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Powering a Sustainable Future

Biodiversity Development Assessment Report

Walla Walla Solar Farm

March 2022

Project Number: 21-200





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ABN 31 124 444 622 ACN 124 444 622

Document verification

Project Title:	Walla Walla Solar Farm
Project Number:	21-200
Project File Name:	Walla Walla_BDAR_FinalV1.5

Revision	Date	Prepared by	Reviewed by	Approved by
Draft	1/07/19	Julie Gooding (BAAS18074) Bridgette Poulton	Aleksei Atkin (BAAS17093)	Aleksei Atkin (BAAS17093)
Draft 1.1	18/09/19	J. Gooding (BAAS18074)	Mitch Palmer (BAAS17051)	Mitch Palmer (BAAS17051)
Final 1.1	27/09/19	Julie Gooding (BAAS18074) Bridgette Poulton	Mitch Palmer (BAAS17051)	Mitch Palmer (BAAS17051)
Final 1.2	19/02/2020	Aleksei Atkin (BAAS17093) Bridgette Poulton	Mitch Palmer (BAAS17051)	Mitch Palmer (BAAS17051)
Final 1.3	25/05/2020	Aleksei Atkin (BAAS17093) Bridgette Poulton	Mitch Palmer (BAAS17051)	Mitch Palmer (BAAS17051)
Final 1.4	26/05/2020	Aleksei Atkin (BAAS17093) Bridgette Poulton	Mitch Palmer (BAAS17051)	Mitch Palmer (BAAS17051)
Final v1.5	28/02/2022	J. Gooding (BAAS18074) J. Russo Amendment to development footprint	Michelle Patrick (BAAS 19078)	Michelle Patrick (BAAS 19078)

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Accredited Assessor Quality Control

I, Julie Gooding (BAAS18074) certify that this Biodiversity Development Assessment Report has been prepared on the basis of the requirements of, and information provided under the Biodiversity Assessment Methodology as of 18/03/2022. The associated cases (00029035/BAAS18074/21/00029036 and 00029035/BAAS18074/22/00031078) within the BAM Calculator have been finalised on 18/03/2022 and submitted.

Name	Role	Qualifications	Signature
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This BDAR version 1.5 involves an update to the development footprint to include additional areas of non-native vegetation, impacts to one additional scattered tree and an additional creek crossing over Back Creek impacting PCT 5. Additional targeted surveys were also undertaken for species credits species.



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Acronyms and abbreviations

BAM	Biodiversity Assessment Methodology
BC Act	<i>Biodiversity Conservation Act 2016</i> (NSW)
BDAR	Biodiversity Development Assessment Report
Biosecurity Act	<i>Biosecurity Act 2015</i>
BOM	Australian Bureau of Meteorology
CEEC	Critically endangered ecological communities
CEMP	Construction environmental management plan
Cwth	Commonwealth
DBH	Diameter at Breast Height
EEC	Endangered ecological community
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwth)
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
GHG	Greenhouse gases
ha	Hectares
HBT	Hollow-bearing trees
IBRA	Interim Biogeographic Regionalisation of Australia
ISEPP	<i>State Environmental Planning Policy (Infrastructure) 2007</i> (NSW)
km	Kilometres
LEP	Local Environment Plan
LRET	Large-scale renewable energy target
m	Metres
MNES	Matters of National environmental significance under the EPBC Act (<i>c.f.</i>)
MW	Megawatt
NSW	New South Wales
OEH	(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water
PV	Photovoltaic
SaII	Serious and Irreversible Impact
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy (NSW)
sp/spp	Species/multiple species
SSD	State Significant Development

TEC	Threatened Ecological Community
VIS	Vegetation Integrity Score

Executive summary

FRV Services Australia (FRV) is proposing to construct a 300 megawatt (MW) alternating current (AC) photovoltaic solar farm northeast of Walla Walla, NSW. The proposal would develop around 438 hectares (ha) of the 605ha development site. This Biodiversity Development Assessment Report (BDAR) has been prepared by NGH on behalf of the proponent, FRV.

- The aim of this BDAR is to address the biodiversity matters raised in the Secretary's Environmental Assessment Requirements (SEARs) and to address the requirements of the *Biodiversity Conservation Act 2016* (NSW) (BC Act) and the Environmental Protection and *Biodiversity Conservation Act 1999* (Cwth) (EPBC Act). This BDAR forms part of an Environmental Impact Statement (EIS) for the State Significant Development (SSD), prepared under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Biodiversity Assessment Methodology (BAM) is the required assessment methodology for SSDs that trigger the NSW Biodiversity Offsets Scheme under the BC Act. This report follows the field work methodologies and assessment required by the BAM. This Version 1.5 involves an update to the development footprint to include additional areas of non-native vegetation, impacts to one additional scattered tree and an additional creek crossing over Back Creek.

Comprehensive mapping and field surveys were completed in accordance with the requirements of the BAM. The majority of the development site has been cleared of native vegetation, and cultivated for agriculture, which is the dominant land use in the area. Approximately 505ha of the development site is comprised of exotic vegetation in the form of exotic pastures and crops. Approximately 100ha of native vegetation occurs in the development site, comprised of scattered isolated patches of remnant woodland, paddock trees and derived grassland. The native vegetation is comprised of four Plant Community Types (PCTS). These are:

- PCT 5 – River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the Eastern Riverina Bioregion.
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.
- PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.
- PCT 278 - Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South Western Slopes Bioregion.
- PCT 76 is listed as Endangered under the BC Act as it forms part of the TEC - Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregion.
- PCT 277 and PCT 278 form part of the Endangered Ecological Community (EEC): White Box-Yellow Box-Blakely's Red Gum woodland under the BC Act. These communities within the development site do not meet the criteria for the federally listed EEC, due to having a very degraded understory dominated by exotic annual grasses.

Consideration has been given to avoiding and minimising impacts to native vegetation throughout each phase of the proposal. Site design options have been assessed against key environmental, social and economic criteria. Larger patches of remnant woodland and creek lines have been

avoided by the development footprint. Mitigation and management measures would be put in place to adequately address impacts associated with the proposal, both direct and indirect.

