Appendix D

Biodiversity Development Assessment Report

MARYVALE SOLAR FARM

BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

Prepared for Pitt & Sherry Pty. Ltd.

by C.C. Bower
Principal Consultant Ecologist

JULY 2018

FloraSearch

37 Kent Avenue, Orange, NSW 2800
PO Box 300, Orange, NSW 2800

Tel: 0263690252
Mob: 0428263274
E-mail: colbower@bigpond.net.au
ABN: 43060913622

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF ATTACHMENTS

EXECUTIVE SUMMARY

FloraSearch was commissioned by Pitt and Sherry Pty. Ltd. on behalf of Maryvale Solar Farm to conduct biodiversity surveys and an ecological assessment of the site of a proposed solar farm at Maryvale, approximately 15 kilometres (km) north west of Wellington town centre in the New South Wales Central West within the Dubbo Regional Council Local Government Area (Figure 1). The Project is a State Significant Development for which approval is being sought under Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act). The survey and assessment were conducted using the Biodiversity Assessment Method (BAM) (OEH, 2017a) under the NSW *Biodiversity Conservation Act 2016* (BC Act). Owing to the small areas of native vegetation to be impacted on the Site, the assessment uses the *Streamlined Assessment Module* of the BAM (OEH, 2017a).

Photon Energy (Photon) propose to construct and operate a 185-megawatt (MW) solar farm (the "Proposal") using photovoltaic (PV) technology at two properties totalling 1,200 hectares (the "Subject Land") in Maryvale, NSW. The solar farm infrastructure would occupy 375 hectares (the "Site") (Figure 2). The properties are "Waroona" 121 Maryvale Road, Maryvale 2820 and "Scarborough House", 801 Cobbora Road, Maryvale, NSW, 2820 and are contained within part of Lot 2 DP 573426, Lot 1 DP 1095725, Lot 2 DP 1095725, Lot 1 DP 1006557, part of Lot 182 and Lot 122 DP754318.

Vegetation surveys of the whole study area by FloraSearch were conducted over three days (28 November 2017 and 21 and 22 June 2018) and included searches of relevant State and Commonwealth databases and a literature review to determine which threatened biodiversity has potential to occur on the investigation area. A fauna survey over most of the site was conducted by Biosphere Environmental Consultants Pty. Ltd. on 23 November 2017.

The key findings of the survey were:

Flora

- A patch of remnant Yellow Box Woodland (3.1 ha) occurs in the north west corner of Paddock 5 (Figures 6 and 7). This patch would not be disturbed by the Project.

- Approximately 0.8 ha of remnant native grassland which would be removed for the Project occurs along Bakers Lane (Figure 6).

- A total of 109 scattered remnant paddock trees occur mainly in Paddocks 4 to 8 and 10 (Figure 6). These trees would be removed for the Project and comprise;
  - Yellow Box (*Eucalyptus melliodora*) – 6 trees in total in Paddock 5 (3 trees) and Paddocks 6, 12 and 13 (1 tree each).
  - White Box (*Eucalyptus albens*) – 99 trees on the higher parts of the Site mainly in Paddocks 4 to 8, 10 and 11.
  - Kurrajong (*Brachychiton populneus*) – 2 trees in Paddocks 5 and 6.
  - Dead standing trees (probably of White Box) – 2 in Paddock 11.

- The Site also has two linear eucalypt plantings totalling 71 individuals within an area of 0.4 hectares. The main trees in the plantings are River Red Gum (*Eucalyptus camaldulensis*), Mugga Ironbark (*E. sideroxylon*) and Yellow Gum (*E. leucoxylon*) with minor amounts of several other species. The species composition of the plantings does not mimic the original vegetation of the Site

- Seven introduced flora species recorded on the study area (Attachment 1) are considered to be High Threat Exotic weeds by OEH (2018g); African Boxthorn, Khaki Weed, Bathurst Burr, Saffron Thistle, St. Johns Wort, Paspalum and Great Brome. One weed, African Boxthorn, is listed as a Priority Weed for the Dubbo Regional LGA under the NSW *Biosecurity Act 2015* (DPI, 2018) and as a Weed of National Significance by the Australian Weeds Committee of the Commonwealth Government (www.weeds.org.au).

- It is considered the following two Plant Community Types occupied the Site pre-European settlement:

  - PCT266 – *White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.*
  - PCT277 – *Blakelys Red Gum – Yellow Box grassy tall woodland in the NSW South Western Slopes Bioregion.*

- Scattered old growth eucalypts along Seatonville Road comprise White Box and Yellow Box trees that would not be harmed by road upgrade work to provide improved access to the Site.

- Ground cover vegetation on roadsides proposed to be upgraded (Seatonville Road, Maryvale Road and the intersection of Cobbora and Maryvale Roads) is highly disturbed and dominated by exotic species. Accordingly, it has not been formally assessed.

Threatened Biodiversity

- No threatened flora species, populations or critical habitat listed under the BC Act or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were identified on the study area by the survey, or by a survey of fauna by Biosphere Environmental Consultants Pty. Ltd.

- No suitable habitat was considered to be present on the Site for any of the threatened flora species returned by the BAM Credit Calculator as having potential to occur.

- Six ecosystem credit fauna species were considered to have a low potential to use the limited resources on the Site; the Little Eagle, Little Lorikeet, Swift Parrot, Regent Honeyeater, Scarlet Robin and Flame Robin.

- No species credit fauna species were considered to have potential to utilise the Site owing to a lack of breeding resources.

- One threatened ecological community (TEC) listed under the BC Act and the EPBC Act is considered to have occupied the study area pre-European settlement;

  White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community (BC Act), and
  White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community (EPBC Act).

  This community has been reduced by clearing for agriculture to a 3.1 ha remnant of Yellow Box Woodland that would not be disturbed, 0.8 ha of derived native grassland and 109 scattered paddock trees.

Impact Avoidance and Mitigation

Impact avoidance measures that have been, or would be implemented for the Project include;

- The project has been positioned in the landscape to avoid significant patches of remnant vegetation on the Subject land, in particular;
  - the semi-cleared woodland east of Paddocks 1 and 2 (Figure 3), and
  - the denser areas of eucalypt woodland surrounded by paddocks 8, 10 and 13 that would be developed (Figure 3).
- Avoidance of the dense three hectare patch of mature Yellow Box Woodland in the north west corner of Paddock 5.
- Avoidance of damage to the mature eucalypts on the verges of Seatonville Road during road upgrade operations.

Mitigation measures include:

- Preparation of a vegetation removal strategy to ensure that harm is minimised to wildlife that may be inhabiting hollows in the 85 hollow-bearing trees that are proposed for removal.
- Development of a weed management strategy.
- Monitoring for feral animals and control as necessary.
- Prohibition of domestic pets on site.
- A site closure and rehabilitation plan.

Project Impacts

Direct impacts of the Proposal on biodiversity include;

- Loss of 0.4 ha of eucalypt plantings.
- Loss of 0.8 ha of native grassland derived from clearing the Box-Gum Woodland Endangered Ecological Community in Bakers Lane.
- Loss of 107 remnant paddock trees and two stags (dead standing trees), including 85 with potential wildlife hollows.

Cumulative Impacts

The cumulative impacts of the project on native vegetation loss are negligible whether derived grassland or plantings of native windbreak trees are considered. While the project will cause the loss of old growth and hollow bearing trees, this is not considered significant in the local or regional contexts in which these trees are gradually diminishing without replacement through senescence and other natural causes. Losses due to the project will be offset whereas natural declines are not.

Biodiversity Credit Report

The biodiversity credit report of the BAMC indicated that the plantings, which were assumed to represent PCT266 in order to run the calculator, are valued at 21 credits. Paddock trees for removal were assessed according to Appendix 1 of the BAM (2017a), which valued them at 103.25 credits.

The total credit liability for the Project is 124.25 credits.

Offset

Maryvale Solar Farm propose to acquit the liability of 124.25 credits by making a lump sum payment of equivalent value to the Biodiversity Conservation Trust Fund.

Commonwealth Environment Protection and Biodiversity Conservation Act (EPBC Act)

Two threatened species considered to have potential habitat on the investigation area are listed under the EPBC Act; the Swift Parrot and the Regent Honeyeater. Neither species would be dependent on the site for breeding, and foraging visits would occur rarely, if at all. The small loss of potential habitat on the site is highly unlikely to have an adverse impact on either species and referral of the Project to the Department of Energy and the Environment is not required.

SEPP 44

Two of the remnant eucalypt species on and around the Subject Land are recognised as Koala food trees (OEH, 2018e), viz. Yellow Box and White Box. The last of these is listed as a Koala feed tree in Schedule 2 of SEPP 44. However, the Site does not have an extant Koala population and therefore is not 'core' Koala habitat so that a SEPP 44 plan of management is not required.

1 INTRODUCTION

FloraSearch was commissioned by Pitt and Sherry Pty. Ltd. on behalf of Maryvale Solar Farm to conduct biodiversity surveys and an ecological assessment of the site of a proposed solar farm at Maryvale, approximately 15 kilometres (km) north west of Wellington town centre in the central west of New South Wales in the Dubbo Regional Council Local Government Area (LGA) (Figure 1). The Project is a State Significant Development for which approval is being sought under Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act). The survey and assessment were conducted using the Biodiversity Assessment Method (BAM) (OEH, 2017a) under the NSW *Biodiversity Conservation Act 2016* (BC Act).

1.1 PROJECT OVERVIEW

Photon Energy (Photon) propose to construct and operate a 125-megawatt (MW) solar farm (the "Proposal") using photovoltaic (PV) technology at two properties totalling 1,200 hectares (the "Subject Land") in Maryvale, NSW. The solar farm infrastructure would occupy 375 hectares (the "Site") (Figure 2). The properties are "Waroona" 121 Maryvale Road, Maryvale 2820 and "Scarborough House", 801 Cobbora Road, Maryvale, NSW, 2820 and are contained within part of Lot 2 DP 573426, Lot 1 DP 1095725, Lot 2 DP 1095725, Lot 1 DP 1006557, part of Lot 182 and Lot 122 DP754318.

The Proposal will comprise of up to 4 0,000 PV panels, using a single axis tracking system, facing east-west and tilted 60° along the north-south axis. The PV modules (2m x 1m) will consist of 72 high efficiency monocrystalline cells with glass and aluminium frames. The mounting structures will be constructed in rows with approximately 11m spacing between the rows to facilitate movement of the panels and provide access for maintenance. The modules will be arranged in strings and connected to inverters located adjacent to PV arrays.

An existing Essential Energy 132kV easement runs through Lot 2 DP 573426 in a north – west to south-east direction and contains an existing 132 kV powerline on wooden pole structures, which connects with the Wellington substation some 12 km to the south and approximately 3.5km north of Wellington.

The Proposal would consist of the following elements:

- Solar Components including:
  - Up to 450,000 PV panels on mounting structures that enable the panels to track the sun
  - Electrical connections and inverter stations (where the inverters are within containers within the solar PV arrays)
  - Underground cabling / collection circuits.
- Electrical infrastructure including:
  - Transmission kiosk
  - A 132kV Substation
  - 33kV switchgear
- A main access road
- Upgrade of intersections and roads to facilitate safe access as described below
- Ancillary facilities and construction compounds
- Perimeter security fencing

- Two maintenance storage containers.

Access Roads and Upgrades

Current access is on the western side of the Site via a single lane unsealed road, Seatonville Road, which would be upgraded to allow access for heavy vehicles, including entry through a new gate way. Seatonville Road will be upgraded to a similar standard to Maryvale Road to allow for 2-way traffic movements, as per Council requirements, between the site access and Maryvale Road. The intersection of Seatonville Road and Maryvale Road will be upgraded to allow for truck movements and the water crossing east of the intersection of Maryvale Road and Seatonville Road will be upgraded and widened to allow for 2-way truck movements. The intersection of Maryvale Road and Cobbora Road will be upgraded to provide a minimum left turn deceleration lane for trucks.

During operations, access would also be required between the modules and inverter stations onsite for maintenance, however this would not need to be constructed access or delineated roads due to the low frequency of use.

Ancillary facilities and construction compound

The proposed works will require the installation and use of a site compound and a construction laydown area to be located in the southern portion of the Site on Lot 2 DP 573426. Temporary ancillary facilities associated with the compound site would include:

- Construction offices (one 12m x 3m site office, two 12 x 3m break rooms)
- Parking area
- Staff amenities

Figure 1. Regional Location of the Project Site.

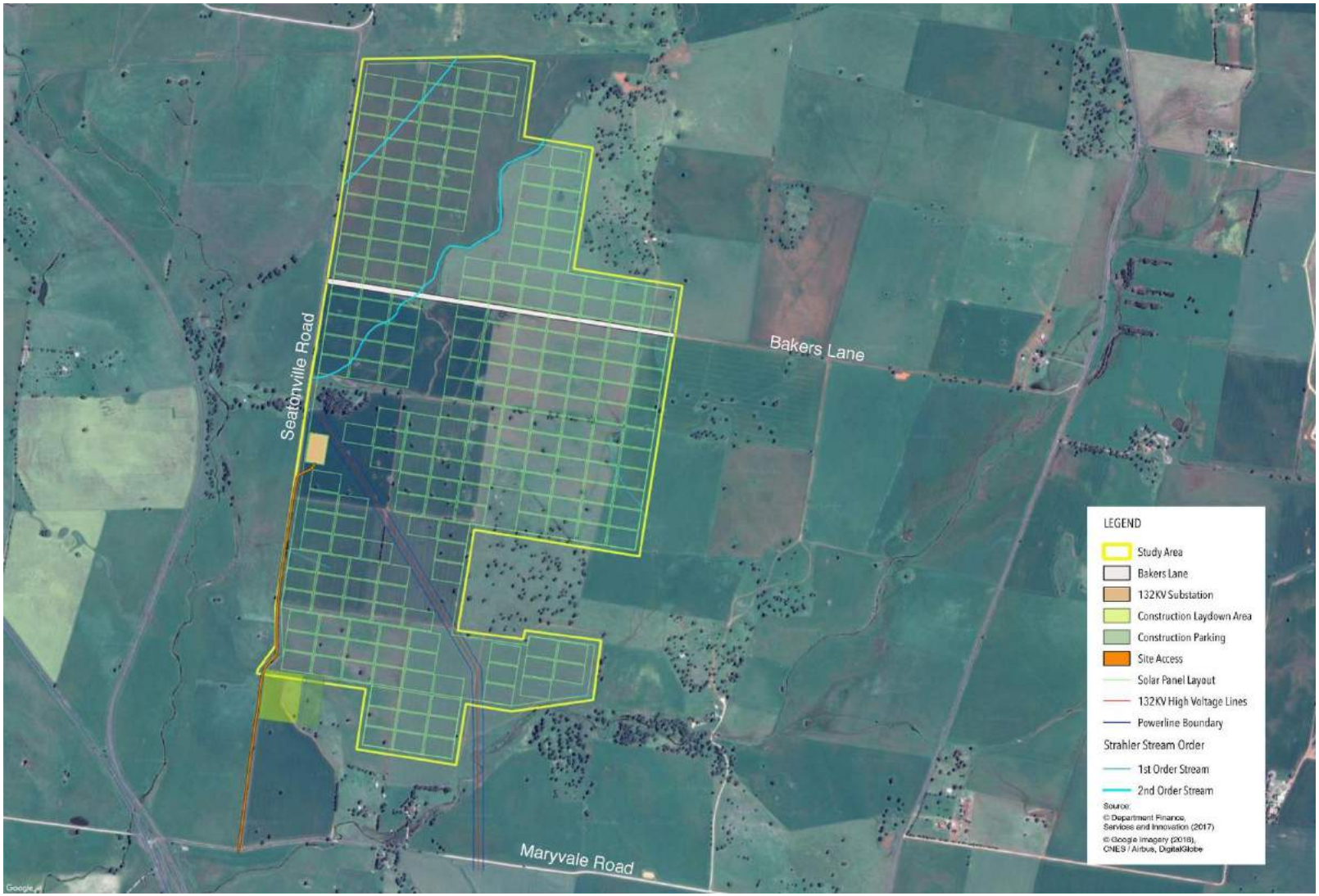

Figure 2. Site Layout.

