.64 ha) cleared of canopy species is also present and dominated by high threat weeds and roadside edge effects. As these areas are within the patches of forestry pine, it is not possible to avoid impacts to these patches within the development footprint. Approximately 2.34 ha of Box gum woodland and 1.17 ha of low condition woodland would be impacted or modified. Impacts however are restricted to the removal of canopy species and midstorey shrubs > 3 m height with minimal disturbance to native groundcover present. However, upon final design it may be possible to minimise the transmission line easement (development footprint) width from approximately 45 m to 30 m in these patches, minimising impacts to Box-gum woodland vegetation.

Additionally, there is also 7.16 ha of planted vegetation of local provenance consisting of species consistent with Box gum woodland. The majority of planted vegetation is on the western edge of Cadia rd and would be avoided. However, approximately 0.01 ha would require removal.

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

Up to 3.85 ha would be impacted or modified by the construction of the transmission line. This however is restricted to predominantly the removal of canopy species and midstorey shrubs > 3m in height within the development footprint and with minimal groundcover disturbance where native groundcover species are present. This does not include approximately 1.17 ha of low condition vegetation that results in an integrity score of < 15.

There is opportunity during final design of the transmission line easement to restrict the total development footprint within these areas of Box-gum woodland.

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

No threshold has yet been defined by OEH for the extent of Box-gum Woodland to be removed that constitutes a serious and irreversible impact.

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

Box-gum woodland in the broader locality of the development site has been heavily modified with only small patches discreet remnant patches and isolated paddock trees remining. Using GIS and State Vegetation Mapping, it is estimated 63 ha of Box-gum Woodland occurs within an area of 1000 ha surrounding the proposed development footprint and 661 ha of Box-gum Woodland occurs within an area of 10000 ha surrounding the proposed development footprint.

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

Threatened Species Scientific Committee (2006) estimates 55,798 ha of Box-gum Woodland remains in the NSW South Western Slopes and Southern tablelands IBRA Region. The linear removal of 3.85 ha as a result of the proposal equates to 0.007% of the estimated extent remaining.

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

In NSW Box-gum Grassy Woodland is known to occur within at least 42 reserve systems. 8,000 ha of Box-gum woodland is estimated to occur in national parks and nature reserves within the NSW South Western Slopes and tablelands IBRA Region (Benson 2008).

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

Groundwater supplies and levels are unlikely to be affected by the proposal plant and no groundwater is anticipated to be intercepted or extracted. During construction, the proposal would have a short term gross impact upon soils and possibly surface water flow, within discreet areas. These impacts are manageable with the implementation of erosion and sediment controls and would be unlikely to impact on abiotic factors critical to the long-term survival of Box-gum woodland.

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

No characteristic or functionally important species would be lost through the removal of the Box-gum woodland. The vast majority of Box-gum woodland within the development site has been modified or degraded due to historical land use and roadside edge effects. Minimal understory species would be removed and are restricted to pole construction only. No impacts to the remaining Box-gum woodland are anticipated. No introduced fire or flooding regimes would occur and no increase of natural occurrences of these events is anticipated from the development.

iii. the quality and integrity of an occurrence of the potential TEC through threats and indirect impacts

The linear removal of 3.85 ha of Box-gum Woodland would be impacted or modified. It is likely the remaining 20.72 of Box-gum woodland within the development site avoided by the development would remain unchanged from the current existing condition.

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

Due to the linear nature of the proposal predominantly adjacent to existing roads as well as through cleared agricultural landscapes, no direct or indirect fragmentation of an important area of Box-gum Woodland would occur as a result of the proposal. Connectivity of the TEC would be maintained.

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

The 3.85 ha of Box-gum woodland to be removed will be offset by 52 ecosystem credits, which equates to between 15 to 25 ha of managed and improved Box gum woodland, ensuring no net loss of the Box-gum Woodland in the IBRA region.

10 REQUIREMENT TO OFFSET

10.1 IMPACTS REQUIRING AN OFFSET

10.1.1 Ecosystem credits

An offset is required for all impacts of development on PCTs that are associated with:

a) a vegetation zone that has a vegetation integrity score ≥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.

The PCTs and vegetation zones requiring offset and the ecosystem credits required are documented in Table 10-1 and mapped on Figure 10-1.

Table 10-1 PCTs and vegetation zones that require offsets

Zone ID	PCT ID	Zone	Impact area (ha)	Vegetation integrity score	Ecosystem credits required
PCT 277: Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion					
1	277	Moderate	1.5	19.6	15
5	277	Planted native vegetation	0.01	68.5	1
				Subtotal:	**16**
PCT 1330: Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion					
3	1330	Moderate	1.6	28	23
4	1330	Moderate/good	0.7	33.3	12
				Subtotal:	**35**
				TOTAL:	**51**

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix H.

10.1.2 Paddock Tree Credits

Offsets are required for the clearing of Class 2 and Class 3 Paddock trees. One (1) Class 3 paddock tree would be removed by the proposal. The paddock trees are considered to form part of PCT 277: *Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.* Ecosystem credits are calculated as per the streamlined assessment defined in Appendix 1 of the BAM. The ecosystem credits are documented in Table 10-2. One (1) ecosystem credit is required for the clearing of the paddock tree.

Table 10-2 Paddock tree offsets

Class of Paddock Tree being cleared	Hollows Present	Number of Paddock Trees to be cleared	Credits Required	Ecosystem credits required
PCT 277: Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion				
Class 3 **>50cm DBH**	Yes	1	1	1
			TOTAL:	**1**

10.1.3 Species credits

An offset is required for the threatened species impacted by the development that require species credits. These species and the species credits required are documented in Table 10-3.

Table 10-3 Species credit species that require offsets

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost	Species credits required
Fauna			
Callocephalon fimbriatum Gang-gang Cockatoo	2	0.2 ha (0.24 ha 277_mod and 0.06 ha 1330 mod)	3
Petaurus norfolcensis Squirrel Glider	2	0.82 ha	11
		TOTAL	**14**

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix H.

10.1.4 Offsets required under the EPBC Act

No species listed on the EPBC Act have been identified as having the potential to be significantly impacted by the development. As such, the proposal is not considered to require offsets in accordance with the EPBC Act Environmental Offsets Policy.

10.2 AREAS NOT REQUIRING ASSESSMENT

Up to 47.91 ha of land comprised of exotic improved pastures (16.21 ha) and forestry pine plantation (31.7 ha) would be modified or impacted by the proposal. This area is not considered native vegetation, does not contain optimal threatened species habitat and does not require offsetting or further assessment.

These areas are mapped on Figure 10-1 to Figure 10-3.

10.3 SUMMARY OF OFFSET CREDITS REQUIRED

The following credit requirement is generated for the proposal.

Table 10-4 Credit requirement for the proposal

Ecosystem Credits	**Offset credits required**
PCT 277: Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	16
PCT 277: Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (**Paddock Trees**)	1
PCT 1330: Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion	35
TOTAL	**52**
Species Credits	**Offset Credits Required**
Squirrel Glider *Petaurus norfolcensis*	11
Gang-gang Cockatoo *Callocephalon fimbriatum*	3
TOTAL	**14**