For biodiversity impacts that are unavoidable, the proposal would require the removal of:

- 0.18ha of PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
- 15.66ha of PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
- 11.47ha of PCT 76 – Derived Grassland of western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
- 2.54ha of PCT 5 – River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the Eastern Riverina Bioregion
- 0.11ha of PCT 278 - Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South Western Slopes Bioregion

The removal of this native vegetation generated the following ecosystem credits:

- PCT 5 – River Red Gum herbaceous-grassy very tall open forest wetland – 28 credits
- PCT 76 – Western Grey Box tall grassy woodland – 268 credits
- PCT 278 - Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest – 3 credits
- PCT 277 was not required to be offset as the vegetation condition was low and fell below the threshold of requiring an offset.

The removal of 47 scattered paddock trees generated the following credits

- PCT 5 – River Red Gum herbaceous-grassy very tall open forest wetland – 2 credits.
- PCT 76 – Western Grey Box tall grassy woodland – 30 credits.
- PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland - 13 credits.

Two ecosystem species, Flame Robin (*Petroica phoenica*) and Brown Treecreeper (*Climacteris picumnus*) listed as vulnerable under the BC Act, were detected during the site surveys. These species are accounted for in the ecosystem credit requirement.

Targeted surveys were undertaken for 25 candidate credit species. Two credit species, the Squirrel Glider (*Petaurus norfolcensis*) and Southern Myotis (*Myotis macropus*) were detected within the development site. No other candidate credit species were detected from the site surveys.

The removal of suitable habitat relating to these threatened species credit species generated the following species credits.

- Squirrel Glider (*Petaurus norfolcensis*)- 184 credits
- Southern Myotis (*Myotis Macropus*) – 100 credits.

The retirement of the credits generated will be carried out in accordance with the NSW Biodiversity Offsets Scheme under the BC Act. With the retirement of credits and effective implementation of the mitigation measures, the proposal would be consistent with the requirements of the BAM.

1. Introduction

The Walla Walla Solar Farm proposal is classified as State Significant Development (SSD) under the State and Regional Development State Environmental Planning Policy (SEPP) and therefore a 'major project'. This Biodiversity Development Assessment Report (BDAR) assesses the impacts of the proposed Walla Walla Solar Farm (the proposal) according to the NSW Biodiversity Assessment Methodology (BAM) as required by the Secretary's Environmental Assessment Requirements (SEARs) for the proposal. NGH Environmental has prepared this report on behalf of the proponent, FRV Services Australia (FRV).

The following terms are used in this document:

- **Development footprint** – The area of land that is directly impacted on by the proposal. Including, solar array design, perimeter fence, Asset Protection Zones (APZ), access roads, transmission line footprint and areas used to store construction materials. The development footprint is approximately 438ha.
- **Development site** – The area of land within the proposed development that are subject to potential direct and indirect impacts from the proposal. The development site is approximately 605ha. The development site is the area surveyed for this assessment.
- **Subject land** – The combined areas of the development site and development footprint within affected lot boundaries, and the area to where the BAM has been applied.
- **Buffer area** – All land within 1500m of the outside edge of the boundary of the development footprint.

1.1 The proposal

Walla Walla Solar Farm would occupy around 438ha of the 605ha development site, retaining existing viable native vegetation remnants that occur on the array site. The proposal would comprise the installation of a solar plant that would generate a maximum 300MW alternating current (AC) of renewable energy for the national grid.

The proposal would include the following elements:

- One primary access point of Benambra Road at northeast corner of the development site. Two minor access points on Schneiders Road, facilitating traffic movements east to west only and operation access on Benambra Road for the substation.
- Single-axis tracker photovoltaic solar panels mounted on steel frames (approximately 700,000PV solar panels).
- Onsite 330kV substation.
- A site operations and maintenance building, switch room and vehicle parking areas.
- Internal inverter stations to allow conversion of DC module output to AC electricity.
- Underground electrical conduits and cabling to connect the arrays on the array site.
- Internal access tracks to allow for site maintenance.
- Perimeter security fencing.
- 330kV electrical transmission line to connect the proposal to the existing transmission line.
- Native vegetation screening to break up views of infrastructure and enhance biodiversity values onsite.

In total, the construction phase of the proposal is expected to take 16 to 20 months. The Walla Walla Solar Farm is expected to operate for around 30 years. Approximately 21 operations and maintenance personnel would operate the plant. The solar farm would be decommissioned at the end of its operational life; all above ground infrastructure and below ground infrastructure less than 2500mm deep would be removed in consultation with the landowner, with the site to be returned to its existing land capability for agricultural land use.

1.2 The development site

1.2.1 Site location

The proposed location of Walla Walla Solar Farm is in the Greater Hume Local Government Area (LGA), around 35km north of Albury as shown in Figure 1 1. The subject land comprises Lots 16, 17, 20, 21, 87, 88, 89, 108, 109 118 of DP 753735, Lot 3 253113, Lot 1 DP 933189, Lot A DP 376389 and Lot 1 DP 1069452, approximately 807ha.