1.2 BIODIVERSITY ASSESSMENT METHOD

The Environmental Assessment Requirements issued on behalf of the Secretary of the NSW Department of Planning and Environment to Maryvale Solar Farm require that the assessment of impacts from this Project on biodiversity should be conducted in accordance with the Biodiversity Assessment Method (BAM) (OEH, 2017a) established under the *Biodiversity Conservation Act 2016* (BC Act). The BAM outlines the methodology that underpins the NSW Biodiversity Offsets Scheme established under Part 6 of the BC Act.

The BAM (OEH, 2017a) requires the use of an online program (calculator) to assess biodiversity impacts and determine the biodiversity offset requirements for those impacts. The *Biodiversity Assessment Method Calculator* (BAMC or the Credit Calculator) was used for this assessment.

As specified by the BAM (OEH, 2017a), three stages of assessment are outlined in this report:

- Stage 1 summarises the biodiversity values of the BDAR Footprint that are entered into the Credit Calculator (e.g. landscape features, native vegetation and threatened species) (Section 2);
- Stage 2 assesses potential impacts on biodiversity, describes impact avoidance and mitigation measures and determines offset requirements (Section 3); and
- Stage 3 describes the Biodiversity Offset Strategy.

This Biodiversity Development Assessment Report (BDAR) has been prepared by Dr Colin Bower (FloraSearch), who is an accredited assessor under section 6.10 of the BC Act (assessor accreditation number BAAS18048).

1.3 GENERAL DESCRIPTION OF THE DEVELOPMENT SITE

The Biodiversity Development Assessment Report Site Footprint (BDAR Footprint) (Figure 2) is the development Site construction and operational area comprising approximately 375 hectares (ha). An existing Essential Energy easement runs in a south-easterly direction across the Site from near the north-western corner of Lot 2 DP573426 beside Seatonville Road and exiting through the southern boundary of Lot 22 DP 754318 (Figure 2). This easement contains existing Essential energy 132kV powerlines on wooden pole structures connecting to the Wellington substation approximately 15km to the south-east of the Site.

The Proposal area is divided into 14 fenced paddocks currently used for agriculture, including cropping (e.g. wheat, canola and lucerne) and grazing (Figure 3). It is proposed that grazing activities would continue on the land occupied by the solar farm. The Study Area has been almost entirely cleared of its original vegetation except for;

- A 3.1 ha patch of remnant woodland in the north west corner of Paddock 5, which is not proposed to be disturbed,
- 107 scattered paddock trees and two stags (standing dead trees),
- two narrow linear plantings of eucalypts, one on the western boundary of Paddock 9 and one on the western boundary of Paddock 10, and
- narrow strips of heavily grazed native grassland alongside the vehicle track within Bakers Lane.

The remnant paddock trees, remnant native grassland and plantings are proposed to be removed. Plates 1 to 10 illustrate the current condition of the vegetation across the Site according to the paddock numbering in Figure 3. The photos show that the whole property, including Bakers Lane, has been regularly cultivated, cropped and/or heavily grazed and, except for Bakers Lane, lacks remnants of native ground cover.

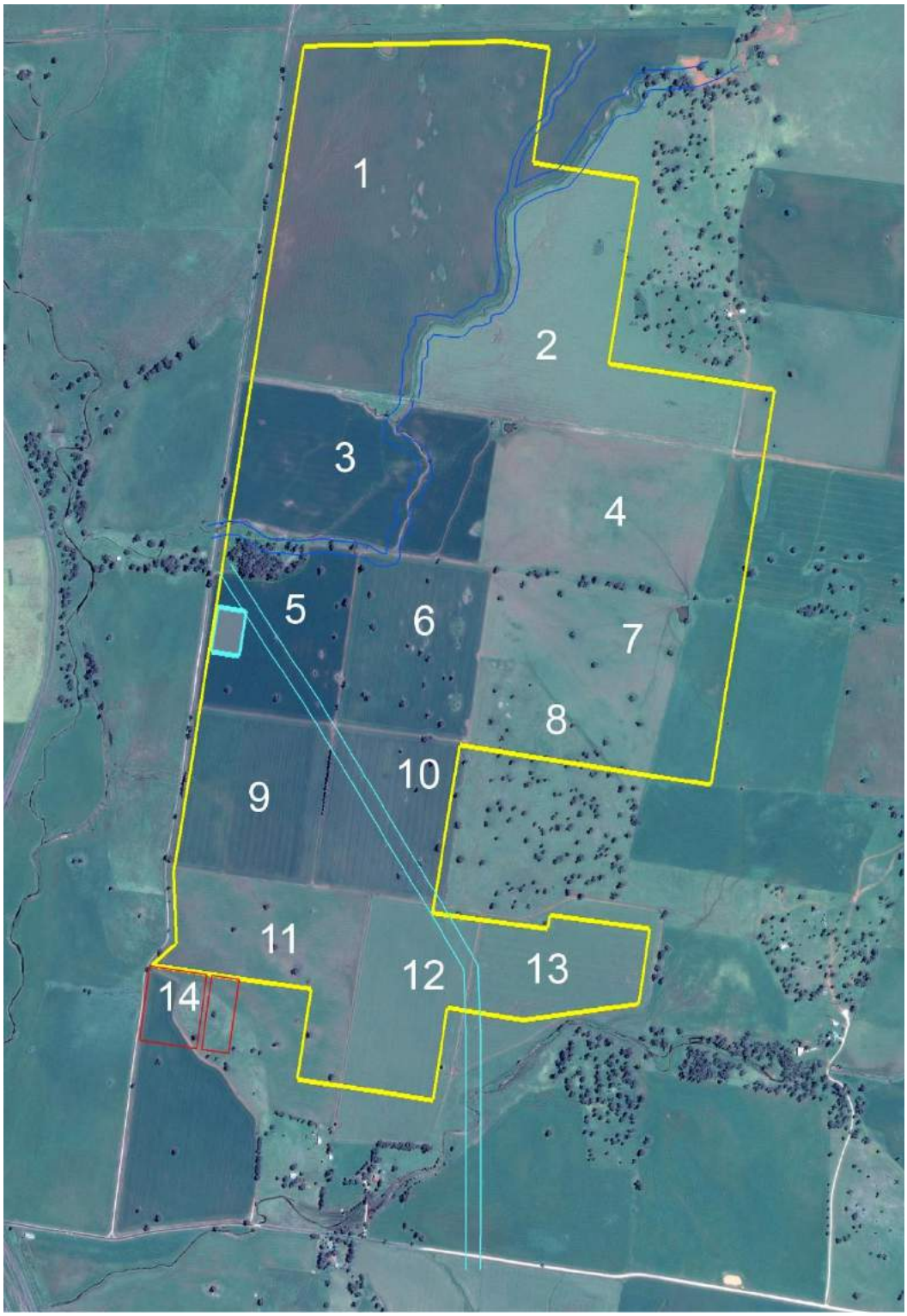

Figure 3. Paddock Arrangement on the Proposal Site.
[Note laneway (Bakers Lane) between paddocks 1/2 and 3/4]

Plate 1. Crop in Paddock 1.

Plate 2. Wheat stubble, Paddock 3.

Plate 3. Unharvested canola crop, Paddock 5.

Plate 4. Unharvested canola crop, Paddock 6.

Plate 5. Wheat stubble, Paddock 10.

Plate 6. Fallow, Paddock 11.

Plate 7. Fallow after wheat, Paddock 12.

Plate 8. Fallow after wheat, Paddock 13.

Plate 9. Native perennial grasses, Bakers Lane.

Plate 10. Planting of Eucalypts, Paddock 10.

2 STAGE 1 – BIODIVERSITY ASSESSMENT

Stage 1 of the biodiversity assessment summarises the biodiversity values of the BDAR Footprint that are inputs into the Credit Calculator.

2.1 LANDSCAPE FEATURES

Landscape features relevant to the Project are described in this section and illustrated on Figures 4 (Site Map) and 5 (Location Map).

This Site is assessed using the site-based assessment module within BAMC. Accordingly, a 1.5 km buffer zone was used to assess the landscape around the development Site (Figure 4).

2.1.1 Regional Setting

The Project is located approximately 15 km north west of Wellington town centre in central western NSW (Figure 1), entirely within the following regions:

- the New South Wales South Western Slopes Bioregion and Inland Slopes Sub-region of the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway and Cresswell, 1995); and
- the Dubbo Regional LGA.

2.1.2 Mitchell Landscapes

Details of the Mitchell Landscapes within the solar farm footprint are provided in Table 1 and shown on Figure 5. The footprint is predominantly within the Mullion Slopes Mitchell Landscape (OEH, 2018a) (Table 1).

Table 1. Mitchell Landscapes in the BDAR Footprint

Landscape Name	Percentage Cleared Estimate[1]	Area (ha)	Percent (%) of BDAR Footprint Covered by Landscape
Mullion Slopes	93	389.9	96.0
Macquarie Alluvial Plains	78	16.3	4.0

[1] Sourced from the 'Over-cleared Landscapes Database' within the BioNet Vegetation Classification Database (OEH, 2018b).

2.1.3 Native Vegetation Extent

The Project is located in a highly cleared agricultural region. The 1.5 km buffer zone around the Project area encompasses 2,485.6 ha, of which only 154.3 ha (6.2%) is remnant native woodland (Figure 5). Within the BDAR footprint the only patches of native vegetation are the two linear plantings totalling 0.4 ha in area and approximately 0.8 ha of native grassland along Bakers Lane, together comprising 0.3 percent of the Site area.

2.1.4 Connectivity

No vegetation corridors exist within the Project area or immediate surrounds (Figure 5).

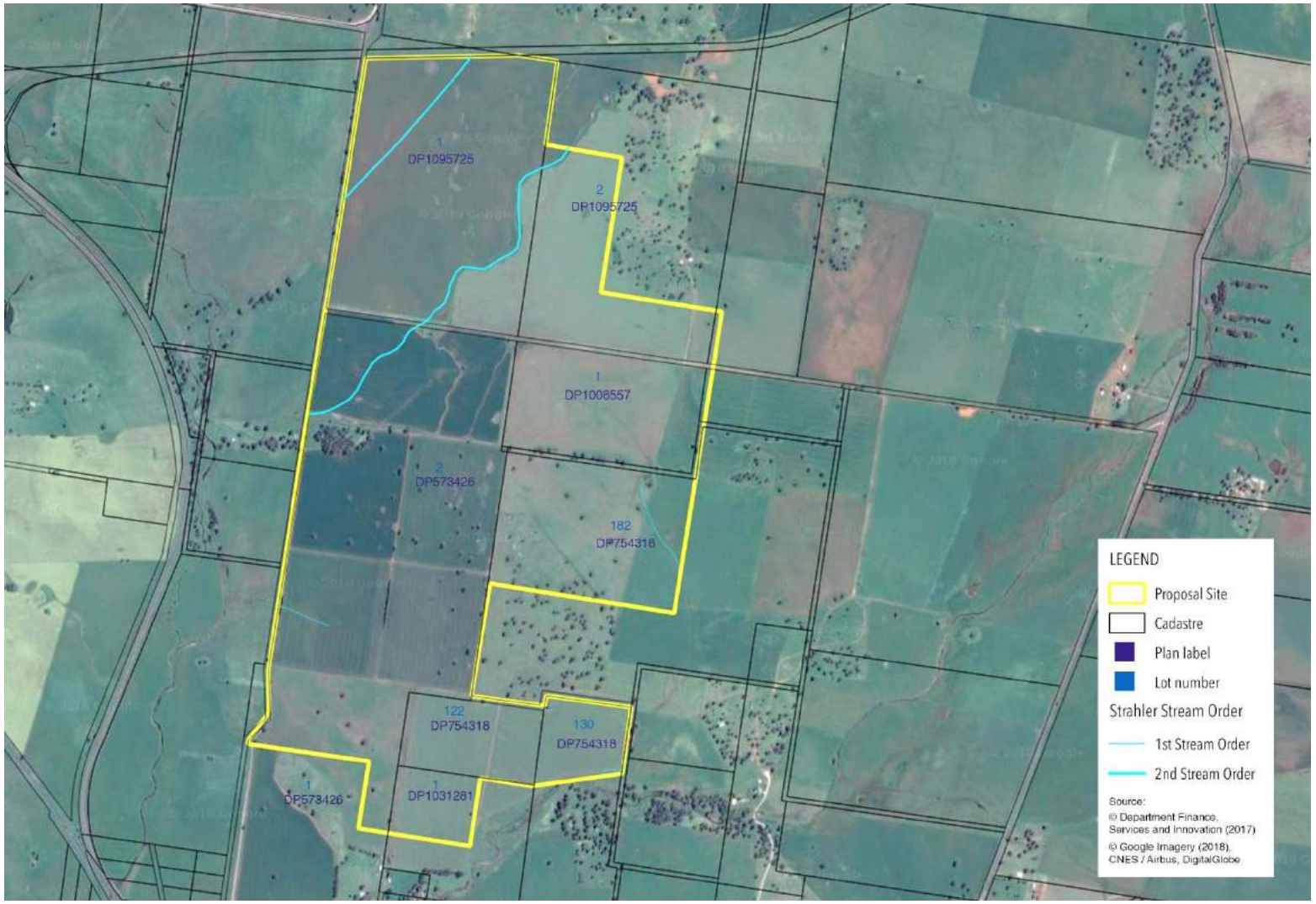

Figure 4. BAM Site Map of Subject Land.