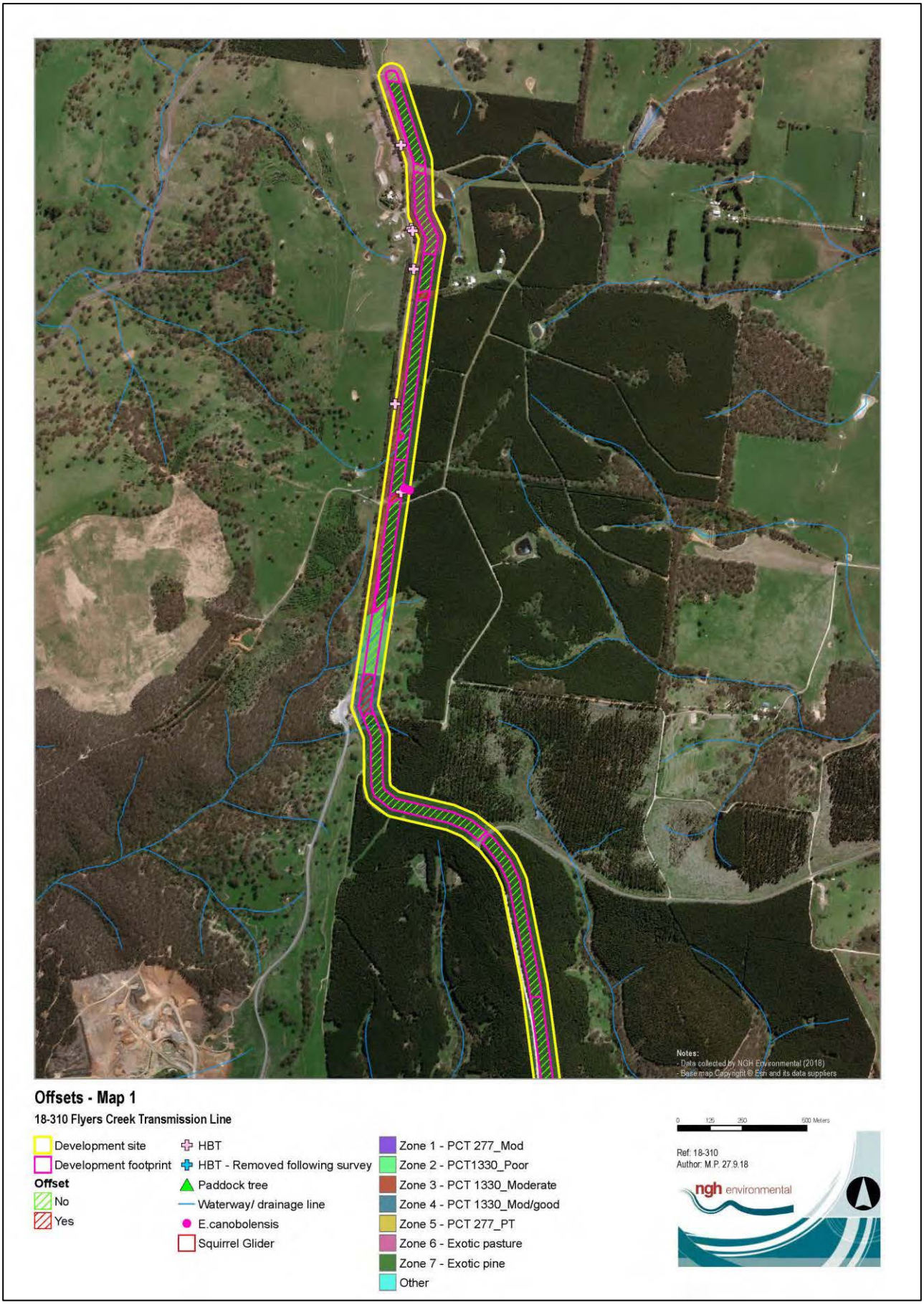

Figure 10-1 Impacts requiring offsets northern

Figure 10-2 Impacts requiring offset central

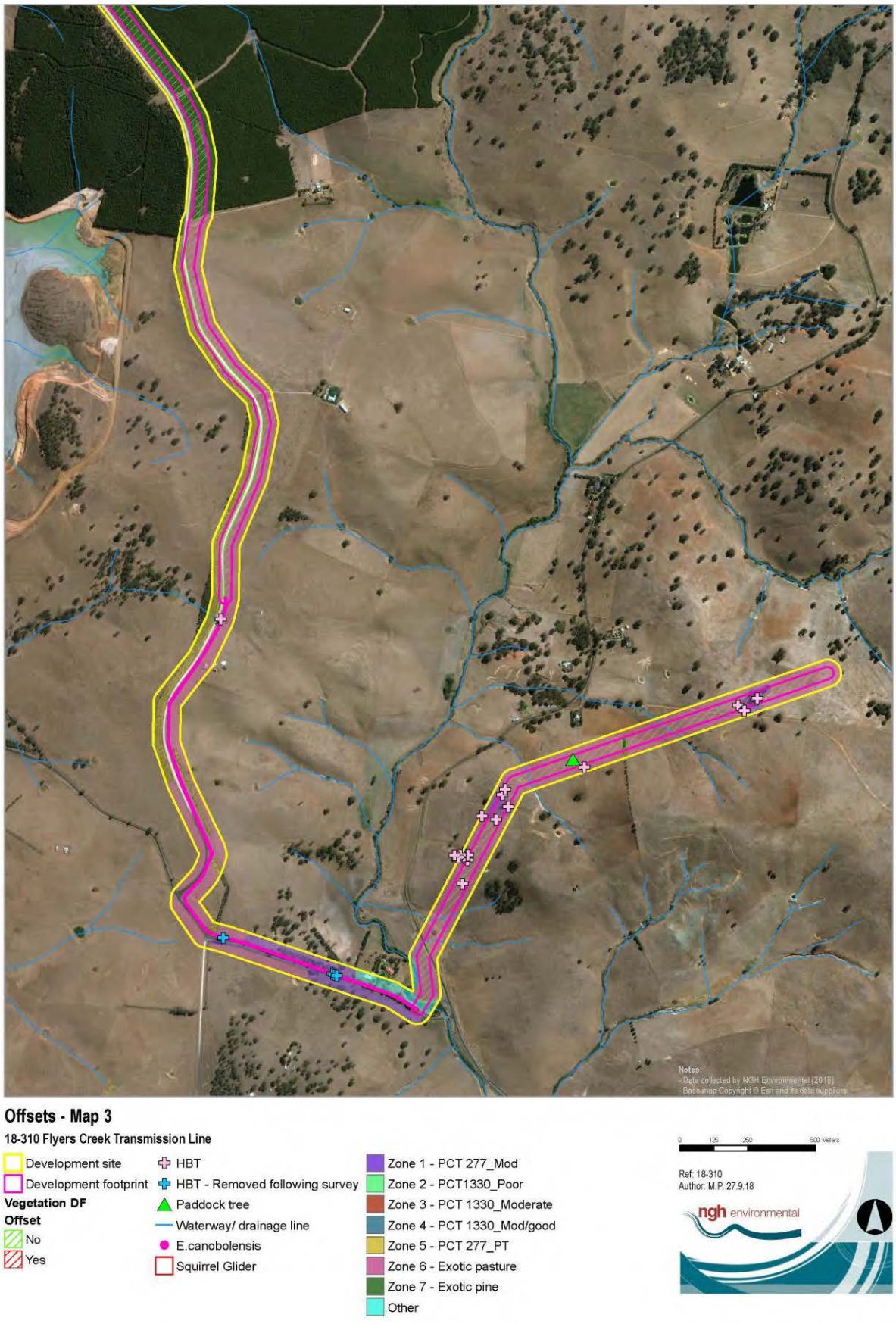

Figure 10-3 Impacts requiring offset southern

11 CONCLUSIONS

NGH Environmental has prepared this BDAR on behalf of Flyers Creek Wind Farm Pty Ltd for the Flyers Creek Wind Farm Transmission Line. The purpose of this BDAR is to address the requirements of the BAM and to address the biodiversity matters raised in the SEARs.

In this BDAR:

- Biodiversity impacts have been assessed through comprehensive mapping and assessment completed in accordance with the BAM
- Biodiversity impacts have been assessed at a worst-case scenario, based on an indicative easement (development site) which will be reduced upon final design
- Mitigation measures have been outlined to reduce impacts to biodiversity
- The credit requirement has been defined as:
    - 15 Ecosystem Credits for impacts to Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (PCT277)
    - 35 Ecosystem Credits for impacts to Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion (PCT 1330).
    - One (1) Ecosystem credit for the removal of one (1) *Eucalyptus blakeyi* paddock tree
    - 11 species credits for Squirrel Glider that was observed during field surveys within PCT 1330 as well three (3) species credits for assumed impacts to the Gang-gang Cockatoo that were unable to be surveyed for during the recommended survey period.

The retirement of these credits must be carried out in accordance with the NSW Biodiversity Offsets Scheme, and will be achieved by:

(a) acquiring or retiring credits under the Biodiversity Offsets Scheme
(b) making payments into the Biodiversity Conservation Fund using the offsets payment calculator, or
(c) funding a biodiversity action that benefits the threatened entity(ies) impacted by the development.

Following final detailed design of the Flyers Creek Wind Farm transmission line, the BDAR and associated calculations will be updated to account for the reduced impacts with offset obligations retired as per the preferred measures stated above.

12 REFERENCES

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Threatened Species Scientific Committee (TSSC) (2016) – Conservation Advice: *Squirrel Glider*

Threatened Species Scientific Committee (TSSC) (2015) – Conservation Advice: *Gang-gang Cockatoo*

APPENDIX A PERSONNEL

Name	Title	Qualifications	**Roles**
Mitch Palmer	Senior Ecologist (Technical Lead)	• BAM Accredited Assessor #BAAS17051) • B.Science (Geology and Geography)	Direction in BAM assessment and lead author BDAR Field Work including PCT identification, vegetation mapping, vegetation integrity plots Approval of BDAR
Brendon True	Botanist	• BAM accredited assessor training (application in process) • B. Science (Ecology and Biodiversity) • Masters Conservation Biology	Direction in BAM assessment Field Work including PCT identification, vegetation mapping, vegetation integrity plots
Freya Gordon	Senior Ecologist CEMVP	• B. Science (Hons)	Review of BDAR
Dave Maynard	Principal Ecologist	• BAM Accredited Assessor #BAAS17026) • B. Science (Ecology Hons 1)	Review of BDAR
Lauren Bryne	Environmental Consultant	• B.Science (Earth Systems)	GIS Mapping
Patrick McEvoy	Environmental Consultant	• B.EnvScMgt (Living Systems) • GradDipEnv	Assistance with Field Work
Clancy Bowman	Environmental Consultant - Graduate	• B.Science (Resource & Environmental Management)	Assistance with Field Work

APPENDIX B FLORA SURVEY PHOTOS

Plot 1	**PCT 1330 Moderate Good**
	
Plot 2	**PCT 1330 Poor**
	
Plot 3	**PCT 1330 Moderate**
	

Plot 4	**PCT 1330 Moderate**
	
Plot 5	**PCT 277 Moderate**
	
Plot 6	**Exotic**
	
Plot 7	**PCT 277 Moderate**

	
Plot 8	**PCT 277 Moderate**
	
Plot 9	**Exotic**
	
Plot 10	**Exotic**

APPENDIX C FIELD DATA SHEETS

BAM Site Field Survey

Project:	Flyers Creek	**Plot Identifier**	FC1	**Pic 20x20**		**Pic 20x50**	
Survey date:	12/09/2018		**Compass Orientation (head of 20x20 plot)**			10	N
Recorders	MP BT		**PCT:**	1330	Good		
GPS Easting	687819	**GPS Northing**	6296676		**Datum**	UTS	**Zone**

Landform			**Soils**			**Drainage & Slope**	
Morphology			**Soil Texture**			**Slope**	
LandF Element			**Soil Colour**			**Aspect**	
LandF Pattern			**Soil Depth**			**Drainage**	
Microrelief			**Geology**			**Watercourses**	

Dominant Species outside Plot	**E.mellidora, Cassina arcuta, acacia cultiformis, acacia dealbata, lissanthe strigosa**

FC1

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	3
	Shrub (SG)	1
	Forb (FG)	5
	Grass/Sedge (GG)	4
	Fern (EG)	0
	Other (OG)	0
	TOTAL	13

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	45
	Shrub (SG)	5
	Forb (FG)	6.3
	Grass/Sedge (GG)	1.3
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	57.6
	TOTAL 'HT'	5