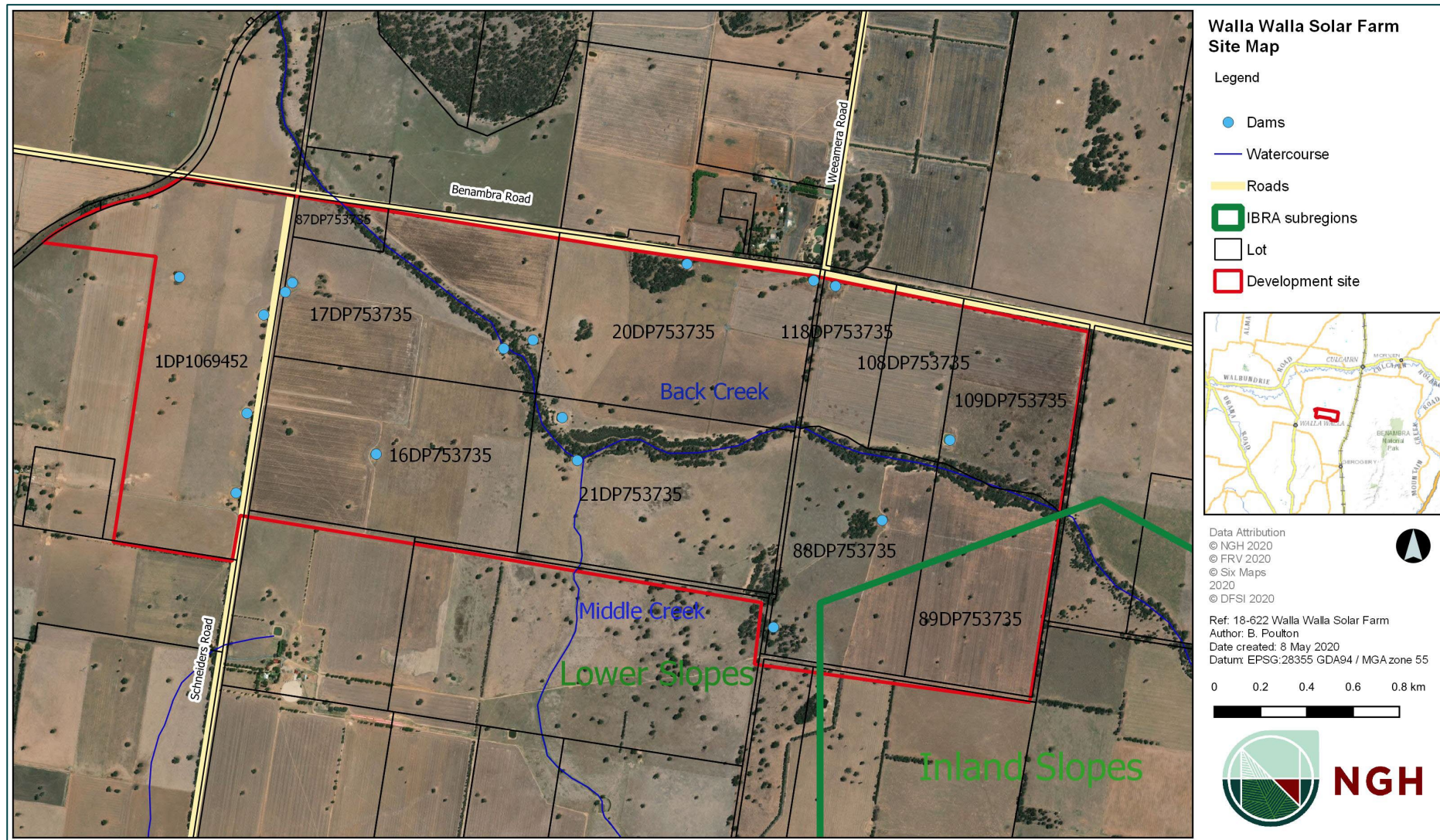


Figure 1-1 Site map

1.2.2 Site description

The development site is located within the Greater Hume LGA. It is accessed primarily from Benambra Road, approximately 2.5km north-west of the intersection with the Olympic Highway, with alternative access points off Schneiders Road. Benambra Road and Schneiders Road are both local roads managed and maintained by Greater Hume Shire Council. An existing quarry is located on Weeamera Road, off Benambra Road. The intersection of Benambra Road and the Olympic Highway has already been upgraded to facilitate the turning of heavy vehicles.

The Olympic Highway is a major regional highway, servicing the communities of the central western and south-eastern Riverina including the LGAs of Cowra, Hilltops, Cootamundra-Gundagai, Wagga Wagga, Greater Hume and Albury. The Olympic Highway is an important link between the towns in this productive region and connecting these areas with the national highway network. The region supports a diverse economy associated with agriculture, tourism, large commercial centres, residential facilities, health centres, railroad activities, energy generation (hydro, gas, solar), energy distribution, road freight and intermodal logistics.

Walla Walla is the closest town to the proposal, approximately 4.3km south-west of the proposal. Its population in 2016 was recorded as 836 persons (ABS 2016) and hosts a number of historic buildings, churches, a grain storage facility and a community sports ground. The closest services are located in the regional centre of Albury, around 32km south of the proposal. The population for Albury's urban locality in June 2018 was recorded as 53,289 persons (Population Australia 2018). It supports supermarkets, post offices, service stations, accommodation, restaurants, medical services and recreation facilities.

The Murray River and Lake Hume are located approximately 36km south and 20km south-east, respectively, of the proposed. Lake Hume is one of the major water storage areas for the Murray River system and water discharged from the Snowy Mountains Hydro-electric Scheme is also used as a recreational facility. The Benambra National Park and Tabletop Nature Reserve are located approximately 9.5km east and 13.7km south-east, respectively, of the proposal.

The proposal is located within the South Western Slopes Bioregion with the main vegetation types identified as Grey Box tall grassy woodland, Blakely's Red Gum – Yellow Box grassy tall woodland, River Red Gum herbaceous – grassy very tall open forest wetland on inner floodplains, and Riparian Blakely's Red Gum – box – sedge grass tall open forest.

1.3 Study aims

The aim of this BDAR is to address the requirements of the BAM, as required in the Secretary's Environmental Assessment Requirements (SEARs), which are summarised in Table 1-1 below.

Table 1-1 Biodiversity SEARs for Walla Walla Solar Farm

Secretary's Environmental Assessment Requirement	Where addressed
The EIS must address the following specific issues: Biodiversity impacts related to the proposed development are to be assessed in accordance with section 7.9 of the <i>Biodiversity Conservation Act 2016</i> using the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the Biodiversity	Sections 6 and 7

Secretary's Environmental Assessment Requirement	Where addressed
Conservation Act 2016 (s6.12), Biodiversity Conservation Regulation 2017 (s6.8) and the BAM, unless OEH and DPE determine that the proposed development is not likely to have any significant impact on biodiversity values.	
The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM.	Sections 8, 9 and 10
The BDAR must include details of the measures proposed to address the offset obligation as follows: 1. The total number and classes of biodiversity credits required to be retired for the development/project. 2. The number and classes of like-for-like biodiversity credits proposed to be retired. 3. The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules. 4. Any proposal to fund a biodiversity conservation action. 5. Any proposal to make a payment to the Biodiversity Conservation Fund. If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits	Section 10
The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under s6.10 of the BC Act 2016.	Document verification (front of document)

No specific considerations for any threatened species, populations or communities were specified in the SEARs or by the NSW Office of Environment and Heritage (OEH).