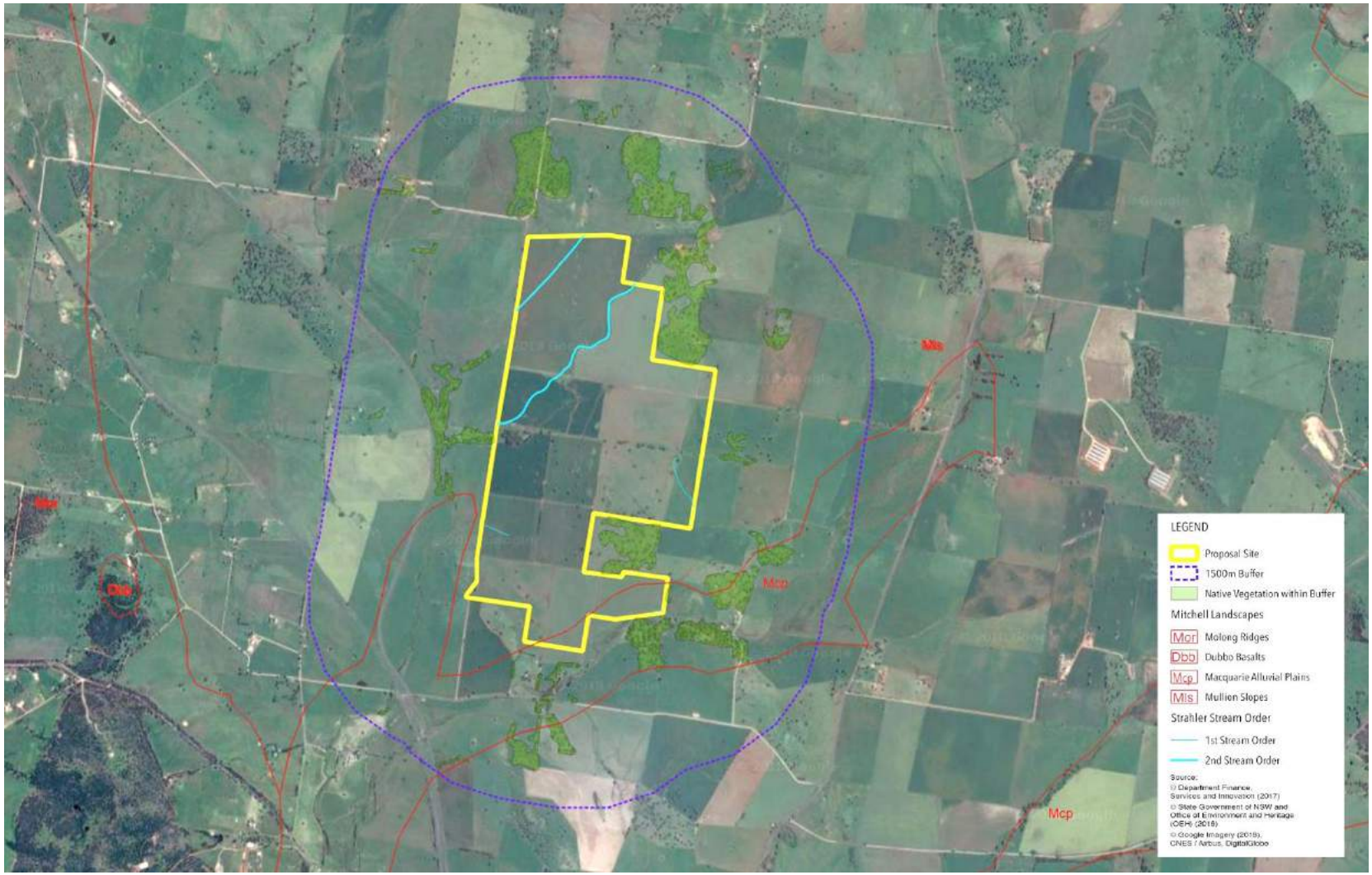

Figure 5. BAM Location Map of Subject Land.

2.2 NATIVE VEGETATION

Native vegetation on the BDAR Footprint is described in this section based on site visits undertaken by FloraSearch on 28 November 2017 and 21 and 22 June 2018. The following sampling to document the vegetation was undertaken (Figure 6):

- Two BAM flora quadrats were conducted in November 2017 within a remnant of native woodland in the north west corner of Paddock 5 (Figure 6). Floristic data from the two quadrats is given in Attachment 1.
- It was intended to conduct a further BAM quadrat in June 2018 in native grassland in Bakers Lane. The quadrat could not be conducted because extreme drought conditions and heavy grazing had removed almost all of the vegetation. In lieu of site-specific data for the grassland, ground cover benchmark data for PCT266 (BioNet, 2018a) has been used in the BAM Credit Calculator.
- In June 2018 roadside vegetation that may be affected by road upgrades for the Project in Seatonville Road, Maryvale Road and at the Maryvale Road / Cobbora Road intersection was inspected. The vegetation at all sites was dominated by perennial exotic species, which was documented by rapid assessment samples as below.
- Seven rapid assessment samples were conducted to document the vegetation at the following locations (Figure 6) (Attachment 1);
    - Paddock 1 (November 2018)
    - Bakers Lane (November 2018)
    - Maryvale / Cobbora Road intersection (June 2018)
    - Maryvale Road / Seatonville Road intersection (June 2018)
    - Three sites along Seatonville Road (June 2018)

2.2.1 Plant Community Types

All that remains of the original pre-European tree cover on the Study Area is:

- A patch of Yellow Box Woodland (3.1 ha) in the north west corner of Paddock 5 (Figures 6 and 7). This patch would not be disturbed by the Project.
- Approximately 0.8 ha of native grassland along Bakers Lane (Figure 6), which would be removed for the Project. [The area of grassland was estimated by calculating the area of the road easement and subtracting an estimate of the road surface area assuming a road width of 5 m. This is likely to be a slight overestimate of the grassland since the road surface width exceeded 5 m in places.]
- A total of 107 living remnant paddock trees and two dead trees, mainly in Paddocks 4 to 8 and 10 (Figure 6). These trees would be removed for the Project and comprise;
    - Yellow Box (*Eucalyptus melliodora*) – 6 trees in total in Paddock 5 (3 trees) and Paddocks 6, 12 and 13 (1 tree each).
    - White Box (*Eucalyptus albens*) – 99 trees on the higher parts of the Site mainly in Paddocks 4 to 8, 10 and 11.
    - Kurrajong (*Brachychiton populneus*) – 2 trees in Paddocks 5 and 6.
    - Stags (dead standing trees - probably of White Box) – 2 in Paddock 11.

From the remnant vegetation and paddock trees it is possible to determine the likely original Plant Community Types (PCT) (BioNet, 2018a) on the Site (Table 2). It is considered the following two PCTs occupied the Site pre-European settlement:

- PCT266 – *White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.*

- PCT277 – *Blakelys Red Gum – Yellow Box grassy tall woodland in the NSW South Western Slopes Bioregion.*

2.2.2 Endangered Ecological Communities

PCTs 266 and 277 are both part of the *White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community* (BC Act). This community is commonly known as Box-Gum Woodland. Remnants of Box-Gum Woodland that meet Commonwealth criteria (DEH, 2006) are listed as the *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community* (Environment Protection and Biodiversity Conservation Act 1999 [EPBC Act]). The Box-Gum Woodland remnants on the study area do not meet the Commonwealth criteria for protection under the EPBC Act (DEH, 2006). In particular, the ground cover is highly degraded and lacks the required diversity of 12 non-grass native species, including one important species, per 0.1 hectares.

2.2.3 Streamlined Assessment Module

This section provides justification for using the streamlined assessment module of the BAM for this Project. The native vegetation on the BDAR footprint comprises 107 live remnant paddock trees, two stags and two linear plantings (0.4 ha) of native trees along fence lines and 0.8 ha of derived native grassland. The total area of the native vegetation clearance is 1.2 ha, which is above the minimum threshold (1.0 ha) for application of the Biodiversity Offsets Scheme and below the 5 ha maximum area limit for application of the streamlined assessment module (BAM, Appendix 2 [OEH, 2017a]) on a site with a minimum Lot size of 400 ha (Wellington Shire Council LEP, 2016). Accordingly, this report follows the requirements of the BAM streamlined assessment module (OEH, 2017a), which is applied in two parts;

- The streamlined assessment module for the on-site plantings and the derived native grassland in Bakers Lane, and

- the paddock tree module for 109 paddock trees and stags that would be removed from the Site.

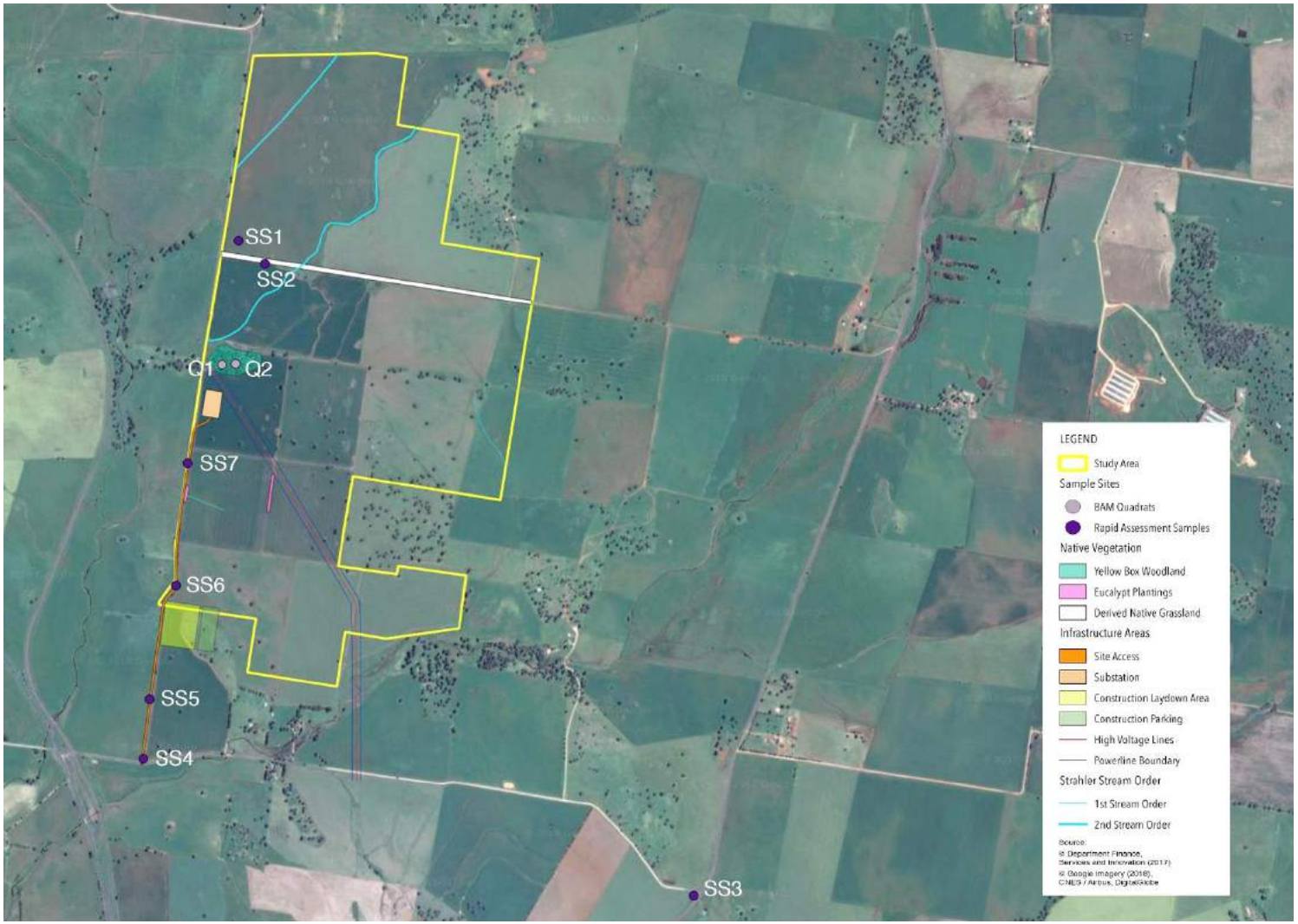

Figure 6. Native Vegetation and Sample Locations on the Study Areas.