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %
Litter Cover	5m	80%	92%
	15m	90%	
	25m	100%	
	35m	100%	
	45m	90%	
Bare	5m	0%	1%
	15m	0%	
	25m	0%	
	35m	5%	
	45m	0%	
Cryptogam cover	5m	0%	0%
	15m	0%	
	25m	0%	
	35m	0%	
	45m	0%	
Rock Cover	5m	0%	0%
	15m	0%	
	25m	0%	
	35m	0%	
	45m	0%	

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80	1		
50-79	5		
30-49	3		
20-29			
10-19	1		
5-9			N/A
<5			N/A
Length of logs (m)		2.2	

Species recorded for FC1

N:Native | E:Exotic | HT: High Threat Exotic

Abbreviation	Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	N, E or 'HT'
TREE (TG)							
Euca mell	*Eucalyptus melliodora*	Yellow Box	Myrtaceae		30		T
Euca brid	*Eucalyptus bridgesiana*	Apple Box	Myrtaceae		5		T
Euca goni	*Eucalyptus goniocalyx*	Bundy	Myrtaceae		10		T
cass arcu	*Cassinia arcuata*	Sifton Bush	Asteraceae		5		S
rubu frut	*Rubus fruticosus sp. agg.*	Blackberry complex	Rosaceae	*	5		HT
gera moll moll	*Geranium molle subsp. m*	Cranesbill Geranium	Geraniaceae	*	5		
hydr laxi	*Hydrocotyle laxiflora*	Stinking Pennywort	Apiaceae		5		F
oxal pere	*Oxalis perennans*		Oxalidaceae		0.5	100	F

micr stip	*Microlaena stipoides*	Weeping Grass	Poaceae		1	50	G
phal aqua	*Phalaris aquatica*	Phalaris	Poaceae	*	1	10	
acae nova	*Acaena novae-zelandiae*	Bidgee-widgee	Rosaceae		0.5	20	F
aspe conf	*Asperula conferta*	Common Woodruff	Rubiaceae		0.1	5	F
plan lanc	*Plantago lanceolata*	Lamb's Tongues	Plantaginacea	*	0.1	2	
echi caes	*Echinopogon caespitosus*	Bushy Hedgehog-gras	Poaceae		0.1	5	G
medi	*Medicago spp.*	A Medic	Fabaceae (Fab	*	0.2	50	
acet vulg	*Acetosella vulgaris*	Sheep Sorrel	Polygonaceae	*	0.1	5	
Unknown grass	*#N/A*	#N/A	#N/A	#N/A	0.1	5	
stel medi	*Stellaria media*	Common Chickweed	Caryophyllace	*	0.1	20	
cirs vulg	*Cirsium vulgare*	Spear Thistle	Asteraceae	*	0.1	10	
gera sola	*Geranium solanderi*	Native Geranium	Geraniaceae		0.2	50	F
vici sati	*Vicia sativa*	Common vetch	Fabaceae (Fab	*	0.1	20	
ente acic	*Enteropogon acicularis*	Curly Windmill Grass	Poaceae		0.1	5	G
them tria	*Themeda triandra*		Poaceae		0.1	5	G

BAM Site Field Survey

Project:	Flyers Creek	**Plot Identifier**	FC2	**Pic 20x20**		**Pic 20x50**		
Survey date:	12/09/2018		**Compass Orientation (head of 20x20 plot)**			60		
Recorders	MP BT		**PCT:**	1330	Low			
GPS Easting	687853	**GPS Northing**	6296866		**Datum**	UTS	**Zone**	55
Dominant Species outside Plot								

FC2

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	4
	Grass/Sedge (GG)	3
	Fern (EG)	0
	Other (OG)	0
	TOTAL	7

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	5.4
	Grass/Sedge (GG)	11.5
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	16.9
	TOTAL 'HT'	15

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter	5m	5%	3%	
	15m	5%		
	25m	5%		
	35m	0%		
	45m	0%		
Bare	5m	1%	4%	
	15m	1%		
	25m	1%		
	35m	15%		
	45m	0%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			N/A
<5			N/A
Length of logs (m)		0	

Species recorded for FC2

N:Native | E:Exotic | HT: High Threat Exotic

Abbreviation	Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	N, E or 'HT'	EPBC Stat	BCA Stat
Rubu frut	*Rubus fruticosus sp. agg.*	Blackberry complex	Rosaceae	*	15		HT		
gera moll moll	*Geranium molle subsp. m*	Cranesbill Geranium	Geraniaceae	*	1	100			
medi	*Medicago spp.*	A Medic	Fabaceae (Fab	*	15				
acet vulg	*Acetosella vulgaris*	Sheep Sorrel	Polygonaceae	*	0.1	5			
rume cris	*Rumex crispus*	Curled Dock	Polygonaceae	*	0.1	1			
sene quad	*Senecio quadridentatus*	Cotton Fireweed	Asteraceae		5		F		
stel medi	*Stellaria media*	Common Chickweed	Caryophyllace	*	5				
salv verb	*Salvia verbenaca*	Vervain	Lamiaceae	*	0.1	5			
hypo radi	*Hypochaeris radicata*	Catsear	Asteraceae	*	0.1	5			
acae nova	*Acaena novae-zelandiae*	Bidgee-widgee	Rosaceae		0.1	10	F		
oxal pere	*Oxalis perennans*		Oxalidaceae		0.1	50	F		
cirs vulg	*Cirsium vulgare*	Spear Thistle	Asteraceae	*	0.5	5			
plan lanc	*Plantago lanceolata*	Lamb's Tongues	Plantaginacea	*	1	50			
gono tetr	*Gonocarpus tetragynus*	Poverty Raspwort	Haloragaceae		0.2	5	F		
Phal aqua	*Phalaris aquatica*	Phalaris	Poaceae	*	20				
micr stip	*Microlaena stipoides*	Weeping Grass	Poaceae		1	50	G		
care appr	*Carex appressa*	Tall Sedge	Cyperaceae		10		G		
junc usit	*Juncus usitatus*		Juncaceae		0.5	10	G		

BAM Site Field Survey

Project:	Flyers Creek	**Plot Identifier**	FC3	**Pic 20x20**		**Pic 20x50**		
Survey date:	13/09/2018		**Compass Orientation (head of 20x20 plot)**			55		
Recorders	MP BT		**PCT:**	1330	mod			
GPS Easting	688002	**GPS Northing**	6297454		**Datum**	UTS	**Zone**	55
Dominant Species outside Plot								

FC3

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	2
	Shrub (SG)	1
	Forb (FG)	4
	Grass/Sedge (GG)	1
	Fern (EG)	0
	Other (OG)	0
	TOTAL	8

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	35
	Shrub (SG)	2
	Forb (FG)	1.7
	Grass/Sedge (GG)	5
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	43.7
	TOTAL 'HT'	20

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter	5m	90%	92%	
	15m	90%		
	25m	90%		
	35m	98%		
	45m	90%		
Bare	5m	0%	1%	
	15m	1%		
	25m	4%		
	35m	1%		
	45m	0%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	1%		
	25m	0%		
	35m	1%		
	45m	0%		

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80	6		7
50-79	2		
30-49			
20-29			
10-19			
5-9			N/A
<5			N/A
Length of logs (m)		16	

Species recorded for FC3

N:Native | E:Exotic | HT: High Threat Exotic

Abbreviation	Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	N, E or 'HT'	EPBC Stat	BCA Stat
Euca brid	*Eucalyptus bridgesiana*	Apple Box	Myrtaceae		30		T		
Euca cano	*Eucalyptus canobolensis*	Silver-Leaf Candlebark	Myrtaceae		5		T	E	V,P
gera moll moll	*Geranium molle subsp. m*	Cranesbill Geranium	Geraniaceae	*	1	100			
phal aqua	*Phalaris aquatica*	Phalaris	Poaceae	*	30				
rubu frut	*Rubus fruticosus sp. agg.*	Blackberry complex	Rosaceae	*	20		HT		
sily mari	*Silybum marianum*	Variegated Thistle	Asteraceae	*	10				
rori palu	*Rorippa palustris*	Yellow Cress	Brassicaceae	*	10				
acet vulg	*Acetosella vulgaris*	Sheep Sorrel	Polygonaceae	*	0.2	5			
rume brow	*Rumex brownii*	Swamp Dock	Polygonaceae		0.1	2	F		
pinu radi	*Pinus radiata*	Radiata Pine	Pinaceae	*	1	2			
micr stip	*Microlaena stipoides*	Weeping Grass	Poaceae		5		G		
hydr laxi	*Hydrocotyle laxiflora*	Stinking Pennywort	Apiaceae		1	100	F		
hypo radi	*Hypochaeris radicata*	Catsear	Asteraceae	*	0.5	20			
cass arcu	*Cassinia arcuata*	Sifton Bush	Asteraceae		2	3	S		
medi	*Medicago spp.*	A Medic	Fabaceae (Fab	*	5				
vici sati	*Vicia sativa*	Common vetch	Fabaceae (Fab	*	0.5	20			
rume cris	*Rumex crispus*	Curled Dock	Polygonaceae	*	0.1	2			
sene quad	*Senecio quadridentatus*	Cotton Fireweed	Asteraceae		0.5	2	F		
acae nova	*Acaena novae-zelandiae*	Bidgee-widgee	Rosaceae		0.1	5	F		
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	*	5				
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	*	1	50			
stel medi	*Stellaria media*	Common Chickweed	Caryophyllace	*	0.5	20			

BAM Site Field Survey

Project:	Flyers Creek	**Plot Identifier**	FC4	**Pic 20x20**		**Pic 20x50**		
Survey date:	13/09/2018		**Compass Orientation (head of 20x20 plot)**			70		
Recorders	MP BT		**PCT:**	1330	mod			
GPS Easting	688669	**GPS Northing**	6294867		**Datum**	UTS	**Zone**	55
Dominant Species outside Plot								