1.4 Source of the information used in the document

The following information sources were used in this BDAR:

Proposal layers, construction methodology and concept designs provided by FRV.

Australian Government's Species Profiles and Threats (SPRAT) database
<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>.

DPI profiles of threatened species, population, and ecological communities.

Commonwealth Department of Environment and Energy Protected Matters Search Tool Accessed online at <http://environment.gov.au/epbc/protected-matters-search-tool>.

Australia's IBRA Bioregions and Sub-bioregions. Accessed online at <http://environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps>.

Department of Environment and Climate Change NSW (DECC) (2002). Descriptions for NSW (Mitchell) Landscapes, Version 2.

NSW OEH's Biodiversity Assessment Method (BAM) calculator
(<http://www.environment.nsw.gov.au/bbccapp/ui/mynews.aspx>).

NSW OEH's BioNet threatened biodiversity database Accessed online via login at
<http://www.bionet.nsw.gov.au/>.

NSW OEH Threatened Species Profiles
<http://www.environment.nsw.gov.au/threatenedSpeciesApp/> and
www.environment.nsw.gov.au/AtlasApp/UI_Modules/.

OEH BioNet Vegetation Classification Database (OEH 2017) Accessed online via login at
<http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx>.

OEH VIS Mapping Accessed online at <http://www.environment.nsw.gov.au/research/VISmap.htm>.

Office of Environment and Heritage (OEH) (2017). Biodiversity Assessment Method.

NSW Government SEED Mapping
https://geo.seed.nsw.gov.au/Public_Viewers/index.html?viewer=Public_Viewers&locale=en-AU.

NSW Biodiversity Values Map
<https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap>

2. Landscape features

2.1 IBRA bioregions and subregions

Interim Biogeographic regionalisation for Australia (IBRA) Bioregions are geographically distinct bioregions based on common climates, geology, landforms and native vegetation (Thackaway and Creswell, 1995). There are 89 IBRA bioregions within Australia. The development site falls within the NSW South Western Slopes IBRA Bioregion. The South Western Slopes is an extensive area of foothills and isolated ranges, comprising the lower inland slopes of the Great Dividing Range extending from north of Cowra through southern NSW into western Victoria.

The development site occurs within two IBRA subregions. Inland Slopes and Lower Slopes. The majority of the development site falls within the Lower Slopes subregion and this was entered into the BAM Calculator for the proposal.

The Lower Slopes Subregion is characterised by wide valleys of the Riverina alluvial fans containing isolated peaks and undulating hilly ranges. The geology of the Lower Slopes comprises Ordovician to Devonian faulted sedimentary rocks imbedded with large areas of intrusive granites.

The Lower Slopes also contains large areas of Tertiary and Quaternary alluvium deposits. Vegetation communities within the subregion occupy suitable landscapes, such as:

- White Cypress Pine on the ranges.
- Poplar Box, Kurrajong, Wilga and Red Box in the north.
- Grey Box woodlands with Yellow Box, White Cypress Pine and Belah on lower areas.
- Myall, Rosewood and Yarran on grey clays.
- Dwyer's Gum on granite.
- Red Ironbark on sedimentary rocks.
- River Red Gum on all streams with Black Box in the west.

2.2 Native vegetation

An assessment of native vegetation in the 1500m buffer area was undertaken using aerial imagery, State Vegetation Mapping (OEH, 2016b) and field assessments. Approximately 455ha of native vegetation occurs in the surrounding 1500m buffer area. This vegetation, in the landscape surrounding the development site is predominantly open woodland comprised of Blakely's Red Gum (*Eucalyptus blakelyi*), Yellow Box (*Eucalyptus melliodora*), Grey Box (*Eucalyptus microcarpa*), White Box (*Eucalyptus albens*) and River Red Gum (*Eucalyptus camaldulensis*).

2.3 Cleared areas

An assessment of cleared areas in the 1500 m buffer area was undertaken using aerial imagery, State Vegetation Mapping (OEH, 2016b), NSW Landuse Mapping (OEH, 2017) and field assessments. Approximately 2569ha occurs as cleared areas within the 1500m buffer around the development site. These cleared areas are primarily agricultural lands used for cropping and modified pastures. Approximately 46ha occurs as rural residential areas.



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

2.4 River and streams

The development site is located approximately 33km north of the Murray River. Two watercourses run through the development site: Back Creek and Middle Creek. Both these creeks are ephemeral and were dry at the time of the field inspections. Back Creek is vegetated with River Red Gum, Blakley's Red Gum, Grey Box and White Box. Middle Creek is a small drainage depression and runs through a cropped paddock. Middle creek lacks any woody vegetation. These two water courses flow into Billabong Creek, which in turn flows into the Murray River.

Seventeen man-made dams exist within the development site, four within Lot 22 DP 1069452 and thirteen across multiple Lots of DP 753735. Fifteen of the seventeen dams would be retained.



Figure 2-2 Back Creek within the development site



Figure 2-3 Middle Creek



Figure 2-4 Farm dam

2.5 Wetlands

An EPBC protected matters search completed on 7 November 2018 identified seven wetlands of international importance. The closest of these to the development site is Barmah Forest and NSW Central Murray State Forests, located over 100km from the development site, upstream within the Murray Catchment. The EPBC protected matters search also identified one nationally important wetland that could potentially be impacted by land use at the development site. Walla Walla Swamp (Gum Swamp) is located about 2.5km west from the development site and is a seasonal swamp that is mostly dry during the warmer months.

Several smaller, unlisted swamps were identified near the development site. These are shown in Figure 2-5 from the Greater Hume Local Environmental Plan (LEP) 2011.