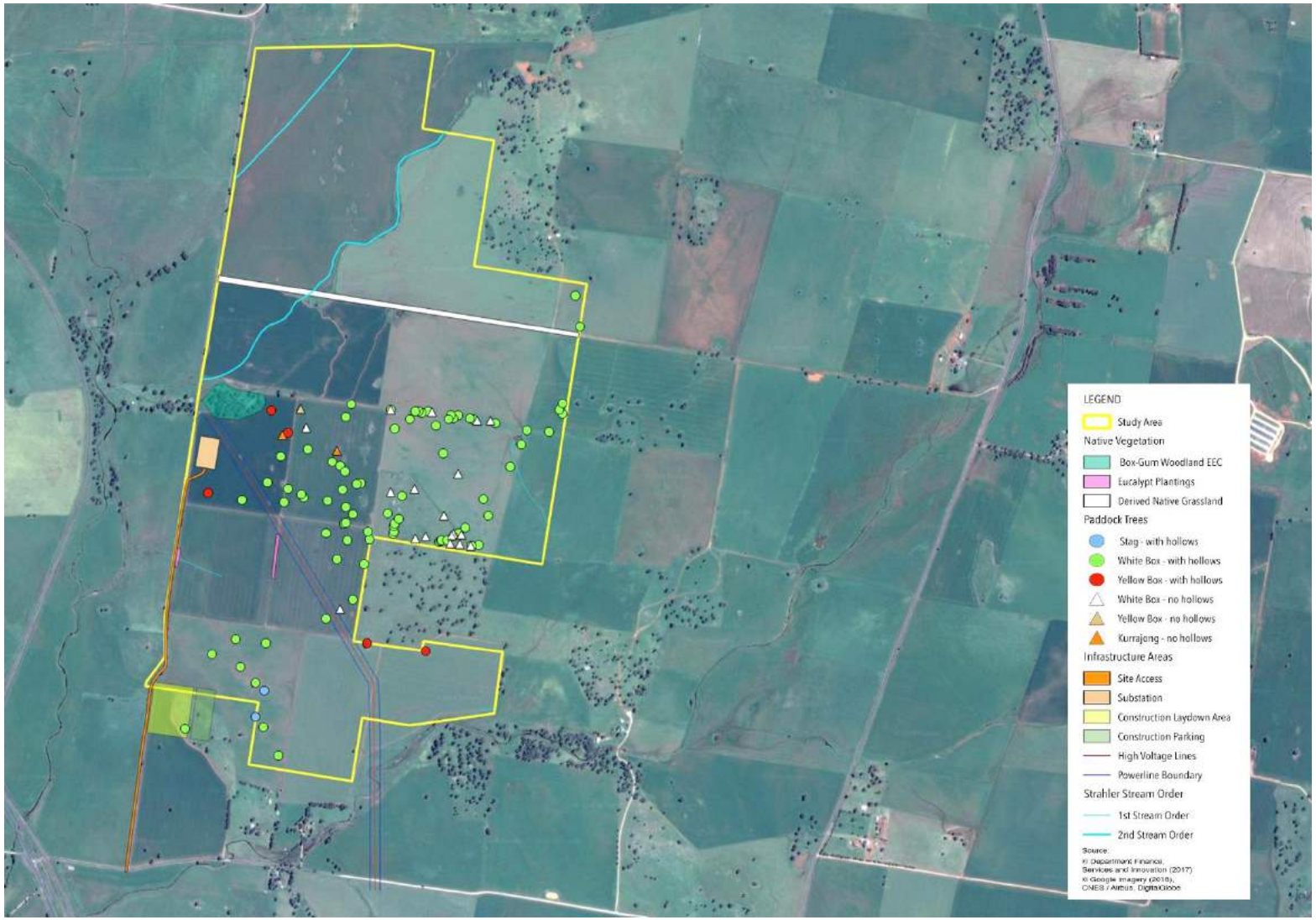

Figure 7. Box-Gum Woodland EEC, Derived Native Grassland and Paddock Tree Locations.

Table 2. Likely Pre-European Plant Community Types on the Development Site.

Vegetation Formation	Vegetation Class	PCT (BioNet, 2018a)		Dominant tree species	Justification	Threatened Ecological Communities
		No.	Name			
Grassy Woodlands	Western Slopes Grassy Woodlands	266	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.	*E. albens* *Brachychiton populneus* *E. blakelyi*	This community formerly dominated over most of the Site as demonstrated by the widespread occurrence of White Box (*Eucalyptus albens*) paddock trees along with occasional Kurrajongs (*Brachychiton populneus*) (Figure 6).	*White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community* (BC Act) and *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community* (Environment Protection and Biodiversity Conservation Act 1999 [EPBC Act]). [This community is commonly known as Box-Gum Woodland]
		277	Blakelys Red Gum – Yellow Box grassy tall woodland in the NSW South Western Slopes Bioregion.	*E. melliodora* *E. blakelyi* *E. bridgesiana*	This community formerly occurred on flatter terrain and lower slopes in Paddocks 3, 5 and 6 (Figure 3) associated with a tributary of Maryvale Creek. The dominant remnant tree is Yellow Box (*E. melliodora*) with occasional *E. blakelyi*, best matching PCT277.	

2.2.4 Plantings

The plantings comprise a total of 71 trees within an area of 0.4 ha. The main trees in the plantings are River Red Gum (*Eucalyptus camaldulensis*), Mugga Ironbark (*E. sideroxylon*) and Yellow Gum (*E. leucoxylon*) with minor amounts of several other species. The species composition of the plantings does not mimic the original vegetation of the Site.

Tree stem diameter at breast height was measured on all trees to determine the size distribution (Table 3). The data in Table 3 were used to estimate the number of trees in each size class within a representative 1000m^2 for input to the BAMC.

Other parameters for input to the BAMC were estimated qualitatively as per paragraph 5.3 of Appendix 2 of the BAM (OEH, 2017a) (Table 4). Owing to the small area of the plantings (0.4 ha), an overall estimate of the condition of the plantings was required for the equivalent of one set of quadrat data (Table 4). The estimates were based on field observations across both plantings.

Table 3. Size Distribution of Planted Native Trees.

Planting	Diameter at Breast Height (DBH)						
	< 5 cm	5 - 9 cm	10 – 19 cm	20 – 29 cm	30 – 49 cm	50 – 79 cm	80 + cm
1	0	4	8	5	5	4	0
2	0	3	4	15	21	2	0
Total	0	7	12	19	26	6	0
Estimate / 1000m^2	**0**	**2**	**3**	**5**	**6**	**1**	**0**

Table 4. Estimates of Inputs to BAMC for Farm Plantings.

BAM attribute (400m^2)	No. of species	Foliage cover (%)
Trees	3	30
Shrubs	0	0
Grasses / grass-like	2	2
Forbs	2	0.2
Ferns	0	0
Other	0	0
High Threat Weeds	2	1
Litter cover **(1000m^2)**	-	30
Length of logs	-	0 m

For the purposes of inputting the plantings data to the BAMC, it was assumed the plantings represent the likely original dominant PCT on the Site, i.e. PCT266, *White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion*, which they were intended to replace. The resulting vegetation integrity statistics from the BAMC are given in Table 5.

Table 5. Vegetation Integrity Statistics for Plantings (PCT266).

Statistic	Score
Composition	22.4
Structure	33.1
Function	45.5
Vegetation Integrity	32.3

2.2.5 Native Grassland on Bakers Lane

Owing to drought conditions in June 2018 and heavy grazing, it was not possible to conduct a meaningful BAM flora quadrat in the native grassland along Bakers Lane. For the purposes of this assessment benchmark data for native ground cover in PCT266 (BioNet, 2018a) has been used for input to BAMC (Table 6). This is considered likely to overestimate the actual quality of the grassland.

Table 6. Inputs to BAMC for Native Grassland.

BAM attribute (400m^2)	No. of species	Foliage cover (%)
Trees	0	0
Shrubs	0	0
Grasses / grass-like	8	30
Forbs	9	6
Ferns	1	0.1
Other	1	0.1
High Threat Exotics	4	10
Litter cover **(1000m^2)**	-	56
Length of logs	-	0

The planting and derived native grassland data were entered as two separate zones in the calculator. The integrity statistics output by the BAMC for the native grassland are given in Table 7.

Table 7. Vegetation Integrity Statistics for the Derived Native Grassland in Bakers Lane.

Statistic	Score
Composition	73.1
Structure	65.5
Function	15
Vegetation Integrity	41.6

2.2.6 Paddock Trees

The remnant trees on the Site are treated as paddock trees for this assessment (Figure 7). Their diameters at breast height (DBH) and the presence of any hollows suitable for wildlife were recorded for input to the Paddock Tree module of the Streamlined Assessment (Appendix 1, BAM [OEH, 2017a]) (Table 8). Some very large remnant trees, probably dating to pre-European times, occur across the Site (Table 8) and along Seatonville Road. The trees on Seatonville Road were not assessed as they are not proposed for removal. All but five of the remnant paddock trees exceed the lower limit (50 cm) for classification as large trees in PCT266.

Checking of aerial photographs post field work indicated seven trees had not been assessed. Based on the data in Table 8 it is assumed all of these trees exceed a DBH of 50 cm and that all but one have hollows.

Table 8. Paddock Tree Sizes and Presence of Hollows.

Species	Tree Diameter at Breast Height (cm) (number of trees)							
	≤ 20	21 – 50	51 - 90	91 - 130	131 - 170	> 170	Other	Total
Brachychiton populneus	-	-	2	-	-	-		2
Eucalyptus melliodora	-	-	-	2	4	-		6
Eucalyptus albens	-	4	49	30	8	1		92
Stags	-	-	2	-	-			2
Unassessed trees							7	7
TOTAL TREES	**-**	**4**	**53**	**32**	**12**	**1**	**7**	**109**
Trees with hollows	**-**	**1**	**41**	**24**	**12**	**1**	**6**	**85**

2.2.7 High Threat, Priority and Nationally Significant Weeds

Seven introduced flora species recorded on the study area (Attachment 1) are considered to be High Threat Exotic weeds by OEH (2018g); African Boxthorn, Khaki Weed, Bathurst Burr, Saffron Thistle, St. Johns Wort, Paspalum and Great Brome. One weed, African Boxthorn, is listed as a Priority Weed for the Dubbo Regional LGA under the NSW *Biosecurity Act 2015* (DPI, 2018) and as a Weed of National Significance by the Australian Weeds Committee of the Commonwealth Government (www.weeds.org.au).

2.3 FAUNA SURVEY

A fauna survey of Paddocks 1, 2, 3, 5, 6, 9 and 10 was conducted by Biosphere Environmental Consultants on 23 November 2017 with the following methods and results.

The survey commenced with a site familiarisation tour in which all of the roads and tracks on the site were traversed by vehicle. Following this, the site was re-traversed so that areas of potential habitat for threatened species could be mapped. As most of the site consisted of cleared paddocks, there were relatively few areas left that could provide potential habitat for native fauna. Each area was then revisited and traversed on foot. The survey included non-threatened species as well as threatened species. No trapping or netting of animals was carried out. All animal species encountered were identified and recorded on map of the site. The survey components consisted of:

- **Arboreal mammals**: A search was made of the trees on site and evidence of the presence of arboreal mammals was searched for: these include scratch marks on trees, the presence of used hollows or drays, faecal droppings and chew marks. A particular emphasis was made to search for evidence of koalas on the site and all Yellow Box and Blakely's Red Gums were fully checked for signs of koala scratches or faecal pellets.

- **Terrestrial Mammals**: Evidence of terrestrial animals was searched for across the site. This included searching for animal tracks, burrows, digging sites and scats.

- **Bats**: Potential food trees for flying foxes were noted. These included trees that either produce edible fruit that flying foxes could eat, or produce flowers with edible nectar. For the smaller insectivorous bats, small hollows or loose bark refuge sites on the trees were sought and investigated to see if there were any signs of current or previous occupation by microbats.

- **Diurnal Birds**: A constant watch was kept for birds using field binoculars. Birds were identified and their location noted on the field map.

- **Nocturnal Birds**: No night survey work was conducted. Owl, nightjar and frogmouth roosts were searched for during daylight hours and any potential site found was recorded on the site map.

- **Reptiles**: A hand search for reptiles was carried out in areas where there was ground cover such as fallen bark, branches, logs or scrap timber or metal that could be used as shelter areas by reptiles. Reptiles were not caught unless this was necessary for positive identification. Other reptiles were encountered opportunistically and their location was also recorded on the site map.

- **Frogs**: A search of the channels and water collection points on site was made to see if any evidence of frogs could be found. Standing water was netted using a long-handled net and if tadpole were caught they were identified using Anstis (2002). In clay areas near water points, evidence of frog burrows was also searched for and when found recorded on the site map.

- **Fish**: Fish sampling was carried out in the larger farm dams using long handled nets.

Given the paucity of potential habitat areas for native species on site, the above fauna survey methodology is considered to be sufficient to identify the habitat of threatened species on site.

2.3.1 Fauna survey limitations

The surveys undertaken by Biosphere Environmental Consultants Pty. Ltd. were short in duration and only conducted during one season (spring). The techniques used were observation-based rather than trapping. Accordingly, it is likely the surveys would not have recorded the full range of fauna on site, particularly those species that may only occur seasonally or occasionally.

2.3.2 Fauna habitat types, condition and features

Five broad fauna habitat types were recorded within the site;

- Mature Yellow Box (*Eucalyptus melliodora*) woodland is present in field 5 (Figure 3). These trees contain hollows and other refuge sites for arboreal and flying species, and understorey vegetation is present.

- Stand of mature White Box (*E. alba*) in cleared fields (fields 5, 6 and 10). These trees are in good condition and could provide food resources for threatened birds and bats.

- Rock piles in field 6.

- Reed beds in ephemeral channel: stands of Bulrushes *Typha orientalis* are present in an ephemeral watercourse in field 3 and these water plants could provide shelter habitat for Australasian Bitterns, but the associated channels may also provide habitat for threatened wading birds.

- Cleared land with scattered trees. The majority of the project area has been previously cleared for agricultural purposes. There are very few isolated rocks as most surface rocks have been collected and heaped into rock piles in field 6. Minor rocky outcrops occur in fields 6 and 10.

2.3.3 Fauna recorded by the surveys

Only 22 species of vertebrate fauna were recorded by the surveys and are listed in Appendix 2. This included 12 species of bird (1 of which was non-native), 3 exotic species of mammal, five species of reptiles and one species of frog, but no fish. No threatened fauna species were recorded within the study area or nearby.

2.4 THREATENED SPECIES

Threatened species relevant to the Project are identified in this section. The BAM recognises two categories of threatened species:

- ecosystem credit species (i.e. species predicted to be present based on the PCTs present on the Site); and/or
- species credit species (i.e. species that cannot be reliably predicted by PCTs) (OEH, 2017a).

Threatened species that are ecosystem credit species and/or species credit species are pre-determined in the Credit Calculator and *BioNet Threatened Species Profile Database* (OEH, 2018c).

2.4.1 Data Sources

Three data sources were used to compile lists of threatened flora and fauna that may potentially occur on the Site (Tables 9 and 10):

- BAM online calculator – Lists of ecosystem credit species and species credit species generated by the BAMC from the BioNet databases using inputs on IBRA subregion, Site location and vegetation integrity (OEH, 2018d).

- BioNet website – Searches of the NSW Atlas of Wildlife, NSW State Forests, Australian Museum and Royal Botanic Gardens Sydney databases (BioNet, 2018b). The search area comprised a 20 × 20 km square centred on the study area. This search returned a list of threatened species records from within the search area and shown on Figure 8.

- Commonwealth Department of the Environment and Energy (DoEE) website – Protected Matters Search Tool (PMST) (DoEE, 2018a). The search area comprised the same 20 × 20 km square as for the BioNet search. The PMST uses actual records and habitat modelling to return a list of 'protected matters' that are known or predicted to occur in the search area, including threatened species, migratory species, ecological communities, wetlands of international significance, and national and world heritage properties.

BAMC returned 17 ecosystem credit species, all fauna; and 19 species credit species, seven flora and 12 fauna species (Tables 9 and 10). Six of the fauna species are dual ecosystem and credit species. All species returned by the BAMC require assessment within the calculator of the suitability of the habitat on the Site for them.