FC4

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	3
	Shrub (SG)	0
	Forb (FG)	5
	Grass/Sedge (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	8

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	50
	Shrub (SG)	0
	Forb (FG)	10.4
	Grass/Sedge (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	60.4
	TOTAL 'HT'	5

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter	5m	80%	78%	
	15m	70%		
	25m	80%		
	35m	80%		
	45m	80%		
Bare	5m	0%	2%	
	15m	1%		
	25m	4%		
	35m			
	45m			
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	1%		
	25m	0%		
	35m	0%		
	45m	0%		

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79	5		2
30-49	14		
20-29	2		1
10-19	1		
5-9			N/A
<5			N/A
Length of logs (m)		40	

Species recorded for FC4

N:Native | E:Exotic | HT: High Threat Exotic

Abbreviation	Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	N, E or 'HT'	EPBC Stat	BCA Stat
TREE (TG)									
Euca goni	*Eucalyptus goniocalyx*	Bundy	Myrtaceae		20		T		
Euca mell	*Eucalyptus melliodora*	Yellow Box	Myrtaceae		20		T		
euca brid	*Eucalyptus bridgesiana*	Apple Box	Myrtaceae		10		T		
urti inci	*Urtica incisa*	Stinging Nettle	Urticaceae		5		F		
gera moll moll	*Geranium molle subsp. m*	Cranesbill Geranium	Geraniaceae	*	2	100			
phal aqua	*Phalaris aquatica*	Phalaris	Poaceae	*	10				
rubu frut	*Rubus fruticosus sp. agg.*	Blackberry complex	Rosaceae	*	5		HT		
sene quad	*Senecio quadridentatus*	Cotton Fireweed	Asteraceae		5		F		
stel medi	*Stellaria media*	Common Chickweed	Caryophyllace	*	20				
Unkown forb	*#N/A*	#N/A	#N/A	*	2	20		#N/A	#N/A
acae nova	*Acaena novae-zelandiae*	Bidgee-widgee	Rosaceae		0.2	20	F		
vici sati	*Vicia sativa*	Common vetch	Fabaceae (Fab	*	0.2	5			
rori palu	*Rorippa palustris*	Yellow Cress	Brassicaceae	*	1	20			
marr vulg	*Marrubium vulgare*	White Horehound	Lamiaceae	*	0.2	5			
cirs vulg	*Cirsium vulgare*	Spear Thistle	Asteraceae	*	1	10			
hydr laxi	*Hydrocotyle laxiflora*	Stinking Pennywort	Apiaceae		0.1	10	F		
good hede	*Goodenia hederacea*	Ivy Goodenia	Goodeniaceae		0.1	10	F		
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	*	10				

BAM Site Field Survey

Project:	Flyers Creek	**Plot Identifier**	P5	**Pic 20x20**		**Pic 20x50**		
Survey date:	13/09/2018		**Compass Orientation (head of 20x20 plot)**			310		
Recorders	MP BT		**PCT:**	277	Mod			
GPS Easting	690258	**GPS Northing**	6289316		**Datum**	UTS	**Zone**	55
Dominant Species outside Plot								

P5

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	2
	Shrub (SG)	0
	Forb (FG)	2
	Grass/Sedge (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	4

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	40
	Shrub (SG)	0
	Forb (FG)	1.1
	Grass/Sedge (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	41.1
	TOTAL 'HT'	0

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter	5m	10%		
	15m	35%		
	25m	75%	38%	
	35m	40%		
	45m	30%		
Bare	5m	0%		
	15m	0%		
	25m	1%	2%	
	35m	7%		
	45m	1%		
Cryptogam cover	5m	0%		
	15m	0%		
	25m	0%	0%	
	35m	0%		
	45m	0%		
Rock Cover	5m	0%		
	15m	0%		
	25m	0%	0%	
	35m	0%		
	45m	0%		

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80	1		3
50-79	4		2
30-49			
20-29			
10-19			
5-9			N/A
<5			N/A
Length of logs (m)		12	

5

Species recorded for P5

N:Native | E:Exotic | HT: High Threat Exotic

Abbreviation	Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	N, E or 'HT'	EPBC Stat	BCA Stat
Euca mell	*Eucalyptus melliodora*	Yellow Box	Myrtaceae		30		T		
Euca blak	*Eucalyptus blakelyi*	Blakely's Red Gum	Myrtaceae		10		T		
Sily mari	*Silybum marianum*	Variegated Thistle	Asteraceae	*	5				
phal aqua	*Phalaris aquatica*	Phalaris	Poaceae	*	20				
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	*	5				
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	*	10				
trif repe	*Trifolium repens*	White Clover	Fabaceae (Fab	*	10				
medi	*Medicago spp.*	A Medic	Fabaceae (Fab	*	10				
acet vulg	*Acetosella vulgaris*	Sheep Sorrel	Polygonaceae	*	0.1	5			
tara offi	*Taraxacum officinale*	Dandelion	Asteraceae	*	0.1	1			
urti inci	*Urtica incisa*	Stinging Nettle	Urticaceae		1	20	F		
acae nova	*Acaena novae-zelandiae*	Bidgee-widgee	Rosaceae		0.1	5	F		
cart lana	*Carthamus lanatus*	Saffron Thistle	Asteraceae	*	1	1			
stel medi	*Stellaria media*	Common Chickweed	Caryophyllace	*	5				
trif subt	*Trifolium subterraneum*	Subterranean Clover	Fabaceae (Fab	*	15				
erod cicu	*Erodium cicutarium*	Common Crowfoot	Geraniaceae	*	0.1	5			
arct cale	*Arctotheca calendula*	Capeweed	Asteraceae	*	5				

BAM Site Field Survey

Project:	Flyers Creek	**Plot Identifier**	FC6	**Pic 20x20**		**Pic 20x50**		
Survey date:	13/09/2018		**Compass Orientation (head of 20x20 plot)**			45		
Recorders	MP BT		**PCT:**	EXOTIC				
GPS Easting	689641	**GPS Northing**	6289171		**Datum**	UTS	**Zone**	55
Dominant Species outside Plot								

FC6

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	1
	Grass/Sedge (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	1

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0.1
	Grass/Sedge (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	0.1
	TOTAL 'HT'	0

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter	5m	1%	1%	
	15m	1%		
	25m	1%		
	35m	1%		
	45m	1%		
Bare	5m	6%	6%	
	15m	6%		
	25m	7%		
	35m	8%		
	45m	3%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	1%	1%	
	15m	0%		
	25m	1%		
	35m	0%		
	45m	2%		

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			N/A
<5			N/A
Length of logs (m)			

Species recorded for FC6

N:Native E:Exotic HT: High Threat Exotic

Abbreviation	Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	N, E or 'HT'	EPBC Stat	BCA Stat
Arct cale	*Arctotheca calendula*	Capeweed	Asteraceae	*	20				
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	*	5				
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	*	5				
trif subt	*Trifolium subterraneum*	Subterranean Clover	Fabaceae (Fab	*	20				
medi	*Medicago spp.*	A Medic	Fabaceae (Fab	*	5				
stel medi	*Stellaria media*	Common Chickweed	Caryophyllace	*	10				
oxal pere	*Oxalis perennans*		Oxalidaceae		0.1	20	F		
sily mari	*Silybum marianum*	Variegated Thistle	Asteraceae	*	0.1	1			
acet vulg	*Acetosella vulgaris*	Sheep Sorrel	Polygonaceae	*	0.1	2			
tara offi	*Taraxacum officinale*	Dandelion	Asteraceae	*	0.1	1			
erod cicu	*Erodium cicutarium*	Common Crowfoot	Geraniaceae	*	20				

BAM Site Field Survey

Project:	Flyers Creek	**Plot Identifier**	FC7	**Pic 20x20**		**Pic 20x50**		
Survey date:	13/09/2018		**Compass Orientation (head of 20x20 plot)**			80		
Recorders	MP BT		**PCT:**	277 mod				
GPS Easting	689340	**GPS Northing**	6289015		**Datum**	UTS	**Zone**	55
Dominant Species outside Plot								

FC7

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	1
	Shrub (SG)	0
	Forb (FG)	4
	Grass/Sedge (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	5

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	20
	Shrub (SG)	0
	Forb (FG)	0.4
	Grass/Sedge (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	20.4
	TOTAL 'HT'	0

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter	5m	1%		
	15m	85%		
	25m	35%	37%	
	35m	25%		
	45m	40%		
Bare	5m	3%		
	15m	2%		
	25m	50%	28%	
	35m	75%		
	45m	10%		
Cryptogam cover	5m	20%		
	15m	0%		
	25m	0%	4%	
	35m	0%		
	45m	0%		
Rock Cover	5m	0%		
	15m	1%		
	25m	0%	0%	
	35m	0%		
	45m	0%		

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80	2		9
50-79			
30-49			
20-29			
10-19			
5-9			N/A
<5			N/A
Length of logs (m)		21	

3
4
2

Species recorded for FC7

N:Native E:Exotic HT: High Threat Exotic

Abbreviation	Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	N, E or 'HT'	EPBC Stat	BCA Stat
Euca blak	*Eucalyptus blakelyi*	Blakely's Red Gum	Myrtaceae		20		T		
arct cale	*Arctotheca calendula*	Capeweed	Asteraceae	*	20				
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	*	5				
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	*	10				
erod cicu	*Erodium cicutarium*	Common Crowfoot	Geraniaceae	*	1	50			
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiace		0.1	2	F		
acet vulg	*Acetosella vulgaris*	Sheep Sorrel	Polygonaceae	*	0.1	5			
hypo radi	*Hypochaeris radicata*	Catsear	Asteraceae	*	0.2	20			
tara offi	*Taraxacum officinale*	Dandelion	Asteraceae	*	0.5	20			
sily mari	*Silybum marianum*	Variegated Thistle	Asteraceae	*	0.2	10			
urti inci	*Urtica incisa*	Stinging Nettle	Urticaceae		0.2	20	F		
cera glom	*Cerastium glomeratum*	Mouse-ear Chickweed	Caryophyllace	*	0.1	5			
oxal pere	*Oxalis perennans*		Oxalidaceae		0.1	5	F		
phal aqua	*Phalaris aquatica*	Phalaris	Poaceae	*	5				
marr vulg	*Marrubium vulgare*	White Horehound	Lamiaceae	*	0.1	1			