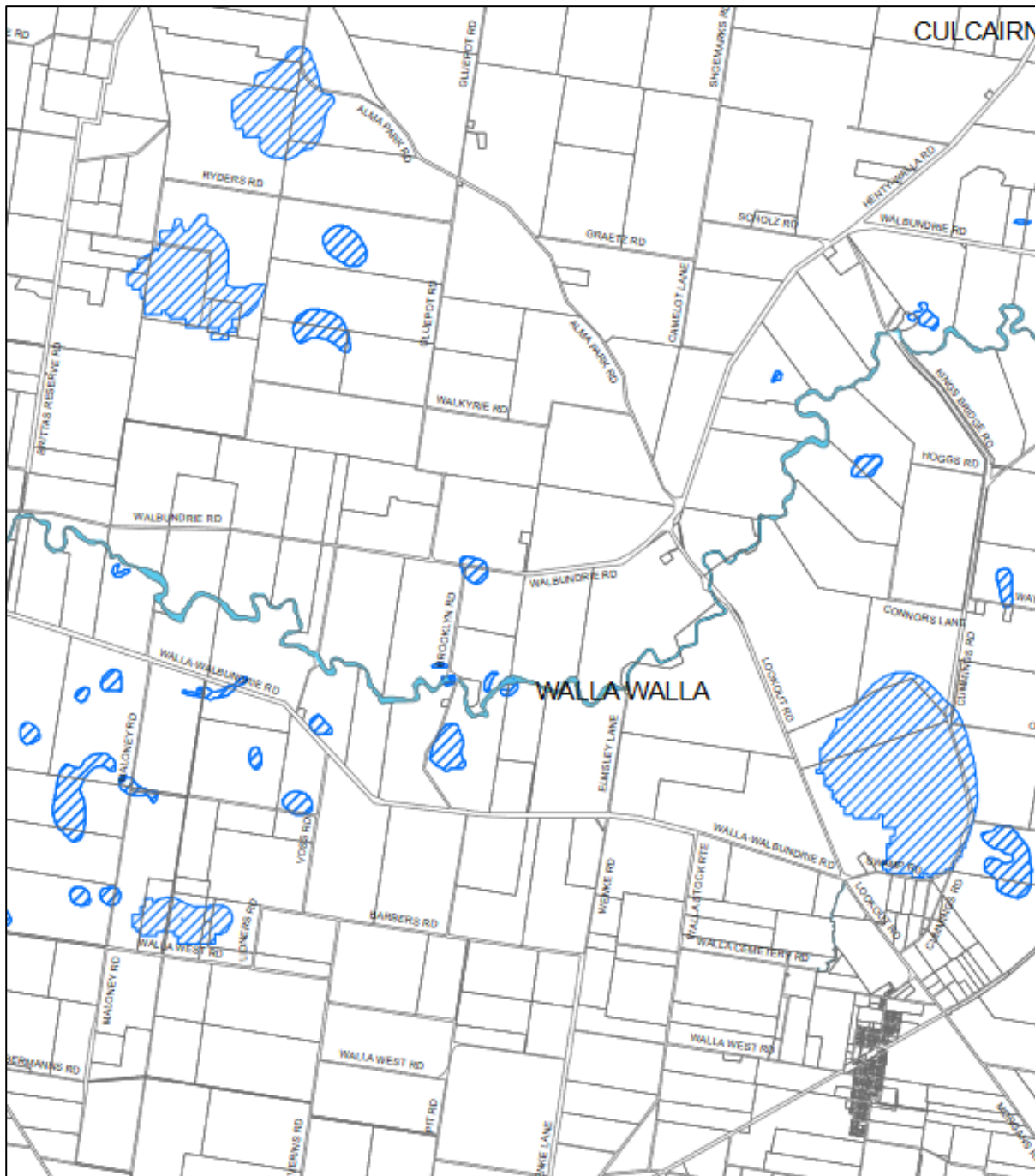


Figure 2-5 Wetlands identified in the Greater Hume LEP

2.6 Connectivity features

The 1.5km buffer area is largely cleared and heavily fragmented. The vegetated Back Creek provides connectivity in an east to west direction. The east to west flowing section of Back Creek provides a wildlife corridor through multiple Lots of DP 753735.

2.7 Areas of geological significance

No karsts, caves, crevices or cliffs or other areas of geological significance occur in or adjacent to the development site.

2.8 Areas of Outstanding Biodiversity Value

No Areas of Outstanding Biodiversity Value (AOBV) occur within the development site (NSW Biodiversity Values Map).

2.9 Biodiversity Values Map

Back Creek is listed as an area of high biodiversity value under the Biodiversity Conservation Regulation 2017 (Figure 2-6). The development site falls within an area of high biodiversity value. The potential impact to an area of high biodiversity value would trigger the requirement of a BDAR if not already required as a state significant development. Impacts on Back Creek have been considered in this report.