The BioNet database search returned records of one flora species, the Pine Donkey Orchid (*Diuris tricolor*) and six fauna species, the Little Eagle (*Hieraaetus morphnoides*), Black Falcon (*Falco subniger*), Turquoise Parrot (*Neophema pulchella*), Masked Owl (*Tyto novaehollandiae*), Black-chinned Honeyeater (*Melithreptus gularis*) and the Varied Sitella (*Daphoenositta chrysoptera*) close to the Site that were not identified by BAMC (Figure 8). The potential for habitat of these species to occur on the Site is also assessed in Tables 9 and 10.

The PMST search returned 8 potentially occurring flora species and 22 fauna species. Assessment of these species is required to determine whether there is any obligation to refer the Project to the Commonwealth Department of the Environment and Energy (DoEE) under the EPBC Act.

The total numbers of potentially occurring threatened species identified by the searches are 14 flora and 44 fauna species.

2.4.2 Likelihood of Threatened Species Occurrence on the Site

BAMC allows the assessor to include or exclude from further consideration the candidate threatened species selected by the calculator on the basis of the presence or absence of suitable habitat, and other constraints, on the BDAR footprint. The likelihood of occurrence of each candidate species has been assessed in Tables 9 and 10 based on distribution records in the NSW Atlas of Wildlife (BioNet, 2018b), and information in both the *Threatened Biodiversity Profile Database* (OEH, 2018e) and referenced scientific publications. Knowledge of the Site is based on three days of site visits and surveys by the assessor (28 November 2017 and 21 and 22 June 2018).

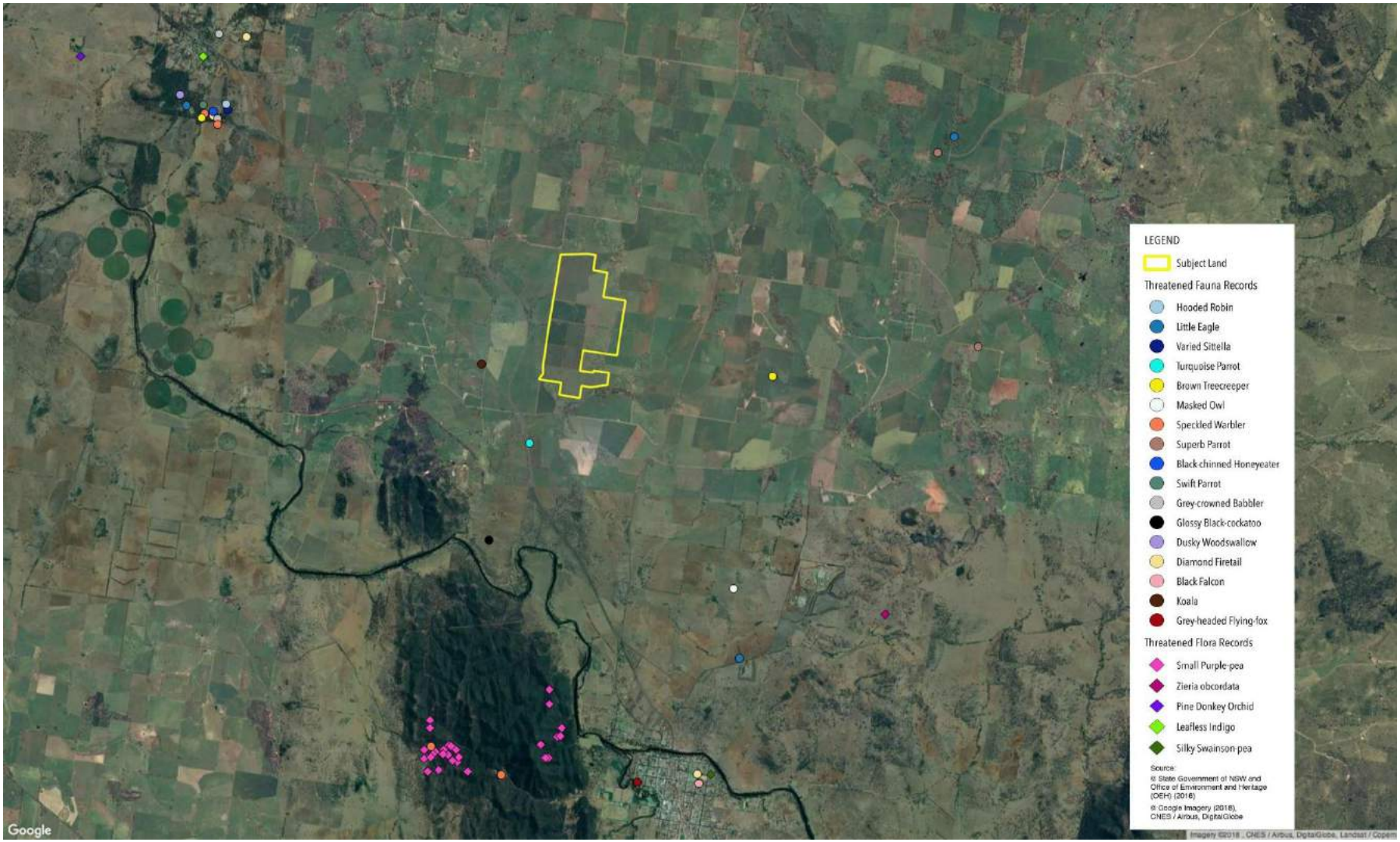

Figure 8. Locations of Threatened Species within 10 km of the Subject Land.

Table 9. Threatened Flora Species Returned by Database Searches of the Surrounding Region.

Scientific Name	Common Name	Data Source			Conservation Status		Ecosystem OR Credit Species[5]	Likelihood to be on Study Area	Assessment of Likelihood
		BAMC[2]	BioNet[3]	PMST[4]	BC Act	EPBC Act			
Acacia ausfeldii	Ausfeld's Wattle	✓	-	-	V	-	Sp[1]	Nil	Generally confined to an area between Dubbo, Ulan and Mudgee, where it occurs on sandy soils in dry shrubby forests (OEH, 2018e). It is unlikely to have once occurred on the Site.
Ammobium craspedioides	Yass Daisy	✓	-	-	V	V	Sp	Nil	Found from near Crookwell on the Southern Tablelands to near Wagga Wagga on the South Western Slopes (OEH, 2018e). Most populations are in the Yass region. Found in moist or dry forest communities, Box-Gum Woodland and secondary grassland derived from clearing of these communities (OEH, 2018e). Tolerates light grazing. Study area is well outside the known range of this species.
Austrostipa wakoolica	-	-	-	✓	E	E	Sp	Nil	Confined to the floodplains of the Lachlan, Murrumbidgee and Murray Rivers in central-western and south-western NSW (OEH, 2018e). It typically occurs on floodplain alluvial and stagnant alluvial soils, which do not occur on the Site.
Commersonia procumbens [syn. *Androcalva procumbens*]	-	-	-	✓		V	Sp	Nil	Grows in sandy sites in *Eucalyptus dealbata* and *Eucalyptus sideroxylon* communities, *Melaleuca uncinata* scrub, under mallee eucalypts with a *Calytrix tetragona* understorey (OEH, 2018e). Also occurs in *Eucalyptus fibrosa* subsp. *nubila, Eucalyptus dealbata, Eucalyptus albens* and *Callitris glaucophylla* woodlands north of Dubbo. Habitats absent from Maryvale.
Diuris tricolor	Pine Donkey Orchid	-	✓	-	V	-	Sp	Nil	The Pine Donkey Orchid grows in sclerophyll forest among grass, often with native Cypress Pine (*Callitris* spp.). It is generally found in sandy soils, either on flats or small rises. The nearest record is at Geurie (BioNet, 2018b). It is unlikely to have occurred around Wellington in habitats lacking Cypress Pines.

Scientific Name	Common Name	Data Source			Conservation Status		Ecosystem OR Credit Species[5]	Likelihood to be on Study Area	Assessment of Likelihood
		BAMC[2]	BioNet[3]	PMST[4]	BC Act	EPBC Act			
Euphrasia arguta	-	✓	-	✓	CE	CE	Sp	Nil	*Euphrasia arguta* has been recorded from grassy areas near rivers at elevations up to 700 m above sea level in central western NSW, and grassy forests or regrowth vegetation on the Northern Tablelands (DoEE, 2018b). Suitable habitat is lacking on the Site.
Grevillea wilkinsonii	Tumut Grevillea	✓	-	-	E	E	Sp	Nil	Only known from the Tumut and Gundagai areas. Grows along rivers or on serpentinite outcrops (OEH, 2018e). Suitable habitat is absent from the study area.
Philotheca ericifolia	-	-	-	✓	-	V	Sp	Nil	*Philotheca ericifolia* grows chiefly in dry sclerophyll forest and heath on damp sandy flats and in gullies. The species has been collected from open woodland, heathland, dry sandy creek beds and rocky ridge and cliff tops. Preferred soils have a sandy, gravelly or rocky component (DoEE, 2018b). The Site lacks suitable habitat for this species.
Prasophyllum petilum		-	-	✓	E	E	Sp	Nil	Grows in open sites in natural temperate grassland, grassy woodland and in grassy Box-Gum Woodland. Highly susceptible to grazing, being retained only at little-grazed travelling stock reserves and in cemeteries (OEH, 2018e). The habitat that occurs on the Site is too disturbed for this species.
Prasophyllum sp. Wybong (Phelps ORG 5269)		-	-	✓	-	CE	-	Nil	*Prasophyllum* sp. Wybong (C. Phelps ORG 5269) is known from open eucalypt woodland and grassland in northern NSW, exclusively Box-Gum Woodlands (DoEE, 2018b). Suitable habitat is absent from the Site.

Scientific Name	Common Name	Data Source			Conservation Status		Ecosystem OR Credit Species[5]	Likelihood to be on Study Area	Assessment of Likelihood
		BAMC[2]	BioNet[3]	PMST[4]	BC Act	EPBC Act			
Swainsona recta	Small Purple-pea	✓	✓	✓	E	E	Sp	Nil	Before European settlement Small Purple-pea occurred in the grassy understorey of Box-Gum Woodlands and open-forests dominated by *Eucalyptus blakelyi*, *E. melliodora*, *E. rubida* and *E. goniocalyx* (OEH, 2018e). Populations remain in the Mt. Arthur Reserve (Figure 8), only 8 km south of the Site, in colluvial and alluvial soils in the lower parts of the reserve. It is not known from cleared and heavily grazed habitats such as those on the Site.
Swainsona sericea	Silky Swainson-pea	✓	✓	-	V	-	Sp	Nil	The Silky Swainson-pea was formerly a widespread, common species in Box-Gum Woodlands and is likely to have been common in the Wellington district (OEH, 2018e). However, the high degree of disturbance to the Site means it is highly unlikely to occur there now.
Tylophora linearis	-	-	-	✓	V	E	Sp	Nil	Grows in dry scrub and open forest. Recorded from low-altitude sedimentary flats in dry woodlands (OEH, 2018e). On coarse-grained sediments. Distributed to the north and west of the study area. Suitable habitat is absent from the Site.
Zieria obcordata	Granite Zieria	✓	✓	-	E	E	Sp	Nil	Grows in eucalypt woodland or shrubland dominated by species of *Acacia* on rocky hillsides (OEH, 2018e) and in *Eucalyptus* and *Callitris* dominated woodland in sandy loam amongst granite boulders (OEH, 2018e). Occurs at Wuuluman north east of Wellington. Plants are very susceptible to grazing. Granite geology does not occur on the study area.

[1] Sp=Species Credit Species
[2] Biodiversity Assessment Method Credit Calculator (OEH, 2018d)
[3] NSW Atlas of Wildlife (BioNet, 2018b)
[4] Protected Matters Search Tool (DoEE, 2018a)
[5] *BioNet Threatened Species Profile Database* (OEH, 2018c)
E Endangered.
CE Critically Endangered
V Vulnerable.

Table 10. Threatened Fauna Species Returned by Database Searches of the Surrounding Region.

Scientific Name	Common Name	Data Source			Conservation Status		Ecosystem and/or Credit Species[5]	Likelihood to be on Study Area	Assessment of Likelihood
		BAMC[2]	BioNet[3]	PMST[4]	BC Act	EPBC Act			
Synemon plana	Golden Sun Moth	✓	-	-	E	CE	Sp	Nil	The Golden Sun Moth's NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut (OEH, 2018e). The species' historical distribution extended from Bathurst through the NSW Southern Tablelands to central and western Victoria and Bordertown in eastern South Australia. Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which the ground layer is dominated by wallaby grasses *Austrodanthonia* spp (OEH, 2018e). Suitable habitat is absent from the study area.
Galaxias rostratus	Flathead Galaxia	-	-	✓	CE[6]	CE	-	Nil	These fish species were all identified by the PMST and are covered by the *Fisheries Management Act 1994* in NSW. They occur in large permanent rivers with deep waterholes (DoEE, 2018b). No suitable permanent watercourses occur on or near the Site.
Maccullochella macquariensis	Trout Cod	-	-	✓	E[6]	E	-	Nil	
Maccullochella peelii	Murray Cod	-	-	✓	-	V	-	Nil	
Macquaria australasica	Macquarie Perch	-	-	✓	E[6]	E	-	Nil	
Aprasia parapulchella	Pink-tailed Worm-lizard	✓	-	✓	V	V	Sp[1]	Nil	The Pink-tailed Worm-lizard inhabits sloping, open woodland areas with predominantly native grassy ground layers, particularly those dominated by Kangaroo Grass (*Themeda australis*). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks (OEH, 2018e). Suitable habitat does not occur on the Site.
Delma impar	Striped Legless Lizard	-	-	✓	V	V	Sp	Nil	Found mainly on the Southern Tablelands and South West Slopes in Natural Temperate Grassland but may also occur in grasslands with a high exotic component. Occasionally found in open Box-Gum Woodland. Shelters beneath logs and/or rocks in winter (OEH, 2018e). Predicted as potentially occurring on the Site by PMST (DoEE, 2018b), but is not known north of Goulburn. Suitable habitat is lacking on the Site.