BAM Site Field Survey

Project:	Flyers Creek	**Plot Identifier**	FC8	**Pic 20x20**		**Pic 20x50**		
Survey date:	13/09/2018		**Compass Orientation (head of 20x20 plot)**			205		
Recorders	MP BT		**PCT:**	277 mod				
GPS Easting	689205	**GPS Northing**	628861		**Datum**	UTS	**Zone**	55
Dominant Species outside Plot								

FC8

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	1
	Shrub (SG)	0
	Forb (FG)	3
	Grass/Sedge (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	4

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	30
	Shrub (SG)	0
	Forb (FG)	5.2
	Grass/Sedge (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	35.2
	TOTAL 'HT'	0

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter	5m	50%	46%	
	15m	60%		
	25m	25%		
	35m	95%		
	45m	1%		
Bare	5m	6%	5%	
	15m	10%		
	25m	5%		
	35m	1%		
	45m	1%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80	1		4
50-79	1		3
30-49			
20-29			
10-19			
5-9			N/A
<5			N/A
Length of logs (m)		44	

Species recorded for FC8

N:Native E:Exotic HT: High Threat Exotic

Abbreviation	Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	N, E or 'HT'	EPBC Stat	BCA Stat
euca mell	*Eucalyptus melliodora*	Yellow Box	Myrtaceae		30		T		
urti inci	*Urtica incisa*	Stinging Nettle	Urticaceae		5		F		
erod cicu	*Erodium cicutarium*	Common Crowfoot	Geraniaceae	*	20				
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	*	5				
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	*	5				
phal aqua	*Phalaris aquatica*	Phalaris	Poaceae	*	5				
sily mari	*Silybum marianum*	Variegated Thistle	Asteraceae	*	0.5	10			
arct cale	*Arctotheca calendula*	Capeweed	Asteraceae	*	1	100			
oxal pere	*Oxalis perennans*		Oxalidaceae		0.1	10	F		
acet vulg	*Acetosella vulgaris*	Sheep Sorrel	Polygonaceae	*	0.1	10			
tara offi	*Taraxacum officinale*	Dandelion	Asteraceae	*	0.5	20			
gera moll moll	*Geranium molle subsp. m*	Cranesbill Geranium	Geraniaceae	*	1	100			
dysp pumi	*Dysphania pumilio*	Small Crumbweed	Chenopodiace		0.1	2	F		
stel medi	*Stellaria media*	Common Chickweed	Caryophyllace	*	1	100			

BAM Site Field Survey

Project:	Flyers Creek	**Plot Identifier**	FC9	**Pic 20x20**		**Pic 20x50**		
Survey date:	13/09/2018		**Compass Orientation (head of 20x20 plot)**			0		
Recorders	MP BT		**PCT:**	Exotic				
GPS Easting	689118	**GPS Northing**	6288632		**Datum**	UTS	**Zone**	55
Dominant Species outside Plot								

FC9

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	2
	Grass/Sedge (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	2

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	5.1
	Grass/Sedge (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	5.1
	TOTAL 'HT'	0

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter	5m	1%	1%	
	15m	1%		
	25m	1%		
	35m	1%		
	45m	1%		
Bare	5m	5%	5%	
	15m	5%		
	25m	5%		
	35m	5%		
	45m	5%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	1%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	5%		

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			N/A
<5			N/A
Length of logs (m)			

Species recorded for FC9

N:Native | E:Exotic | HT: High Threat Exotic

Abbreviation	Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	N, E or 'HT'	EPBC Stat	BCA Stat
oxal pere	*Oxalis perennans*		Oxalidaceae		5		F		
erod cicu	*Erodium cicutarium*	Common Crowfoot	Geraniaceae	*	5				
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	*	5				
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	*	5				
trif subt	*Trifolium subterraneum*	Subterranean Clover	Fabaceae (Fab	*	40				
stel medi	*Stellaria media*	Common Chickweed	Caryophyllace	*	2	100			
arct cale	*Arctotheca calendula*	Capeweed	Asteraceae	*	2	100			
medi	*Medicago spp.*	A Medic	Fabaceae (Fab	*	10				
acet vulg	*Acetosella vulgaris*	Sheep Sorrel	Polygonaceae	*	0.1	5			
phal aqua	*Phalaris aquatica*	Phalaris	Poaceae	*	1	10			
hypo radi	*Hypochaeris radicata*	Catsear	Asteraceae	*	0.1	2			
rume brow	*Rumex brownii*	Swamp Dock	Polygonaceae		0.1	1	F		

BAM Site Field Survey

Project:	Flyers Creek	**Plot Identifier**	FC10	**Pic 20x20**		**Pic 20x50**		
Survey date:	13/09/2018		**Compass Orientation (head of 20x20 plot)**			295		
Recorders	MP BT		**PCT:**	Exotic				
GPS Easting	688530	**GPS Northing**	6289530		**Datum**	UTS	**Zone**	55
Dominant Species outside Plot								

FC10

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0
	Grass/Sedge (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	0

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0
	Grass/Sedge (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	0
	TOTAL 'HT'	0

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Bare	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			N/A
<5			N/A
Length of logs (m)			

Species recorded for FC10

N:Native | E:Exotic | HT: High Threat Exotic

Abbreviation	Scientific Name	Common Name	Family	Exotic	% Cover	Abundance	N, E or 'HT'	EPBC Stat	BCA Stat
medi arab	*Medicago arabica*	Spotted Burr Medic	Fabaceae (Fab	*	30				
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	*	5				
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	*	40				
trif subt	*Trifolium subterraneum*	Subterranean Clover	Fabaceae (Fab	*	5				
caps burs	*Capsella bursa-pastoris*	Shepherd's Purse	Brassicaceae	*	2	50			
sily mari	*Silybum marianum*	Variegated Thistle	Asteraceae	*	5				
phal aqua	*Phalaris aquatica*	Phalaris	Poaceae	*	5				
arct cale	*Arctotheca calendula*	Capeweed	Asteraceae	*	0.1	5			
cart lana	*Carthamus lanatus*	Saffron Thistle	Asteraceae	*	0.1	1			
acet vulg	*Acetosella vulgaris*	Sheep Sorrel	Polygonaceae	*	0.1	1			

APPENDIX D HABITAT AND PADDOCK TREES

ID	Latitude	Longitude	Species	DBH (cm)	Hollows Present	DBH above Benchmark (50cm)	Paddock Tree Class	Impacted By proposal	Credits Required	Zone
1	149.048311	-33.5186	Stag	80	Small Limb	N/A	N/A	Yes		1
2	149.0485	-33.5188	E. blakeyii	40	Medium Trunk	N/A	N/A	No		1
3	149.049	-33.5184	E. blakeyii	65	Medium Limb	N/A	N/A	Yes		1
4	149.0491	-33.5184	E. melliodora	75	Small Trunk	N/A	N/A	Yes		1
5	149.0371	-33.5242	Stag	100	Trunk and Limb	N/A	N/A	Yes		6
6	149.0373	-33.5234	E. melliodora	100	Small Limb	N/A	N/A	Yes		1
7	149.0373	-33.5233	E. melliodora	90	Medium Limb	N/A	N/A	Yes		1
8	149.0373	-33.5232	E. melliodora	90	Small Limb	N/A	N/A	Yes		1
9	149.037	-33.5232	E. melliodora	100	Small Limb	N/A	N/A	No		1
10	149.0369	-33.5233	E. melliodora	100	Small Limb	N/A	N/A	No		1

ID	Latitude	Longitude	Species	DBH (cm)	Hollows Present	DBH above Benchmark (50cm)	Paddock Tree Class	Impacted By proposal	Credits Required	Zone
11	149.0368	-33.5232	E. melliodora	100	Trunk and Limb	N/A	N/A	No		1
12	149.0385	-33.5221	E. melliodora	100	Small Limb	N/A	N/A	Yes		1
13	149.039	-33.5217	E. melliodora	100	Medium Trunk	N/A	N/A	Yes		1
14	149.0388	-33.5213	E. melliodora	80	Small Limb	N/A	N/A	Yes		1
15	149.0389	-33.5211	E. melliodora	75	Small Limb	N/A	N/A	Yes		1
16	149.0379	-33.522	Stag	80	Trunk and Limb	N/A	N/A	No		1
17	149.0418	-33.5202	E. blakeyi	89	Trunk and Limb	Yes	3	Yes	1	8
18	149.0421	-33.5205	Stag	100	Trunk and Limb	N/A	N/A	No		6
19	149.0232	-33.4337	E. bridgesiana	Not recorded	Small Limb	N/A	N/A	No		3
20	149.0235	-33.4366	Stag	Not recorded	Small Limb	N/A	N/A	No		3

ID	Latitude	Longitude	Species	DBH (cm)	Hollows Present	DBH above Benchmark (50cm)	Paddock Tree Class	Impacted By proposal	Credits Required	Zone
21	149.0236	-33.4367	Stag	10	Small Limb	N/A	N/A	No		3
22	149.0236	-33.438	E. bridgesiana	Not recorded	Small Limb	N/A	N/A	No		3
23	149.0226	-33.4427	E. goniocalyx	60	Small Limb	N/A	N/A	No		3
24	149.0279	-33.5151	E. blakeyi	100	Small Limb	N/A	N/A	Yes		6
25	149.0275	-33.5257	E. melliodora	99	Small Limb	N/A	N/A	No*		1
26	149.0318	-33.527	E. melliodora	Not recorded	Small Limb	N/A	N/A	No*		1
27	149.0318	-33.5271	E. melliodora	Not recorded	Small Limb	N/A	N/A	No*		1
28	149.0319	-33.5271	E. melliodora	Not recorded	Small Limb	N/A	N/A	No*		1
29	149.0226	-33.4458	E. bridgesiana	Not recorded	Small Limb	N/A	N/A	Yes		3
30	149.0305	-33.4689	E. goniocalyx	Not recorded	Small Limb	N/A	N/A	Yes		3
31	149.0302	-33.4690	E. goniocalyx	Not recorded	Small Limb	N/A	N/A	Yes		3

ID	Latitude	Longitude	Species	DBH (cm)	Hollows Present	DBH above Benchmark (50cm)	Paddock Tree Class	Impacted By proposal	Credits Required	Zone
32	149.0307	-33.4688	E. melliodora	Not recorded	Small Limb	N/A	N/A	No		3

*The PCT entered into the Calculator for paddock tree was PCT 277.