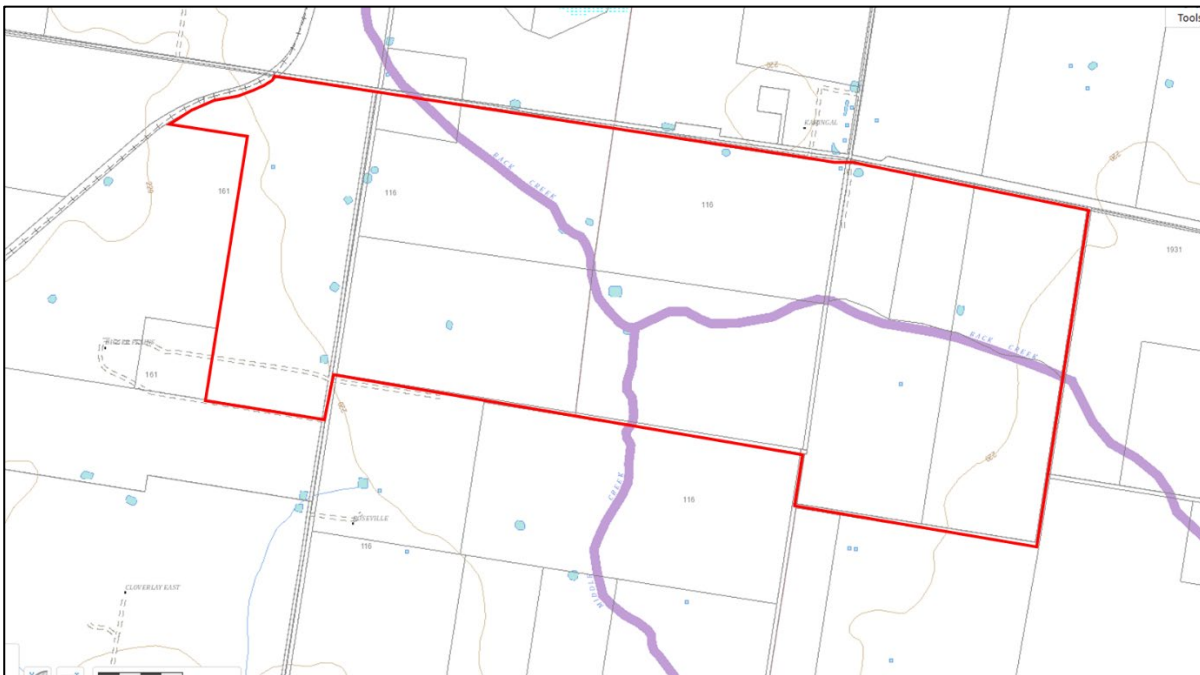


Figure 2-6 Areas listed as high biodiversity value (marked in purple)

2.10 Site context components

Methods applied

The proposal conforms to the definition of a *site-based development* under the BAM. The site-based development assessment methodology has been used in this BAM assessment. The Percent Native Vegetation was calculated by estimating the percent cover of native vegetation relevant to the benchmark for the PCT. PCTs were allocated based on existing vegetation mapping, field inspections and aerial imagery.

Percent native vegetation cover

The 1500m buffer area around the development site comprises an area of 3024ha. As determined by GIS mapping from aerial imagery, approximately 472ha of native vegetation occurs in the 1500m buffer area (Figure 2-7).

Thus, the Percent Native Vegetation Cover within the 1500m buffer area surrounding the development site was calculated to be 15.6%. This was entered into the BAM calculator for the assessment.

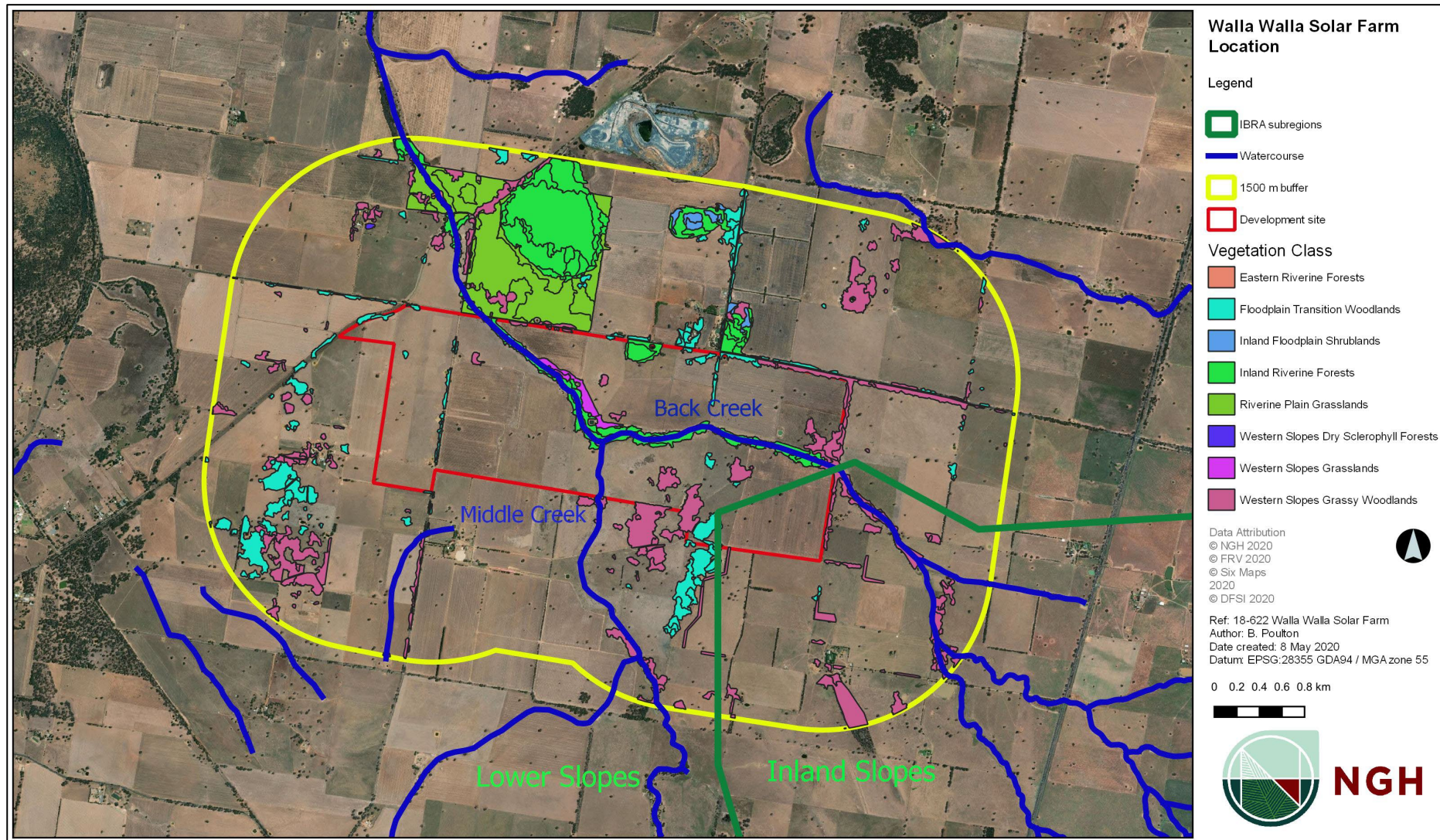


Figure 2-7 Location map

3. Native vegetation within the development site

3.1 Native vegetation extent

69.2ha of native woodland vegetation occurs within the development site (Figure 3-1). This is comprised of:

- 42.7ha of River Red Gum herbaceous – grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the Eastern Riverina Bioregion.
- 19.4ha of Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.
- 0.2ha of Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.
- 6.9ha of Riparian Blakely's Red Gum – box – sedge – grass tall open forest of the central NSW South Western Slopes Bioregion.
- 29.6ha of derived grassland from Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions also occurs within the development site.