Scientific Name	Common Name	Data Source			Conservation Status		Ecosystem and/or Credit Species[5]	Likelihood to be on Study Area	Assessment of Likelihood
		BAMC[2]	BioNet[3]	PMST[4]	BC Act	EPBC Act			
Leipoa ocellata	Mallee Fowl	-	-	✓	E	V	Ec[1]	Nil	The Mallee Fowl was predicted to potentially occur on the study area by the PMST. Mallee Fowl are found in semi-arid to arid shrublands and low woodlands, especially those dominated by mallee and/or acacias. A sandy substrate and abundance of leaf litter are required for breeding (Benshemesh, 2007). Suitable habitat is absent from the Site and surrounding regions.
Haliaeetus leucogaster	White-bellied Sea Eagle	✓	-	-	V	-	Sp	Nil	Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea (OEH, 2018e). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Prime foraging habitat is lacking close to the site, as are potential nest trees.
Hieraaetus morphnoides	Little Eagle	-	✓	-	V	-	Ec/Sp	Moderate	Occupies open eucalypt forest, woodland or open woodland. Sheoak or *Acacia* woodlands and riparian woodlands of interior NSW are also used (OEH, 2018e). Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Potential habitat occurs on the study area and surrounds.
Falco subniger	Black Falcon	-	✓	-	V	-	Ec	Nil	The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions (OEH, 2018e). Favours woodlands and grasslands of the arid and semi-arid zones, especially along watercourses (Olsen, 1995). Habitat in the study area is marginal for this species.
Botaurus poiciloptilus	Australasian Bittern	-	-	✓	E	E	Ec	Nil	Favours permanent freshwater wetlands with tall, dense vegetation, particularly *Typha* spp. and *Eleocharis* spp. (OEH, 2018e). Suitable habitat is absent from the Site.
Rostratula australis	Australian Painted Snipe	-	-	✓	E	V	Ec	Nil	Australian Painted Snipe inhabits freshwater swamps and marshes (Blakers *et al*., 1984). Suitable habitat is absent from the study area.
Calidris ferruginea	Curlew Sandpiper	-	-	✓	E	CE	Ec/Sp	Nil	Forages mainly on coastal estuarine mudflats, but also in inland lakes and lagoons with extensive shallows (OEH, 2018e). Suitable habitat is absent from the Study Area.

Scientific Name	Common Name	Data Source			Conservation Status		Ecosystem and/or Credit Species[5]	Likelihood to be on Study Area	Assessment of Likelihood
		BAMC[2]	BioNet[3]	PMST[4]	BC Act	EPBC Act			
Numenius madagascariensis	Eastern Curlew	-	-	✓	-	CE	Ec/Sp	Nil	The Eastern Curlew has a primarily coastal distribution on mudflats in estuaries. The species is found in all states, particularly the north, east, and south-east regions including Tasmania (DoEE, 2017b). Eastern curlews are rarely recorded in inland wetlands, which in any event are absent from the Study Area.
Calyptorhynchus lathamii	Glossy Black Cockatoo	✓	✓	-	V	-	Ec/Sp	Nil	Feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species), shredding the cones with the massive bill (OEH, 2018e). Casuarinaceae are absent from the Site.
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	✓	-	-	V	-	Ec	Nil	The Purple-crowned Lorikeet occurs across the southern parts of the continent from Victoria to south-west Western Australia (OEH, 2018e). Uncommon in NSW where the species is nomadic and most records are associated with flowering events. Found in open forests and woodlands, particularly where there are large flowering eucalypts. Unlikely to occur on the study area.
Glossopsitta pusilla	Little Lorikeet	✓	-	-	V	-	Ec	Low	The Little Lorikeet is widespread on the coast, tablelands and western slopes of NSW, where it is usually encountered in larger bushland remnants (BioNet, 2018b). It is a nomadic species that may occasionally occur on the Site when woodland eucalypts are in flower.
Lathamus discolor	Swift Parrot	✓	✓	✓	E	CE	Ec/Sp	Low	The Swift Parrot is a migratory species that breeds in Tasmania and winters on the mainland, where it feeds on flowering eucalypts (OEH, 2018e). On the western slopes Swift Parrots utilise Mugga Ironbark and White Box trees as nectar sources (Saunders and Tzaros, 2011). Favoured winter flowering eucalypts occur on and near the Site.
Neophema pulchella	Turquoise Parrot	-	✓	-	V	-	Ec	Nil	Extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range (OEH, 2018e). Lives on the edges of higher quality eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland (OEH, 2018e). Suitable habitat is absent from the study area.

Scientific Name	Common Name	Data Source			Conservation Status		Ecosystem and/or Credit Species[5]	Likelihood to be on Study Area	Assessment of Likelihood
		BAMC[2]	BioNet[3]	PMST[4]	BC Act	EPBC Act			
Polytelis swainsonii	Superb Parrot	✓	✓	✓	V	V	Sp	Nil	The Superb Parrot occurs in tall grassy Box-Gum Woodlands and forests on and west of the Tablelands (Blakers *et al*., 1984). There are several records of the species close to Wellington (BioNet, 2018b). Box Woodland and potentially suitable breeding and/or feeding habitat with large old growth trees having hollow limbs is present on the study area. However, the high degree of disturbance of the Site, especially the ground cover, is likely to deter this species.
Tyto novaehollandiae	Masked Owl	-	✓	-	V	-	Ec/Sp	Nil	Extends from the coast where it is most abundant to the western plains (OEH, 2018e). Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides (OEH, 2018e). Habitat on the study area is considered to be too disturbed for this species
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	✓	✓	-	V	-	Ec	Nil	The Eastern subspecies of the Brown Treecreeper is widespread through much of NSW avoiding only tall wet forests and alpine regions (OEH, 2018e) There are multiple records close to Molong (BioNet, 2018b). It favours grassy woodlands with rough-barked trees at close to natural densities, sparse shrub cover and fallen timber on the ground (OEH, 2018e). Habitat in the study areas is considered to be unsuitable.
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	✓	✓	-	V	-	Ec	Nil	The eastern sub-species of the Grey-crowned Babbler occurs in the Hunter Valley, on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald (OEH, 2018e). It inhabits open Box Woodlands on the slopes. The study area is at the eastern limits of the known distribution of the species on the upper western slopes (BioNet, 2018e) and the habitat is too disturbed to support it.
Chthonicola sagittata	Speckled Warbler	✓	✓	-	V	-	Ec	Nil	A sedentary species of natural relatively undisturbed open woodland on rocky ridges or in gullies. Recorded sparsely but widely in the surrounding region in larger blocks of remnant woodland (OEH, 2018e; BioNet, 2018b). It has been recorded nearby in the Mt. Arthur Reserve but is considered highly unlikely to utilise the Site, which is too highly disturbed.

Scientific Name	Common Name	Data Source			Conservation Status		Ecosystem and/or Credit Species[5]	Likelihood to be on Study Area	Assessment of Likelihood
		BAMC[2]	BioNet[3]	PMST[4]	BC Act	EPBC Act			
Melithreptus gularis	Black-chinned Honeyeater	-	✓	-	V	-	Ec	Nil	Recorded from the tablelands and western slopes of the Great Dividing Range in NSW to the north-west and central-west plains and the Riverina (OEH, 2018e). Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts. Tends to occur in the largest woodland patches in the landscape as birds forage over large home ranges of at least 5 hectares. Habitat is too highly disturbed on the study area for this species.
Anthochaera phrygia	Regent Honeyeater	✓	-	✓	E	E	Ec/Sp	Low	A nomadic/migratory nectar-dependent species found on flowering eucalypts, which has been recorded rarely in the region around the Site (OEH, 2018e, BioNet, 2018b). It has potential to occasionally visit the study area when Eucalypts are flowering, especially White Box.
Grantiella picta	Painted Honeyeater	-	-	✓	V	V	Ec	Nil	Inhabits Boree/ Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*), Box-Gum Woodlands and Box-Ironbark Forests (OEH, 2018e). A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Box Woodland is present, but mistletoes are scarce on the Site. There are very few records on the Central Western Slopes (BioNet, 2018a).
Daphoenositta chrysoptera	Varied Sitella	-	✓	-	V	-	Ec	Nil	Inhabits the more intact eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland (OEH 2018e). The habitat on the Site is too highly disturbed for this species.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	✓	✓	-	V	-	Ec	Nil	Found in larger blocks of woodland and dry open sclerophyll forests, usually dominated by eucalypts (Scientific Committee, 2017). Also recorded in shrublands, heathlands and regenerating forests. The understorey is typically open with sparse eucalypt saplings, acacias and other shrubs. The habitat on the Site is too highly disturbed for this species.

Scientific Name	Common Name	Data Source			Conservation Status		Ecosystem and/or Credit Species[5]	Likelihood to be on Study Area	Assessment of Likelihood
		BAMC[2]	BioNet[3]	PMST[4]	BC Act	EPBC Act			
Melanodryas cucullata cucullata	Hooded Robin (south eastern subspecies)	✓	-	-	V	-	Ec	Nil	The south-eastern subspecies of the Hooded Robin is found throughout much of inland NSW, with the exception of the extreme north-west (OEH, 2018e). It prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas and requires structurally diverse habitats with mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. There are a few records in the Wellington area (BioNet, 2018e). Site habitats are too disturbed to support this species.
Petroica boodang	Scarlet Robin	✓	-	-	V	-	Ec	Low	Breeds in high altitude eucalypt forest with an open understorey (Blakers *et al*., 1984). Juveniles disperse to more open country in autumn. There are relatively few records on the western slopes and one close to Wellington (BioNet, 2018e). It may occasionally occur on the Site in autumn and winter.
Petroica phoenicea	Flame Robin	✓	-	-	V	-	Ec	Low	The Flame Robin breeds in high altitude forests and disperses to lower more open habitats in winter. It has been recorded sparingly on the western slopes with few records near Wellington (BioNet, 2018e). It may occasionally occur on the Site.
Stagonopleura guttata	Diamond Firetail	✓	-	-	V	-	Ec	Nil	Widespread in open forest and woodland mostly on the inland side of the Great Dividing Range in eastern NSW (Blakers *et al*., 1984). Recorded widely in the region around Wellington (BioNet, 2018b). Favours open grassy woodlands. Habitat on the Site lacks the native grasses required by this species.
Dasyurus maculatus	Spotted-tailed Quoll	✓	✓	✓	V	E	Ec	Nil	Generally confined to areas of native forest and woodland where it nests in rock caves or hollow logs (Edgar, 1983). Hollow logs and caves are absent from the Site.
Phascogale tapoatafa	Brush-tailed Phascogale	✓	-	-	V	-	Sp	Nil	Prefers dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Agile climber foraging preferentially in rough barked trees of 25 cm DBH or greater. Feeds mostly on arthropods but will also eat other invertebrates, nectar and sometimes small vertebrates (OEH, 2018e). Suitable habitat is lacking on the Site.

Scientific Name	Common Name	Data Source			Conservation Status		Ecosystem and/or Credit Species[5]	Likelihood to be on Study Area	Assessment of Likelihood
		BAMC[2]	BioNet[3]	PMST[4]	BC Act	EPBC Act			
Phascolarctos cinereus	Koala	✓	✓	✓	V	V	Ec/Sp	Nil	Koalas are widespread in eastern NSW. However, there are only a few records near Wellington with scattered records further east in the timbered country around Burrendong Dam and south west in the Curumbenya Ranges (BioNet, 2018b). There is no known population recorded from the vicinity of the Site.
Petaurus norfolcensis	Squirrel Glider	✓	-	-	V	-	Sp	Nil	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range (OEH, 2018e). Prefers mixed species stands with a shrub or Acacia midstorey. Requires abundant tree hollows for refuge and nest sites. The remnant trees on the Site are too scattered, the ground cover is too disturbed and a suitable mid-storey is lacking for this species.
Petauroides volans	Greater Glider	-	-	✓	V	V	Sp	Nil	There is one record for the Greater Glider south of Wellington BioNet, 2018b). It is found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows (DoEE, 2018b). The study area lacks montane forest and abundant hollows and is unsuitable for this species.
Petrogale penicillata	Brush-tailed Rock-wallaby	-	-	✓	E	V	Sp	Nil	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north (OEH, 2018e). Extends from south-east Queensland to the Grampians in western Victoria, roughly following the line of the Great Dividing Range. Suitable habitat is absent from the study area.
Pteropus poliocephalus	Grey-headed Flying-fox	✓	✓	✓	V	V	Ec/Sp	Nil	The Grey-headed Flying Fox mostly occurs on the eastern side of the Great Dividing Range and is rarely recorded on the western slopes (OEH, 2018e). There is one record in BioNet (2018b) of a temporary roost along the Bell River at Wellington in 2012. There is a very low possibility this species would utilise the study area on rare occasions.

Scientific Name	Common Name	Data Source			Conservation Status		Ecosystem and/or Credit Species[5]	Likelihood to be on Study Area	Assessment of Likelihood
		BAMC[2]	BioNet[3]	PMST[4]	BC Act	EPBC Act			
Nyctophilus corbeni	Corben's Long-eared Bat	-	-	✓	V	V	Ec	Nil	Corben's Long-eared Bat was predicted to potentially occur on the study area by the PMST. It is predominantly a western species in NSW, the nearest records to the study area being in the Hervey Nangar Ranges and Goonoo SCA (BioNet, 2018b) which are at lower altitudes than the study area. It has not been recorded on the upper slopes and tablelands.
Chalinolobus dwyeri	Large-eared Pied Bat	-	-	✓	V	V	Sp	Nil	Large–eared pied Bat is widespread on the Central Coast and Tablelands and reaches its western distributional limit near Wellington (BioNet, 2018b). It roosts in caves, mine tunnels and the abandoned nests of Fairy Martins. The Large-eared Pied Bat forages over areas of continuous forest habitat (Greg Richards and Associates, 2000, 2005). The vegetation on the Site is likely to be too fragmented for this species.
Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat	✓	-	-	V	V	Ec/Sp	Nil	The Eastern Bentwing Bat is widespread in eastern NSW with Dubbo, where it has been recorded several times, close to the western limits of its distribution (BioNet, 2018b). It roosts in caves and man-made structures such as mines and storm water drains and forages in wooded areas, flying above the tree tops (OEH, 2018e). Roosting and foraging habitat are absent from the study area.

[1] Ec=Ecosystem Credit Species; Sp=Species Credit Species
[2] Biodiversity Assessment Method Credit Calculator (OEH, 2018d)
[3] NSW Atlas of Wildlife (BioNet, 2018b)
[4] Protected Matters Search Tool (DoEE, 2018a)
[5] *BioNet Threatened Species Profile Database* (OEH, 2018c)
[6] NSW *Fisheries Management Act 1994.*
E Endangered; CE Critically Endangered; V Vulnerable.