APPENDIX E FAUNA SURVEY RESULTS

Scientific Name	Common Name	Opportunistic	Survey 1 E 687829 N 6296730 GDA94 Z55	Survey 2 E 687990 N 6297445 GDA94 Z55	Survey 3 E 688716 N 6294874 GDA94 Z55	Survey 4 E 689207 N 6288867 GDA94 Z55	Nocturnal
Amphibians							
Crinia signifera	Common Froglet	X					
Birds							
Cacatua sanguinea	Little Corella	X					
Falco berigora	Brown Falcon					X	
Colluricincla harmonica	Grey Shrike-thrush		X	X			
Eopsaltria australis	Eastern Yellow Robin				X		
Coracina novaeholandiae	Black-faced Cuckoo-shrike					X	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill					X	
Pardalotus striatus	Striated Pardalote					X	
Dacelo novaeguineae	Laughing Kookaburra	X	X		X		
Platycercus elegans	Crimson Rosella	X	X	X	X	X	
Ocyphaps lophotes	Crested Pigeon	X					
Anas castandea	Chestnut Teal	X					
Anas superciliosa	Pacific Black Duck	X					
Egretta novaehollandiae	White-faced Heron	X					
Falco longipennis	Australian Hobby	X					
Falco cenchroides	Nankeen Kestrel	X	X				
Ocyphaps lophotes	Crested Pigeon	X					
Eolophus roseicapilla	Galah	X		X			
Platycercus eximius	Eastern Rosella	X	X				
Psephotus haematonotus	Red-rumped Parrot		X	X	X	X	
Ninox novaeseelandiae	Southern Boobook						X
Podargus strigoides	Tawny Frogmouth						X
Hirundo neoxena	Welcome Swallow	X					

Scientific Name	Common Name	Opportunistic	Survey 1 E 687829 N 6296730 GDA94 Z55	Survey 2 E 687990 N 6297445 GDA94 Z55	Survey 3 E 688716 N 6294874 GDA94 Z55	Survey 4 E 689207 N 6288867 GDA94 Z55	Nocturnal
Anthus australis	Australian Pipit	X					
Rhipidura leucophris	Willy Wagtail	X					
Manorina melanocephala	Noisy Miner	X					
Sternus vulgaris	*Starling	X				X	
Grallina cyanoleuca	Magpie Lark	X					
Corcorax melanorhamphos	White-winged Chough				X		
Cracticus nigrogularis	Pied Butcherbird			X			
Cracticus tibicen	Australian Magpie	X	X	X			
Corvus mellori	Little Raven	X					
Sericornis frontalis	White-browed Scrubwren	X					
Anthochaera carunculata	Red Wattlebird	X	X				
Lichenostomus penicillatus	White-plumed Honeyeater	X					
Reptiles							
Hemiergis talbingoensis	Eastern three-toed earless skink	X					
Egernia cunninghami	Cunningham's skink	X					
Mammals							
Petaurus breviceps	Sugar Glider						X
Petaurus norfolcensis	Squirrel Glider						X
Trichosurus vulpecula	Brush-tailed Possum						X
Macropus giganteus	Eastern Grey Kangaroo	X					
Wallabia bicolor	Swamp Wallaby	X					
Oryctolagus cuniculus	*Rabbit	X					

APPENDIX F EPBC PROTECTED MATTERS SEARCH

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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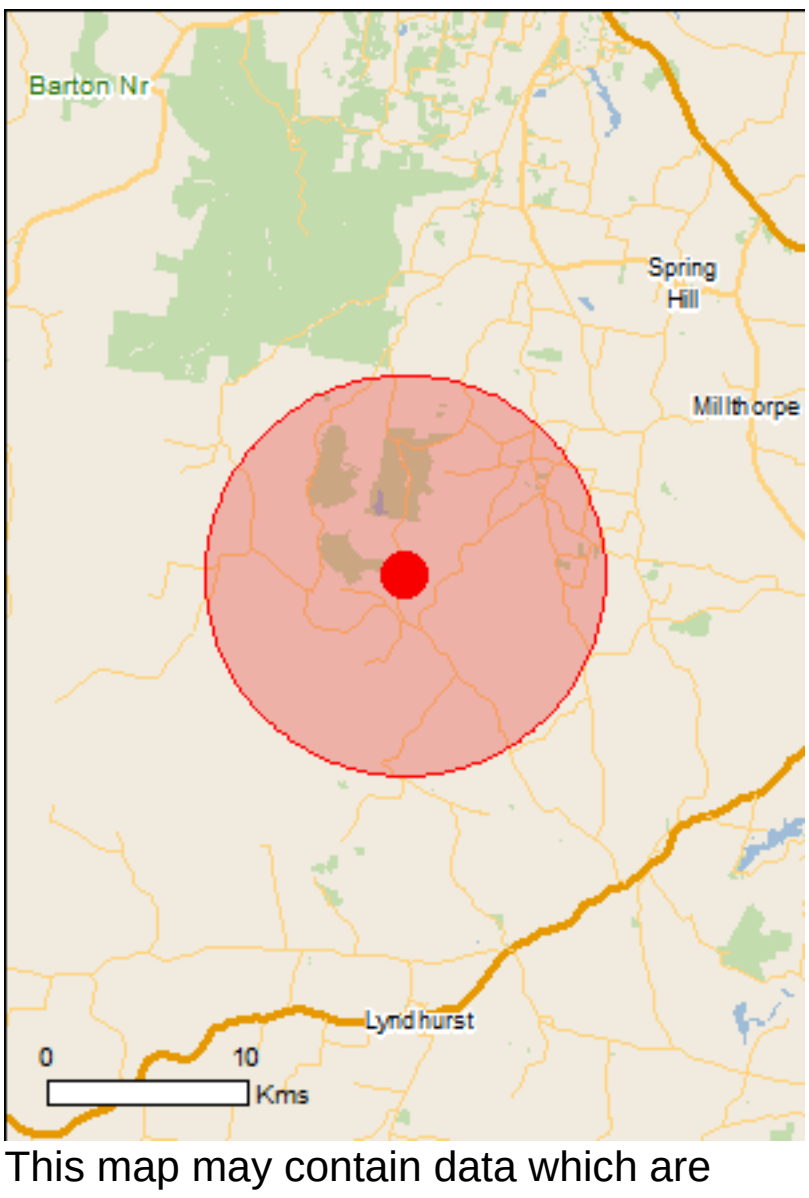

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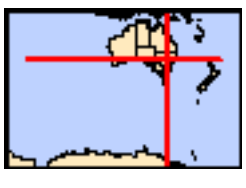

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	30
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	17
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	31
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Banrock station wetland complex	700 - 800km upstream
Hattah-kulkyne lakes	600 - 700km upstream
Riverland	700 - 800km upstream
The coorong, and lakes alexandrina and albert wetland	800 - 900km upstream

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Natural Temperate Grassland of the South Eastern Highlands	Critically Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Fish		
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Frogs		
Litoria booroolongensis Booroolong Frog [1844]	Endangered	Species or species habitat may occur within area
Litoria castanea Yellow-spotted Tree Frog, Yellow-spotted Bell Frog [1848]	Endangered	Species or species habitat likely to occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Ammobium craspedioides Yass Daisy [20758]	Vulnerable	Species or species habitat may occur within area
Eucalyptus aggregata Black Gum [20890]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus canobolensis Silver-leaf Candlebark, Mt Canobolas Candlebark [64896]	Endangered	Species or species habitat may occur within area
Eucalyptus pulverulenta Silver-leaved Mountain Gum, Silver-leaved Gum [21537]	Vulnerable	Species or species habitat likely to occur within area
Leucochrysum albicans var. tricolor Hoary Sunray, Grassland Paper-daisy [56204]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
[Prasophyllum petilum](#) Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within area
[Swainsona recta](#) Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat may occur within area
[Thesium australe](#) Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
Reptiles		
[Aprasia parapulchella](#) Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area
[Delma impar](#) Striped Legless Lizard [1649]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
[Hirundapus caudacutus](#) White-throated Needletail [682]		Species or species habitat likely to occur within area
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat may occur within area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat known to occur within area
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat may occur within area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Telecommunications Commission

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis		
Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis		
European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus		
House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus		
Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis		
Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris		
Common Starling [389]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-33.50845 149.02897

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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APPENDIX G EPBC HABITAT ASSESSMENT