63 scattered paddock trees and 2 dead stags occur within the development site (refer Figure 3-1). Scattered trees met the criteria of;

'A group of three or fewer trees that have a DBH greater than or equal to 5cm and are within a distance of 50m to each other that in turn are greater than 50m away from the nearest living trees that is greater than or equal to 5cm DBH and are completely separated by 100% exotic vegetation. Exotic vegetation between the scattered trees was comprised of cultivated paddocks of Wheat and Barley.'

*The regulatory land mapping has not yet been published under the new *Local Land Service Act 2016* (LLS Act). During the transitional period, land categories are to be determined in accordance with the definitions of regulated land in the LLS Act. In this case, the paddock trees are surrounded by land that has been cleared of native vegetation since January 1990.

Scattered trees throughout the development site were assessed under the streamlined assessment module – scattered trees (Appendix B of BAM 2020) and incorporated into this report. They are considered in terms of ecosystem credits and any credits generated are additional to those created by applying the full BAM.

3.2 Exotic vegetation

Approximately 505ha of the development site occurs as cleared agricultural land used for rotational cropping and grazing (Figure 3-1). These areas are dominated by exotic vegetation such as Wheat (**Triticum aestivum*), Canola (**Brassica rapa*) and Barley (**Hordeum* sp.).

The BC Act determines that the BAM is to exclude the assessment of the impacts of clearing native vegetation on Category 1 - exempt land. As Category 1 Land regulatory maps are not yet publicly available, an assessment of whether the cleared areas meet the definition of the Category 1 - exempt land was undertaken (Appendix A). Based on 2017 Landuse Dataset (OEH, 2017), NSW Woody Vegetation extent dataset (OEH, 2015), Native Vegetation Regulatory Mapping and historical aerial Imagery, 502ha was considered to be classed as Category 1 Land

(Appendix A). These areas are exempt from further assessment in the BAM with exception to prescribed impacts as stated in Section 6.3 of the BC Act.

A further 13ha was assessed as exotic vegetation from the field assessment comprised or predominantly agricultural weeds such as Barley Grass (**Hordeum leporinum*), Rye Grass (**Lolium*), Phalaris (**Phalaris aquatica*) and Patterson's Curse (**Echium plantagineum*).



Figure 3-1 Native vegetation extent within the development site

3.3 Plant Community Types (PCTs)

3.3.1 Methods to assess PCTs

Review of existing information

A search was undertaken of OEH Vegetation Information System (VIS) database and NSW SEED mapping to access existing vegetation mapping information within the development site. Two relevant existing vegetation maps were assessed:

- SEED Mapping – Sharing and Enabling Environmental Data (2017).
- Riverina State and Vegetation Mapping – VIS 4469.

These two vegetation maps provided the same information. 10 PCTs were mapped to be present within a 100m buffer from the development site. These mapped PCTs were:

- PCT 5 - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the Eastern Riverina Bioregion.
- PCT 45 - Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and the NSW South Western Slopes Bioregion.
- PCT 74 - Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion.
- PCT 76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.
- PCT 79 - River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes bioregion and western South East Highlands Bioregion.
- PCT 249 - River Red Gum swampy woodland wetland on Cowals (lakes) and associated flood channels in central NSW.
- PCT 266 - White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.
- PCT 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.
- PCT 278 - Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South Western Slopes Bioregion.
- PCT 633 - Spear grass - Red leg Grass derived grassland on hills in the Jindera to Holbrook region, southern NSW South Western Slopes Bioregion.

Floristic survey

An initial site survey was undertaken on 8 and 9 November 2018. The entire subject land was surveyed by two ecologists by car and on foot. The aim of this survey was to confirm the PCTs present in the development site and their condition and extent. Random meander searches were conducted in areas of native vegetation to determine the plant species present. PCTs were identified from the native species present, landforms, physiography and location in the IBRA subregion using the BioNet Vegetation Classification Database. The subject land was then stratified into areas of similar condition class to determine vegetation zones for each PCT.

Detailed floristic surveys were undertaken on 9 November and the 13 to 15 November 2018. Vegetation integrity plots, of 20m by 50m (or 10m by 100m in the case of roadside verge), were established in each vegetation zone. Data were collected on the composition, structure and function of the vegetation. Data was collected utilising the methodology presented in the BAM 2017 by persons trained in the BAM and under the direction of persons accredited under the BAM.

3.3.2 PCTs identified on the development site

Based on the field surveys, four PCTs were identified to occur within the development site (Figure 3-5). These are:

- PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the Eastern Riverina Bioregion.
- PCT 76 – Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.
- PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.
- PCT 278 – Riparian Blakely's Red Gum – box – sedge – grass tall open forest of the central NSW South Western Slopes Bioregion.

Once the development site had been ground-truthed through the field surveys, it was revealed some of the existing vegetation mapping on SEED mapping and VIS Mapping was mapped incorrectly. This included:

- An area mapped as PCT 266 – White Box Woodland was identified as a patch of planted sugar gums (*Eucalyptus cladocalyx*).
- Patches mapped as PCT 277 – Blakely's Red Gum-Yellow Box grassy Woodland were either dominated by Grey Box (*E. microcarpa*) or River Red Gum (*E. camaldulensis*).
- Area mapped as PCT 633 – Spear grass-red leg grass derived grasslands on hills were identified as being highly modified from grazing and dominated by exotic annual grasses. No spear-grass or red-leg grass was present at the time of survey in November 2018.

A description of each of the PCTs identified in the development site follow in Table 3-1 to Table 3-4, which include justification of PCT selection.