2.4.3 Habitat Features of the Site

In assessing the suitability of the habitat on the Site for threatened biodiversity, the following attributes of the Site were considered;

- The native vegetation being assessed comprises two small linear plantings of native eucalypts, most of which are not endemic to the location, and two long narrow roadside strips of native grassland.
- The choice of PCT266 as a description of the vegetation was made to enable the BAMC to run. The plantings clearly are not remnants of PCT266, which is considered likely to have been the dominant PCT on the Site pre-European settlement.
- The plantings cover very small areas totalling 0.4 ha and, as such, are highly unlikely to support a population of a threatened species. Their values for threatened species are most likely as stepping stones for fauna moving through the landscape, or for short term foraging of wide ranging nomadic species.
- The plantings all have very large perimeter to area ratios, being long, narrow and only two trees wide.
- All the plantings lack a mid-storey; the ground cover is very sparse or absent and comprises mainly exotic species. The surrounds of the plantings are entirely cultivation paddocks supporting wheat, canola or lucerne crops.
- The native grassland comprises large tussock grasses that may provide cover in its undisturbed state for wildlife that forages or nests on the ground. However, it had been heavily grazed by livestock at the time of inspection with the tussocks chewed down and separated by bare ground.

2.4.4 Ecosystem Credit Species

No flora species returned by BAMC were ecosystem credit species. Of the 17 ecosystem credit fauna species listed by BAMC, six are considered to have potential foraging habitat on the Site (Table 11).

Table 11. Ecosystem Credit Fauna Potentially Able to Utilise the Site.

Common Name	Scientific Name	Likelihood of Occurrence
Little Eagle	*Hieraaetus morphnoides*	Moderate
Little Lorikeet	*Glossopsitta pulchella*	Low
Swift Parrot	*Lathamus discolor*	Low
Regent Honeyeater	*Anthochaera phrygia*	Low
Scarlet Robin	*Petroica boodang*	Low
Flame Robin	*Petroica phoenicea*	Low

The species in Table 11 are only likely to utilise the site rarely to occasionally as nomadic foraging visitors.

2.4.5 Habitat Features for Species Credit Species

The BAMC identifies specific habitat features essential to particular species credit species and the BAM (OEH, 2017a) requires the assessor to determine if those habitat features occur on the site. The BDAR footprint lacks habitat features identified in the *BioNet Threatened Biodiversity Profile Database* (OEH, 2018c) that are critical for many threatened species, including:

- Burrows
- Caves
- Cliffs
- Claypans
- Dunes
- Epiphytes
- Escarpments
- Rocky areas (except for man-made rock piles in some paddocks that may shelter some reptiles)
- Fallen and standing dead timber (except for two isolated standing dead trees)
- Swamps
- Termite mounds

Important specific habitat features that are present on the Site are:

- Hollow-bearing trees (totalling 85 scattered paddock trees [Table 8, Figure 7])
- Semi-permanent / ephemeral wet areas (including first and second order streams [Figure 5])
- Waterbodies (including small farm dams)

Given the attributes of the native vegetation (section 2.3.3) and the specific site characteristics (section 2.3.5), very few of the candidate threatened species are likely to utilise the area and those that do would utilise it rarely. This is reflected in the very low number of candidate species in Tables 9 and 10 that are considered likely to utilise the Site.

2.4.6 Species Credit Species

The seven candidate threatened flora species identified by BAMC are all species credit species and none are considered to have any likelihood of occurring on the Site (Table 10). Accordingly, all have been excluded from further consideration in BAMC.

Only three of the threatened species credit fauna species are considered to have some likelihood of utilising the site, the Little Eagle, Swift Parrot and the Regent Honeyeater (Table 10). However, none are likely to breed on the Site and are therefore excluded from further consideration as species credit species but remain as ecosystem credit species. Sixteen other threatened species credit fauna species have also been excluded for further assessment owing to lack of suitable habitat on the Site (Table 10).

2.4.7 Targeted Surveys for Threatened Species

The BAM (OEH, 2017a) requires targeted surveys only for threatened species that are species credit species because ecosystem credit species are predicted to occur based solely on habitat.

All candidate threatened flora listed by BAMC are species credit species, therefore, targeted surveys may be required. However, the assessment applied in Table 9 determined that habitat does not exist on the Site for any of these species so that survey and further consideration in the calculator is unnecessary.

Of the candidate threatened species credit fauna species listed by BAMC, three, the Vulnerable Little Eagle, the Endangered (BC Act) / Critically Endangered (EPBC Act) Swift Parrot and the Critically Endangered Regent Honeyeater (*Anthochaera phrygia*), are considered to have a low probability of utilising the Site. The Little Eagle is unlikely to find the intensively cropped and heavily grazed paddocks attractive, while the Swift Parrot and Regent Honeyeater are both nomadic species that seek out

flowering eucalypts to feed on nectar and may occasionally utilise the Site during a high nectar flow event. None of the species would be able to breed on the Site. Accordingly, they are not regarded as species credit species for this assessment and do not require targeted surveys.

2.4.8 Threatened Species Listed under the EPBC Act

Two fauna species listed as Critically Endangered under the EPBC Act are considered to have a low probability of utilising the Site; the Swift Parrot and the Regent Honeyeater (Table 10). Both are nomadic species that are only likely to use the Site occasionally, if at all, for foraging when eucalypts are in flower. The Site is unsuitable for breeding by the Regent Honeyeater and the Swift Parrot is a winter migrant to the mainland, breeding only in Tasmania. Potential food resources on the Site are limited to scattered mature White Box trees and small plantings of mixed eucalypts. These trees are unlikely to be attractive to either species given their isolation and the preference of both birds for intact woodland and forest habitats. Accordingly, the loss of these trees is highly unlikely to result in a significant adverse impact on either species and referral of the Project to the DoEE is not required.

2.4.9 SEPP 44

NSW SEPP 44 aims to protect habitat utilised by the Koala, *Phascolarctos cinereus*, which is known to occur sparsely on the Central West Slopes, mainly in forested habitats (BioNet, 2018b). Two of the remnant eucalypt species on and around the Subject Land are recognised as secondary Koala food trees (OEH, 2018h), viz. Yellow Box and White Box. The last of these is listed as a Koala feed tree in Schedule 2 of SEPP 44. Accordingly, there is a requirement under SEPP 44 for consideration of the Site as potential Koala habitat. The Site does not have an extant Koala population (Biosphere Environmental Consultants, 2018). Therefore, it does not include ‘core’ Koala habitat and a SEPP 44 plan of management is not required.

3 STAGE 2 – IMPACT ASSESSMENT

Stage 2 involves assessing the potential direct and indirect impacts on biodiversity, describing impact avoidance and mitigation measures and determining the offset requirements.

3.1 MEASURES TO AVOID AND MINIMISE IMPACTS

Measures to avoid and minimise Project impacts on biodiversity are summarised in this section and Table 13.

3.1.1 Impact Avoidance

Impact avoidance measures that have been, or would be implemented for the Project include;

- The project has been positioned in the landscape to avoid significant patches of remnant vegetation on the Subject land, in particular;
  - the semi-cleared woodland east of Paddocks 1 and 2 (Figure 3), and
  - the denser areas of eucalypt woodland surrounded by paddocks 8, 10 and 13 that would be developed (Figure 3).
- Avoidance of the dense three hectare patch of mature Yellow Box Woodland in the north west corner of Paddock 5.
- Avoidance of damage to the mature eucalypts on the verges of Seatonville Road during road upgrade operations.

3.1.2 Vegetation Removal Strategy

A vegetation removal strategy will be prepared to establish measures that will ensure that harm is minimised to wildlife that may be inhabiting hollows in the 85 hollow-bearing trees that are proposed for removal. This will include timing of tree removal outside the nesting season of birds and mammals where possible, i.e. removal in autumn/winter rather than spring and summer, and supervision of the clearance by a qualified animal carer;

3.1.3 Weed Management Strategy

A weed management strategy will be developed to prevent unwanted plants from becoming established in and around the solar farm. Several weed control measures will be employed, including regular site inspections, communication with lessees and authorities and annual control of weeds.

3.1.4 Animal Pest Management and Monitoring

A number of animal pest management and monitoring procedures would be established, including the following:

- the maintenance of a clean, rubbish-free environment in order to discourage scavenging and reduce the potential for colonisation by non-endemic fauna (e.g. introduced rodents, predators and birds);
- monitoring for feral animals (including pigs, foxes, dogs, rabbits) every two years;
- undertaking pest animal control where necessary;
- domestic pets prohibited in the solar farm; and
- employees and contractors not permitted to encourage fauna through feeding.

3.1.5 Rehabilitation

At the completion of the life of the solar farm after 25 years, the site will either be refurbished or be dismantled and rehabilitated to arable agricultural land.

3.1.6 Summary of Avoidance and Mitigation Actions

Table 12 summarises avoidance and mitigation actions with expected outcomes, timing and management responsibility.

Table 12. Avoidance and Minimisation Measures, Responsibility and Timing.

Action	Outcome	Timing	Responsibility
During Construction			
1. Place barriers to protect remnant Yellow Box Woodland in Paddock 5 2. Inform all employees and contractors during inductions of trees not to be damaged.	No damage to trees earmarked for protection and retention.	Throughout construction phase.	Site manager
Removal of hollow-bearing paddock trees supervised by trained wildlife carer.	Harm to hollow-dwelling wildlife minimised during tree falling. Injured wildlife cared for and recovered. Displaced wildlife released into appropriate habitat nearby.	During paddock clearing operations, which should be conducted in the non-breeding season (autumn and winter).	Environmental manager or site manager.
During Solar Farm Operation			
Weed management	Priority Weeds, Weeds of National Significance and Hight Threat Exotic weeds controlled.	Annual inspections and control as required.	Environmental manager
Pest Animal Management: Monitoring and control, Maintain site cleanliness	Pest animals, especially rodents, foxes, rabbits, wild dogs, feral cats and pigs controlled.	Every two years, or as needed.	Environmental manager / site manager.
Domestic pets prohibited. Staff and contractors informed during inductions.	No harassment of wildlife or livestock.	Ongoing	Site manager.
Site closure			
Preparation of a site rehabilitation plan	All solar farm infrastructure removed. Land left in a suitable state for resumption of farming.	At least two years prior to shut down	Site manager / environmental manager.

3.2 SUMMARY OF PROJECT IMPACTS ON BIODIVERSITY

3.2.1 Serious and Irreversible Impacts

No threatened ecological communities, populations, flora or fauna species meet the criteria for Serious and Irreversible Impacts as a result of the Project (OEH, 2018f) (sections 2.2 and 2.3).

3.2.2 Vegetation Clearance Requiring Offsetting

The following native vegetation on the Site would be impacted adversely by the Project;

- Loss of 0.4 ha of eucalypt plantings which are assumed to represent PCT266 for the purposes of running BAMC.
- Loss of 0.8 ha of native grassland derived from the historical clearance of PCT266 in Bakers Lane.
- Loss of 109 remnant paddock trees, 85 of which are hollow-bearing.

3.2.3 Vegetation Clearance Not Requiring Assessment or Offsetting

All other vegetation on the site comprises mainly planted crops and some exotic-dominated ground cover on paddock margins which does not require assessment or offsetting.

3.2.4 Species Credit Species

No impacts on species credit species are expected.

3.2.5 Cumulative Impacts

The cumulative impacts of the project on remnant native vegetation loss are negligible whether derived grassland or plantings of native windbreak trees are considered (Table 13).

Table 13. Cumulative Losses of Native Vegetation in Affected Mitchell Landscapes.

Mitchell Landscape	Area of Landscape (ha)	Percent Cleared	Project Clearance (ha)	Additional Clearance (%)
Mullion Slopes	248,936	93	0.8 (derived grassland) 0.4 (plantings)	0.5×10^{-3}
Macquarie Alluvial Plains	348,198	78	0	0

The loss of 109 mature paddock trees represents a loss of habitat for native species adapted to agricultural landscapes. Although many similar trees remain in the surrounds and further afield, they are not being replaced and are gradually diminishing in the landscape. Over time this will affect the abundance of many common native species dependent on these kinds of trees. This trend would be ameliorated on the Site by plantings of native trees and shrubs as visual screens around the Site perimeter and for landscaping around infrastructure.

3.3 BIODIVERSITY CREDIT REPORT

3.3.1 BAM Assessment Number

The Assessment Identification Number within the BAM online calculator is 00011553/BAAS180848/18/00011555.

3.3.2 Credits for Removal of Plantings and Derived Native Grassland

The biodiversity credit report output from the BAMC for clearance of the blocks of planted trees and the derived native grassland is provided at Attachment 3. The credit report indicates that the total area of native vegetation (1.2 ha) to be removed from the Site is valued at 21 credits.

3.3.3 Credits for Paddock Tree Removal

The number of native paddock trees on the Site is summarised by species, size (DBH) and the presence of hollows in Table 6. The locations of the trees are shown on Figures 7 and 8. Table 14 presents this data in the form required for use in the *Streamlined Assessment Module – Clearing of Paddock Trees* in the BAM (Appendix 1, OEH [2017a]), which values the paddock trees at 103.25 credits.

Table 14. Paddock Trees Assigned to Classes

	Class 1	Class 2	Class 3
Size range	≤20cm DBH	≥20 cm & ≤50cm DBH	≥50cm DBH
No. of trees without hollows	0	4	21
No. of trees with hollows	0	1	84
No. of ecosystem credits[1]	0	3.5	99.75

[1] Calculated according to Table 12, Appendix 1 of the BAM (OEH, 2017a).

The most likely PCT to which the remnant paddock trees formerly belonged is PCT266; *White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion* (Table 2). This PCT is also assumed for the farm plantings and derived native grassland. Accordingly, the remnant paddock trees, farm plantings and derived native grassland are valued at the same rate per credit.

3.3.4 Credit summary

Table 15 summarises the combined credit liability for clearance of the native plantings, roadside woodland, remnant paddock trees and isolated roadside trees.

Table 15. Combined Biodiversity Credits Summary.

IBRA sub-region	PCT common name	No. of ecosystem credits
Plantings and Derived Grassland (ex BAMC credit report)		
Upper Slopes	*White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion*	21
Paddock trees (ex paddock tree calculator)		
Upper Slopes	*White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion*	103.25
Total credits		124.25

4 REFERENCES

Anstis, M. 2002. "Tadpoles of South-eastern Australia, a guide with keys" New Holland Press, French's Forest.

Benshemesh, J. (2007). *National Recovery Plan for Malleefowl.* Department for Environment and Heritage, South Australia.

BioNet (2018a). *BioNet Vegetation Classification*. NSW Office of Environment and Heritage, Sydney. Web address: www.environment.nsw.gov.au/research/Visclassification.htm/. Accessed: July 2018.

BioNet (2018b). *NSW BioNet*. NSW Office of Environment and Heritage, Sydney. Web address: www.bionet.nsw.gov.au/. Accessed: July 2018.