Name	Habitat	Habitat Present	Likelihood of occurrence	Potential for impact?
FAUNA				
Anthochaera phrygia Regent Honeyeater	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Occurs in woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	Absent –suitable habitat not present. No mistletoes present.	Unlikely - outside mapped important areas (OEH). Not detected during surveys	No – Unlikely to occur on site
Australian Bittern *Botaurus poiciloptilus*	Permanent freshwater wetlands with tall, dense vegetation.	Absent – no freshwater wetlands with dense vegetation	Unlikely	No – Unlikely to occur on site
Curlew Sandpiper *Calidris ferruginea*	Intertidal mudflats in both fresh and brackish waters in sheltered coastal areas, such as estuaries, bays, inlets, and lagoons. Also recorded inland, including around ephemeral and permanent lakes, dams, and waterholes, usually with bare edges of mud or sand	Absent – no intertidal mudflats	Unlikely	No – Unlikely to occur on site
Painted Honeyeater *Grantiella picta*	Boree/Weeping Myall, Brigalow, and Box-Gum Woodlands and Box-Ironbark Forests. Specialist feeder on the fruits of mistletoes.	Scattered paddock trees of box-gum woodland. No mistletoes present.	Unlikely – not detected during site surveys. No suitable food sources. (mistletoes)	No – Unlikely to occur on site
Swift Parrot *Lathamus discolor*	On the coast and southwest slopes in areas with abundant flowering eucalypts or lerp. Feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Mugga Ironbark, and White Box and Lerp infested trees such as Grey Box and Black Butt.	Present	Unlikely – outside mapped important areas (OEH). Not detected during surveys	No – Unlikely to occur on site
Mallee Fowl *Leipoa ocellata*	Semi-arid to arid shrublands and low woodlands, especially those dominated by Mallee and/or	Absent	Unlikely	No – Unlikely to occur on site

Name	Habitat	Habitat Present	Likelihood of occurrence	Potential for impact?
FAUNA				
	Acacia which are tall, dense, and floristically rich. A sandy to sandy-loam substrate and abundance of leaf litter are required for breeding.			
Eastern Curlew *Numenius madagascariensis*	Large intertidal mudflats often with seagrass beds along sheltered coasts including in estuaries, bays, harbours, inlets, lagoons, and among saltmarshes and mangroves.	Absent	Unlikely	No – Unlikely to occur on site
Superb Parrot *Polytelis swainsonii*	Box-Gum, Box-Cypress, and Boree Woodlands and River Red Gum Forests. They nest in hollows of large trees in tall open forest or woodland.	Present	Likely – No detected during surveys but known to occur in the area	Yes – Assessment of Significance
Australian Painted Snipe *Rostratula australis*	Shallow terrestrial freshwater or occasionally brackish wetlands, including temporary and permanent lakes, swamps, and claypans, as well as inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms, and bore drains. Fringes of swamps, dams, and nearby marshy areas with cover of grasses, lignum, low scrub, or open timber. Shallow wetlands with areas of bare wet mud.	Absent	Unlikely	No – Unlikely to occur on site
Murray Cod *Maccullochelle peeli*	Wide range of warm water habitat including clear rocky streams, slow flowing turbid rivers, and billabongs, most frequently in main river channel and larger tributaries but occasionally in floodplain channels during floods. Near complex structural cover such as large rocks, woody debris, and overhanging vegetation.	Absent – No waterbodies	Unlikely	No – No suitable habitat
Macquarie Perch *Macquaria australasica*	Both river and lake habitats; especially the upper reaches of rivers and their tributaries. Clear, deep, rocky holes with plenty of cover including aquatic	Absent – No waterbodies	Unlikely	No – No suitable habitat

Name	Habitat	Habitat Present	Likelihood of occurrence	Potential for impact?
FAUNA				
	vegetation, large boulders, large woody debris, and overhanging banks.			
Booroolong Frog *Litoria booroolongensis*	Permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Requires cobble banks, riffles and other rock structures within stream margins.	Marginal	Unlikely	No – Unlikely to occur on site
Yellow-spotted Tree Frog *Litoria castanea*	Require large permanent ponds or slow flowing 'chain-of-ponds' streams with abundant emergent vegetation such as bulrushes and aquatic vegetation	Absent	Unlikely	No – Unlikely to occur on site
Large-eared Pied Bat *Chalinolobus dwyeri*	Caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features.	Absent	Unlikely	No – Unlikely to occur on site
Spotted-tail Quoll *Dasyurus maculatus*	Variety of vegetation types including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Present	Unlikely	No – Unlikely to occur on site
Corben's Long-eared Bat *Nyctophilus corbei*	Variety of vegetation types, most commonly Mallee, Bulloke, and Box-dominated communities, but most common in vegetation with distinct canopy and dense understorey. Roost in tree hollows, crevices, and under loose bark.	Marginal	Unlikely	No – Unlikely to occur on site
Greater Glider *Petauroides volans*	Tall, montane, moist eucalypt forests with relatively old trees and abundant hollows and a high diversity of eucalypts	Absent	Unlikely	No – Unlikely to occur on site
Brush-tailed Rock-wallaby *Petrogale penicillata*	Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north	Absent	Unlikely	No – Unlikely to occur on site

Name	Habitat	Habitat Present	Likelihood of occurrence	Potential for impact?
FAUNA				
Koala *Phascolarctos cinereus*	Temperate, subtropical and tropical eucalypt woodlands and forests where suitable food trees grow, of which there are more than 70 eucalypt species and 30 non-eucalypt species that are particularly abundant on fertile clay soils.	Present	Unlikely – not detected during site surveys	No – Unlikely to occur on site
Grey-headed Flying-fox *Pteropus poliocephalus*	Range of vegetation communities including rainforest, open forest, and closed and open woodland. Roost sites usually near water, including lakes, rivers, and coastlines.	Marginal	Unlikely – not detected during site surveys	No – Unlikely to occur on site
Pink-tailed Worm-lizard *Aprasia parapulchella*	Inhabits sloping open woodland areas with predominantly native grassy ground layers. Commonly found beneath small, partially-embedded rock.	Marginal – non optimal rocky outcrops or partially buried rocks.	Unlikely – Non optimal habitat. Not detected during site surveys	No – Unlikely to occur on site
Striped legless lizard *Delma impar*	Inhabits grassland dominated by perennial, tussock-forming grasses such as Kangaroo Grass *Themeda australis*, spear-grasses *Austrostipa spp*. and poa tussocks *Poa spp*., and occasionally wallaby grasses *Rhytidosperma spp* and exotic components.	Absent- Groundcover dominated by exotic flora	Unlikely– development site outside known distribution	No
FLORA				
Ammobium craspedioides	Moist or dry forest communities, Box-Gum Woodland and secondary grassland derived from clearing of these communities in association with a large range of eucalypts (*Eucalyptus blakelyi, E. bridgesiana, E. dives, E. goniocalyx, E. macrorhyncha, E. mannifera, E. melliodora, E. polyanthemos, E. rubida*)	Present	Unlikely – Groundcover affected by regular disturbance and exotic flora. Not detected during site surveys	No – Unlikely to occur on site
Eucalyptus aggregata	Alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers	Absent	Unlikely – not detected during site surveys	No – Unlikely to occur on site
Eucalyptus canobolensis	Undulating low to steep hills co-occurring with *Eucalyptus*	Present	Present	Yes – Recorded within

Name	Habitat	Habitat Present	Likelihood of occurrence	Potential for impact?
FAUNA				
	pauciflora, *Eucalyptus dalrympleana*, *Eucalyptus viminalis, Eucalyptus dives* and *Eucalyptus saxicola*. Understorey species include *Poa sieberiana* and *Cassinia arcuata*.			development site. Assessment of Significance completed
Eucalyptus pulverulenta	Open forest or woodland typically dominated by Brittle Gum (*Eucalyptus mannifera*), Red Stringybark (*E. macrorhynca*), Broad-leafed Peppermint (*E. dives),* Silvertop Ash (*E. sieberi*) and Apple Box (*E. bridgesiana*).	Marginal	Unlikely – not detected during site surveys	No – Unlikely to occur on site
Leucochrysum albicans var. tricolor	Variety of grassland, woodland and forest habitats, generally on relatively heavy soils	Absent	Unlikely – not detected during site surveys	No – Unlikely to occur on site
Prasophyllum petilum	Open sites within Natural Temperate Grassland	Absent	Unlikely	No – Unlikely to occur on site
Swainsona recta	Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils.	Present - Grey Box-White Cypress Woodland an associated vegetation type	Unlikely – not detected during site surveys	No – Unlikely to occur on site
Thesium australe	Coastal headlands or grassland and grassy woodland away from the coast in association with Kangaroo Grass (*Themeda triandra*)	Present- Grey Box-White Cypress Woodland an associated vegetation type	Unlikely – not detected during site surveys	No – Unlikely to occur on site

APPENDIX H EPBC ASSESSMENTS OF SIGNIFICANCE

The *Environment Protection and Biodiversity Conservation Act 1999* specifies factors to be taken into account in deciding whether a development is likely to significantly affect Endangered Ecological Communities, threatened species and migratory species, listed at the Commonwealth level. The Matters of Environmental Significance – Significant Impact Guidelines (DoE 2013) identify the factors the need to be considered.