Biosphere Environmental Consultants (2018). *Maryvale Solar Farm: Fauna Survey and Assessment.* Report to Pitt and Sherry Pty. Ltd. (Attachment 1 to this report).

Blakers, M., Davies, S.J.J.F. and Reilly, P.N. (1984). *The Atlas of Australian Birds.* Royal Australasian Ornithologists Union. Melbourne University Press.

DEH (2006). *White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands*. EPBC Act Policy Statement. Department of the Environment and Heritage, Canberra.

DoEE (2018a). *Protected Matters Search Tool*. Website: https://www.environment.gov.au/epbc/protected-matters-search-tool. (Accessed: January 2018). Commonwealth Department of Environment and Energy, Canberra.

DoEE (2018b). *Species Profile and Threats Database*. Website: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl (Accessed: January 2018). Commonwealth Department of Environment and Energy, Canberra.

DPI (2018). *NSW Weedwise.* Webpage: http://weeds.dpi.nsw.gov.au/ (Accessed: July 2018). NSW Department of Primary Industries, Sydney.

Edgar, R. (1983). Spotted-tailed Quoll. In Strahan, R. (Ed.). *The Australian Museum Complete Book of Australian Mammals*. The Photographic Index of Australian Wildlife. Angus & Robertson Publishers, Sydney.

Greg Richards and Associates (2000). *An Assessment of the Bat Fauna in Infrastructure Zones at the Ridgeway Mining Project, Central New South Wales*. Appendix K in Cadia Holdings Pty Limited (2000) *Ridgeway Project Environmental Impact Statement*.

Greg Richards and Associates (2005). *Cadia East Study Area Bat Fauna Assessment*. Report to Cadia Holdings Pty Limited.

OEH (2017a). *Biodiversity Assessment Method.* NSW Office of Environment and Heritage, Sydney.

OEH (2017b). *Draft guidance and criteria to assist a decision maker to determine a serious and irreversible impact.* NSW Office of Environment and Heritage, Sydney.

OEH (2018a). *Description of NSW (Mitchell) Landscapes. Version 2 (2002).* Webpage: http://www.environment.nsw.gov.au/resources/conservation/landscapesdescriptions.pdf Accessed: July 2018. NSW Office of Environment and Heritage, Hurstville.

OEH (2018b). *Over-cleared Landscapes Database.* Webpage: https://www.environment.nsw.gov.au/asmslightprofileapp/account/login?ReturnUrl=%2fAtlasApp%2fDefault.aspx. Accessed: July 2018. NSW Office of Environment and Heritage, Sydney.

OEH (2018c). *BioNet Threatened Species Profiles Database.* Webpage: http://www.environment.nsw.gov.au/resources/conservation/landscapesdescriptions.pdf Accessed: July 2018. NSW Office of Environment and Heritage, Hurstville.

OEH (2018d). *Biodiversity Assessment Calculator*. Webpage: https://www.lmbc.nsw.gov.au/bamcalc. Accessed: July 2018. NSW Office of Environment and Heritage, Hurstville.

OEH (2018e). *Threatened species, populations & ecological communities of NSW*. Website: http://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species (Accessed: July 2018). NSW Office of Environment and Heritage, Sydney.

OEH (2018f). *Guidance to assist a decision-maker to determine a serious and irreversible impact.* Webpage: http://www.environment.nsw.gov.au/resources/bcact/guidance-decision-makers-determine-serious-irreversible-impact-170204.pdf. Accessed: July 2018. NSW Office of Environment and Heritage, Sydney.

OEH (2018g). *High Threat Weeds List.* Webpage: www.lmbc.nsw.gov.au/bamcalc. Accessed: July 2018. NSW Office of Environment and Heritage, Sydney.

OEH (2018h). *Koala habitat and feed trees.* Web page: http://www.environment.nsw.gov.au/topics/animals-and-plants/native-animals/native-animal-facts/koala/koala-habitat. (Accessed: July 2018). NSW Office of Environment and Heritage, Sydney

Olsen, P. (1995). *Australian Birds of Prey.* University of New South Wales Press, Sydney.

Saunders, D.L. & Tzaros, C.L. (2011). *National Recovery Plan for the Swift Parrot* (Lathamus discolor). Birds Australia, Melbourne. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-swift-parrot-lathamus-discolor. Accessed: July 2018.

Scientific Committee (2017). *Dusky Woodswallow, Artamus cyanopterus cyanopterus – vulnerable species listing.* Webpage: http://www.environment.nsw.gov.au/resources/threatenedspecies/determinations/FDDuskWoodVS.pdf (Accessed: July 2018). NSW Office of Environment and Heritage, Sydney.

Thackway, R. and Cresswell, I.D. (eds) (1995). An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves. Version 4.0. Australian Nature Conservation Agency: Canberra.

ATTACHMENT 1

Flora Species Lists

	Sample No.	Q1	Q2	RAS1	RAS2	RAS3	RAS4	RAS5	RAS6	RAS7	Opp.
Scientific Name	**Common Name**	Cover	Cover								
CLASS CONIFEROPSIDA											
Cupressaceae											
Callitris glaucophylla	White Cypress Pine								r		
CLASS MAGNOLIOPSIDA											
SUBCLASS MAGNOLIIDAE											
Aizoaceae											
Zaleya galericulata	Hogweed		0.1								
Amaranthaceae											
**Alternanthera pungens*	Khaki Weed	0.2	0.1								
**Amaranthus sp.*		0.1									
Asteraceae											
**Bidens subalternans*	Greater Beggar's Ticks								c	c	
**Carduus tenuiflorus*	Winged Slender Thistle			o							
**Carthamus lanatus*	Saffron Thistle			c	●	u	u				
**Centaurea calcitrapa*	Star Thistle		0.1								
**Centaurea melitensis*	Maltese Cockspur					a	a	o	c		
**Chondrilla juncea*	Skeleton Weed	0.1	0.1	u		c	c	o			
**Cirsium vulgare*	Spear Thistle		0.1								
**Conyza bonariensis*	Flaxleaf Fleabane						c				
**Conyza sp.*						o					
**Lactuca serriola*	Prickly Lettuce	0.1	0.1	o			c	o	o	u	
Pseudognaphalium luteoalbum	Jersey Cudweed			r							
**Silybum marianum*	Variegated Thistle	1	0.2		●		r			c	
**Sonchus oleraceus*	Common Sowthistle	0.2		o							
Vittadinia sp.						u					
**Xanthium spinosum*	Bathurst Burr	0.1	0.1		●						
Boraginaceae											
**Echium plantagineum*	Paterson's Curse					r				u	
**Heliotropium europaeum*	Potato Weed			c							
Brassicaceae											
**Capsella bursa-pastoris*	Shepherd's Purse			r							

	Sample No.	Q1	Q2	RAS1	RAS2	RAS3	RAS4	RAS5	RAS6	RAS7	Opp.
Scientific Name	**Common Name**	Cover	Cover								
**Hirschfeldia incana*	Hairy Brassica	0.1	0.2	o	●		r				
**Lepidium africanum*										r	
**Sisymbrium* sp.										r	
Campanulaceae											
Wahlenbergia communis	Tufted Bluebell			o		o					
Caryophyllaceae											
**Petrorhagia nanteuilii*				r							
**Polycarpon tetraphyllum*	Four-leaved Allseed			r							
Chenopodiaceae											
Einadia nutans	Climbing Saltbush	5	0.7								
Maireana enchylaenoides	Wingless Bluebush	0.1	0.1							r	
Maireana microphylla	Small-leaf Bluebush					r			r		
Convolvulaceae											
**Convolvulus arvensis*					●						
Convolvulus graminetinus							r		r		
Euphorbiaceae											
Euphorbia dallachyana	Mat Spurge			r							
Fabaceae: Caesalpinioideae											
Senna barclayana	Smooth Senna		0.1		●	●			r	r	
Fabaceae: Faboideae											
Glycine clandestina						u					
**Medicago sativa*	Lucerne	0.1	0.1	a		r	u	u	r	o	
**Trifolium arvense*	Haresfoot Clover			c							
**Trifolium glomeratum*	Clustered Clover			r							
**Trifolium subterraneum*	Subterranean Clover			r							
Geraniaceae											
Geranium solanderi	Native Geranium			r							
Geranium sp.						c	o				
Hypericaceae											
**Hypericum perforatum*	St. Johns Wort			c							
Lamiaceae											

	Sample No.	Q1	Q2	RAS1	RAS2	RAS3	RAS4	RAS5	RAS6	RAS7	Opp.
Scientific Name	**Common Name**	Cover	Cover								
**Marrubium vulgare*	White Horehound	2	3		●				o	u	
**Salvia verbenaca*	Vervain	0.1	0.1	r	●	o	r	u	o		
Malvaceae											
**Malva parviflora*	Small-flowered Mallow			u							
**Sida corrugata*	Corrugated Sida		0.1	r	●						
Myrtaceae											
Eucalyptus camaldulensis	River Red Gum										●
Eucalyptus melliodora	Yellow Box	40	30								
Eucalyptus microcarpa	Grey Box	1									
Eucalyptus sideroxylon	Mugga Ironbark										●
Eucalyptus sp.											●
Nyctaginaceae											
Boerhavia dominii	Tarvine	0.1		r							
Onagraceae											
Epilobium billardiereanum						r					
Oxalidaceae											
Oxalis perennans	A Woodsorrel	0.1	0.1								
Papaveraceae											
**Argemone ochroleuca*	Mexican Poppy			o							
**Fumaria* sp.	Fumitory			c							
Plantaginaceae											
**Kickxia elatine*	Pointed Toadflax			u							
Polygonaceae											
Rumex brownii	Swamp Dock	0.1	0.1			o			r	u	
**Rumex crispus*	Curled Dock									o	
Portulacaceae											
Portulaca oleracea	Pigweed						r				
Scrophulariaceae											
**Verbascum virgatum*	Twiggy Mullein					o					
Solanaceae											
**Lycium ferocissimum*	African Boxthorn	1	2								

	Sample No.	Q1	Q2	RAS1	RAS2	RAS3	RAS4	RAS5	RAS6	RAS7	Opp.
Scientific Name	**Common Name**	Cover	Cover								
Solanum americanum	Glossy Nightshade	0.2	0.1								
Urticaceae											
**Urtica urens*	Small Nettle	0.5	0.1								
Verbenaceae											
**Verbena rigida*	Veined Verbena		0.4			u					
Zygophyllaceae											
**Tribulus terrestris*	Caltrop			c	●						
SUBCLASS LILIIDAE											
Cyperaceae											
Carex inversa						u					
Lomandraceae											
Lomandra filiformis subsp. *filiformis*	Wattle mat-rush								o	u	
Phormiaceae											
Dianella longifolia	Blueberry Lily								r		
Poaceae											
Aristida personata	Purple Wire-grass				●	c		c	c	o	
Aristida sp.					●						
Austrostipa aristiglumis	Plains Grass		0.2			u	c		u	c	
Austrostipa bigeniculata					●						
Austrostipa scabra	Speargrass					r					
**Avena fatua*	Wild Oats			a							
**Avena* sp.						a				o	
Bothriochloa biloba						c	c	u	u	o	
Bothriochloa macra	Red Grass		0.1								
**Bromus catharticus*	Prairie Grass	0.1	0.1								
**Bromus diandrus*	Great Brome	2	10	u	●						
Chloris truncata	Windmill Grass			r							
Cynodon dactylon	Couch				●						
Dichanthium sericeum	Queensland Bluegrass				●	o					
Digitaria brownii	Cotton Panic Grass					c	o				
Digitaria sp.									u		

	Sample No.	Q1	Q2	RAS1	RAS2	RAS3	RAS4	RAS5	RAS6	RAS7	Opp.
Scientific Name	**Common Name**	Cover	Cover								
Echinochloa colona	Awnless Barnyard Grass			u		c	c				
Eragrostis alveiformis						r					
**Eragrostis cilianensis*	Stinkgrass			u							
**Hordeum leporinum*	Barley Grass	0.1		r	●						
**Lolium perenne*	Perennial Ryegrass			a							
**Lolium rigidum*	Wimmera Ryegrass					r					
Panicum effusum	Hairy Panic					r					
Paspalidium distans		0.1	0.1				u				
**Paspalum dilatatum*	Paspalum		0.1	r	●	u		a		a	
Rytidosperma caespitosum	Ringed Wallaby Grass			o							
Rytidosperma sp.						u					
Sporobolus caroli	Fairy Grass				●						
Sporobolus creber	Western Rat-tail Grass					r					
Themeda triandra	Kangaroo Grass					u					
**Triticum aestivum*	Common Wheat			r							
No. Native Species	**48**										
No. Introduced Species	**53**										
Total Species	**101**										

* = Introduced Species
Opp. = Opportunistically observed
Q = BAM Quadrat
RAS = Rapid Assessment Sample
a = abundant
c = common
o = occasional
u = uncommon
r = rare
● = present

ATTACHMENT 2

Fauna Species Observed on the Study Area

(Biosphere Environmental Consultants Pty. Ltd.)

Class	Common Name	Scientific Name	TSC Act	EPBC Act
Mammalia	House Mouse	*Mus musculus*	I	-
	Rabbit	*Oryctalagus cuniculus*	I	-
	Fox	*Vulpes vulpes*	I	-
	Eastern Grey Kangaroo	*Macropus giganteus*	P	-
Aves	Black-shouldered Kite	*Elanus axillarus*	P	-
	Magpie	*Cracticus tibicens*	P	-
	Grey Butcherbird	*Cracticus torquatus*	P	-
	Australian Raven	*Corvus coronoides*	P	-
	Crested Pigeon	*Ocyphaps lophotes*	P	-
	Eastern Rosella	*Platycercus exemius*	P	-
	Sulphur-crested Cockatoo	*Cacatua galerita*	P	-
	Galah	*Eolophus rosiecapilla*	P	-
	Noisy Miner	*Manorina melanocephala*	P	-
	Welcome Swallow	*Hirundo neoxena*	P	-
	Common Starling	*Sturnus vulgaris*	I	-
	Australasian Reed-warbler	*Acrocephalis australis*	P	-
Reptiles	Variegated Gecko	*Gehyra variegata*	P	-
	Inland Snake-eyed Skink	*Cryptoblepharus pannosus*	P	-
	Garden Skink	*Lampropholis delicata*	P	-
	Tree Skink	*Egernia striolata*	P	-
	Boulanger's Skink	*Morethia boulangeri*	P	-
Frogs	Common Eastern Froglet	*Crinia signifera*	P	-
			P	-
Fish	Nil	-		

P = Protected, I = Introduced.

ATTACHMENT 3

BAM Credit Summary Report