The following assessment assesses the significance of the likely impacts associated with the proposed works on these species and ecological communities listed under the EPBC Act:

- Birds
  - Superb Parrot (*Polytelis swainsonii*) – V
- Flora
  - Silver-leaf Candlebark (*Eucalyptus canobolensis*) – E

ENDANGERED SPECIES

a) Will the action lead to a long-term decrease in the size of a population of a species?
Two Silver-leaf Candlebark were detected within the development site, however outside of the development footprint. Given that much of the native vegetation present within the development site was traversed during targeted surveys and this species is readily identifiable all year round, no more than the two observed individuals are considered likely to occur. Silver-leaf Candlebark is known only to Mt Canobolas where approximately 60,000 individuals occur within Mt Canobolas State Conservation Area. The two individuals recorded within the development site represent lower altitude outliers of this larger population with others likely to occur in similar bushland pockets that form a mosaic throughout the species range. As these two individuals will be retained and indirect impacts will be mitigated, the proposal is considered unlikely to result in the long-term decrease in the size of the population of Silver-leaf Candlebark.
b) Will the action reduce the area of occupancy of the species?
Approximately 5.0 ha of native vegetation would be removed for the proposal, with 2.35 ha (equivalent to PCT 1330 in moderate/good condition) considered low quality potential habitat for Silver-leaf Candlebark. While the area of occupancy for this species would not be reduced, there would be a reduction in potential habitat as stated above. Given the known area of occupancy is approximately 1672 ha within Mount Canobolas State Conservation Area alone, the removal of 2.35 ha of linear marginal habitat is considered negligible.
c) Will the action fragment an existing population into two or more populations?
No Silver-leaf Candlebark individuals will be impacted. The removal of thin linear segments of native vegetation required for the transmission line will not fragment the existing population in any way or serve as a barrier for the exchange of genetic material between individuals in the locality.
d) Will the action adversely affect habitat critical to the survival of a species?
The Register of Critical Habitat established under the EPBC Act does not list any critical habitat for this species.
e) Will the action disrupt the breeding cycle of a population?
The proposal will not directly disrupt the breeding life cycle of a population as no Silver-leaf Candlebark will be prevented from setting seed. However, regenerative potential within the proposal site will be decreased as 2.35 ha of potential habitat would be removed. This disruption is considered negligible when viewed in context of the population's range such that he population will not be prevented from perpetuating itself.

f) Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The proposal would decrease the availability of linear habitat by 2.35 ha. This habitat is of marginal quality and presents minimal regenerative potential. The overwhelming majority of the population of this species occurs within Mount Canobolas State Recreation Area rendering any potential reduction in habitat from the proposal negligible and unlikely to cause the population as whole to decline.

g) Will the action result in invasive species that are harmful to a critically endangered or endangered/vulnerable species becoming established in the endangered / critically endangered /vulnerable species habitat?

The proposal has the potential to contribute to the spread of invasive species in the proposal area through the transfer and introduction of plant material and soil on machinery. Mitigation measures have been recommended to prevent the spread of weeds on site. The proposal is therefore unlikely to result in invasive species that are harmful to these threatened species becoming established in potential habitat.

h) Will the action introduce disease that may cause the species to decline?

There is a risk that diseases could be introduced to the development site via machinery, vehicles, and materials during construction and operation. With the implementation of the recommended mitigation measures, the proposal is unlikely to result in the introduction of any disease that may cause these species to decline.

i) Will the action interfere with the recovery of the species?

Although the proposal would remove 2.35 ha of potential habitat, this is unlikely to interfere with the recovery of the species whose core occurrence is within the Mt Canobolas State Conservation Area.

No formal recovery plan for this species has been adopted under the EPBC Act.

Conclusion

Two Silver-leaf Candlebark were recorded within the development site that will be retained. However, 2.35 ha of potential habitat, albeit low quality, will be removed. The distribution of this species centres around Mt Canobolas Conservation Area where individuals number approximately 60,000. The individuals recorded are presumably outliers of this larger occurrence. That habitat to be removed is not considered important for the species long-term survival or recovery.

A significant impact to this species is considered unlikely, on the basis that the proposal would not;

- Lead to a reduction of the size or area of occupancy of a population, or fragment or disrupt the breeding cycle of a population
- Affect habitat critical to the survival of these species
- Affect habitat or introduce disease such that these species would decline
- Introduce invasive species harmful to the species
- Interfere with the recovery of these species.

No referral is considered necessary to the Federal Department of Environment for these species.

VULNERABLE SPECIES

The following assessment assesses the significance of the likely impacts associated with the proposed works on these vulnerable species:

- Birds
    - Superb Parrot *Polytelis swainsonii* – V

An 'important population' is defined as a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

a) Will the action lead to a long-term decrease in the size of an important population of a species?

The Superb Parrot was not detected during targeted surveys. However, a significant number (278) of sightings have been recorded within 10 km of the development site since 1998, mainly to the north-east at Bloomfield.

The national recovery plan indicates core breeding areas as:

1. Area bounded by Molong, Rye Park, Yass, Coolac, Cootamundra and Young,
2. Along the Murrumbidgee River between Wagga Wagga and Bringagee,
3. Along the Murray and Edward Rivers

The development site is located within the first breeding area. Breeding habitat is present within the development site in the form of Box-Gum Woodland containing hollow-bearing trees. The proposal would result in the reduction of such habitat by 3.85 ha including the removal of 15 hollow-bearing trees. 13 hollow-bearing trees within Box-Gum Woodland would be retained within the development site.

The population of Superb Parrot within Southern NSW is considered one population as individuals are presumed to intermingle prior to returning to one of the above breeding areas every year. Therefore, this population, which is thought to number about 6500 individuals, constitutes an important population. Though not known to be present within the development site, a trace amount of habitat is available for use by this important population.

Given the species wide range and minimal habitat to be removed, the action is considered unlikely to lead to a long term decrease in the size of an important population.

b) Will the action reduce the area of occupancy of an important population of a species?

The proposal is not considered to reduce the area of occupancy of an important population. The surrounding area will continue to contain suitable areas of breeding and foraging habitat to maintain individuals of the important population in the wider locality.

c) Will the action fragment an existing important population into two or more populations?

The proposal would require the removal of linear segments of native vegetation in a landscape that is already to a high degree of fragmentation amongst bushland patches. As the species is highly mobile, the proposal is unlikely to fragment the important population as it will not impact on its movement from breeding to overwintering areas.

d) Will the action adversely affect habitat critical to the survival of a species?

The Register of Critical Habitat established under the EPBC Act does not list any critical habitat for this species.

e) Will the action disrupt the breeding cycle of an important population?

An important population is not considered to occur within the development site. However, Superb Parrots are known in significant number in the locality, suggesting that the species may use habitat within the development site for breeding. Thirteen hollow bearing trees would be impacted by the proposal which could be suitable breeding habitat for Superb Parrot. Fifteen will be retained.

Mitigation measures will be put in place for hollow bearing tree removal to avoid impacts to the breeding cycle of the species. Pre- clearing surveys would be undertaken during the breeding season for the Superb Parrot (September to November) prior to commencement of construction.

f) Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The proposal would involve the removal of around 5.0 ha of woodland habitat, including 3.85 ha of breeding habitat containing 15 hollow-bearing trees. The quality of potential habitat is low, and the area of habitat to be removed is relatively small and would not disrupt habitat connectivity for this mobile species. With the implementation of the recommended mitigation measures, the proposal would not modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species would be likely to decline.

g) Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The proposal has the potential to contribute to the spread of invasive species in the proposal area through the transfer and introduction of plant material and soil on machinery. Mitigation measures have been recommended to prevent the spread or introduction of invasive species on site. The proposal is therefore unlikely to result in invasive species that are harmful to this vulnerable species becoming established in potential habitat within and adjacent to the development site.

h) Will the action introduce disease that may cause the species to decline?

There is a risk that diseases could be introduced to the development site via machinery, vehicles, and materials during construction and operation. With the implementation of the recommended mitigation measures, the proposal is unlikely to result in the introduction of any disease that may cause these species to decline.

i) Will the action interfere substantially with the recovery of the species?

The National Recovery Plan for Superb Parrot lists the following specific objectives:

1. Determine population trends in the Superb Parrot.
2. Increase the level of knowledge of the Superb Parrot's ecological requirements.
3. Develop and implement threat abatement strategies.
4. Increase community involvement in and awareness of the Superb Parrot recovery program.

The proposal would not interfere with any of these objectives.

Conclusion

A significant impact to Superb Parrot species is considered unlikely, on the basis that the proposal would not;

- Lead to a reduction of the size or area of occupancy of an important population, or fragment or disrupt the breeding cycle of an important population
- Affect habitat critical to the survival of this species
- Affect habitat or introduce disease such that this species would decline

- Introduce invasive species harmful to the species
- Interfere with the recovery of this species.

No referral is considered necessary to the Federal Department of Environment for this species.

APPENDIX I BAM CALCULATOR CREDIT REPORT

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00012482/BAAS17051/18/00012484	Flyers Creek WF Transmission Line	24/02/2018
Assessor Name	**Report Created**	**BAM Data version ***
Mitchell Palmer	09/10/2018	3
Assessor Number	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
BAAS17051		

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Candidate SAII	Ecosystem credits
Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion								
1	277_Moderate	19.6	1.5	0.25	High Sensitivity to Potential Gain	2.00	TRUE	15
5	277_Planted_vegetation	68.5	0.0	0.25	High Sensitivity to Potential Gain	2.00	TRUE	1
							Subtotal	**16**

BAM Credit Summary Report

Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion								
2	1330_Poor	2.5	1.2	0.25	High Sensitivity to Potential Gain	2.00	TRUE	0
3	1330_Moderate	28.0	1.6	0.25	High Sensitivity to Potential Gain	2.00	TRUE	23
4	1330_Moderate-Good	33.3	0.7	0.25	High Sensitivity to Potential Gain	2.00	TRUE	12
							Subtotal	**35**
							Total	**51**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Candidate SAII	Species credits
Callocephalon fimbriatum / Gang-gang Cockatoo (Fauna)						
277_Moderate	19.6	0.24	0.25	2	N/A	2
1330_Moderate	28.0	0.06	0.25	2	N/A	1
					Subtotal	**3**
Petaurus norfolcensis / Squirrel Glider (Fauna)						
1330_Moderate	28.0	0.82	0.25	2	False	11
					Subtotal	**11**

APPENDIX J PADDOCK TREE REPORT

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00012482/BAAS17051/18/00012586	Flyers Creek FL PT	24/02/2018
Assessor Name	**Report Created**	**BAM Data version ***
Mitchell Palmer	05/10/2018	3
Assessor Number	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
BAAS17051		

Paddock Trees Credit Requirement

Class	Contains hollows	Number of trees	Ecosystem credits
277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion			
3	True	1.0	1
			1
			1