Table 3-1 River Red Gum herbaceous – grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes bioregion and the Eastern Riverina bioregion

River Red Gum Herbaceous – grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the Eastern Riverina Bioregion.		
Vegetation formation	Forested Wetlands	
Vegetation class	Inland Riverine Forests	
Vegetation type	PCT ID	5
	Common Community Name	River Red Gum herbaceous – grassy very tall open forest wetland.
Approximate extent within the development site	42.7ha of this PCT occurs in varying condition in the development site along Back Creek and isolated wetland depressions throughout the agricultural land.	
Species relied upon for PCT identification	Species name	Relative cover
	<i>Eucalyptus camaldulensis</i>	10 -20%
	<i>Alternanthera denticulata</i>	<1%
	<i>Euphorbia drummondii</i>	<1%
	<i>Rumex brownii</i>	<1%
	<i>Cynodon dactylon</i>	<1%
	<i>Juncus subsecundus</i>	0 -15%
	<i>Carex sp.</i>	0-1%
	<i>Eleocharis sp.</i>	0-1%
	<i>Elymus scaber</i>	<1%
Justification of evidence used to identify the PCT	This PCT was identified with a dominance of River Red Gum (<i>E. camaldulensis</i>). The shrub layer is absent, and the ground cover is highly disturbed through frequent grazing by sheep and cattle. Five PCTS were considered that have River Red Gum as the dominant species in the NSW South Western Slopes. These are: • PCT 2 - River Red Gum-sedge dominated very tall open forest in frequently flooded forest wetland along major rivers and floodplains in south-western NSW Based on the species. • PCT 5 - River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion. • PCT 7 - River Red Gum - Warrego Grass - herbaceous riparian tall open forest wetland mainly in the Riverina Bioregion. • PCT 9 - River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion.	

River Red Gum Herbaceous – grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the Eastern Riverina Bioregion.	
	PCT 249 --River Red Gum swampy woodland wetland on cowals (lakes) and associated flood channels in central NSW. Very little understory vegetation remains, and it was difficult to distinguish between the PCTS based on understory species. PCT 5 was considered the best match for the PCT based on existing vegetation mapping and location in the landscape.
TEC Status	Not listed under either the BC Act or EPBC Act
Estimate of percent cleared	Current extent = 9,000ha (40% cleared)
Examples	 Figure 3-2 River Red Gum herbaceous-grassy very tall open forest in the development site

Table 3-2 A description of PCT76 -Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregion in the development site

PCT 76: Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.		
Vegetation formation	Grassy Woodland	
Vegetation class	Floodplain Transition Woodlands	
Vegetation type	PCT ID	76
	Common Community Name	Western Grey Box tall grassy woodland
Approximate extent within the development site	16.3ha of woodland in varying condition within the development site 3ha of woodland along adjacent roadsides 29.6ha as a derived grassland	
Species relied upon for PCT identification	Species name	Cover
	<i>Eucalyptus microcarpa</i>	0 – 20%
	<i>Allocasuarina luehmannii</i>	0 -1%
	<i>Callitris glaucophylla</i>	0-1%
	<i>Enteropogon acicularis</i>	0-1%
	<i>Chloris truncata</i>	0-30%
	<i>Elymus scaber</i>	<1%
	<i>Cynodon dactylon</i>	<1%
	<i>Oxalis perennans</i>	<1%
	<i>Sida corrugata</i>	<1%
	<i>Austrostipa scabra</i>	<1%
	<i>Euphorbia drummondii</i>	<1%
Justification of evidence used to identify the PCT	This PCT was identified by a dominance of Western Grey Box (<i>E. microcarpa</i>) in the understory. A few scattered Bullock (Allocasuarina luehmannii) were also present within the paddock trees. The understory has been heavily disturbed through agricultural activities of cropping and continuous grazing by livestock. The shrub layer is absent, and the groundcover is mostly comprised of exotic annuals. Some native groundcovers persist on the road reserves. Two PCTS were considered that have Western Grey Box as the dominant overstory species in the NSW South West Slopes. These are: • PCT 76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregion. • PCT 80 – Western Grey Box – White Cypress Pine tall woodland on loam soil of alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion. As White Cypress Pine was not dominant in the landscape, PCT 80 was not considered a suitable PCT for the remnant Grey Box Woodland. PCT 76 was considered to be most suitable PCT based on:	

PCT 76: Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions.	
	• Dominated by Grey Box in the overstory. • Located in the Inland Slopes IBRA Subregion. • Occurs on flats and floodplains. • Species listed above characteristic of this community. • Existing Vegetation Mapping for this PCT present in the locality. For these reasons, PCT was selected as the most appropriate PCT.
TEC Status	Forms part of the TEC - Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregion listed as Endangered under the NSW BC Act.
Estimate of percent cleared in Bioregion	Current extent = 40 000ha (92% cleared)
Examples	 Figure 3-3 Western Grey Box tall grassy woodland in the development site

Table 3-3 Description of PCT 277 Blakely's Red Gum-Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion in the development site

PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion.		
Vegetation formation	Grassy Woodlands	
Vegetation class	Western Slopes Grassy Woodlands	
Vegetation type	PCT ID	277
	Common Community Name	Blakely's Red Gum-Yellow Box grassy tall woodland
Approximate extent within the development site	0.2ha comprised of one patch within a cropped paddock	
Species relied upon for PCT identification	Species name	Relative abundance
	<i>Eucalyptus blakelyi</i> (Blakely's Red Gum)	50%
	<i>Eucalyptus melliodora</i> (Yellow Box)	50%
Justification of evidence used to identify the PCT	This woodland is comprised of a small patch of 4 trees within a cropped paddock that is used for heavy grazing. There is no native understory. The PCT was assigned based on the overstory species - Blakely's Red Gum and Yellow Box that are characteristic to this PCT in the IBRA subregion	
TEC Status	Forms part of the TEC - White Box - Yellow Box - Blakely's Red Gum Woodland listed as endangered under the BC Act.	
Estimate of percent cleared in NSW	Current extent = 30 000ha (94% cleared)	
Examples	 Figure 3-4 Blakely's Red Gum-Yellow Box grassy tall woodland in the development site	

Table 3-4 Description of PCT 278 -Riparian Blakely's Red Gum - box - sedge grass tall open forest of the central NSW South Western Slopes bioregion

PCT 278 – Riparian Blakely’s Red Gum – box – sedge – grass tall open forest of the central NSW South Western Slopes Bioregion.		
Vegetation formation	Grassy Woodlands	
Vegetation class	Western Slopes Grassy Woodland	
Vegetation type	PCT ID	278
	Common Community Name	Riparian Blakely’s Red Gum – box – sedge – grass tall open forest
Approximate extent within the development site	6.9ha of this PCT occurs within the development site along the Eastern side of Back Creek	
Species relied upon for PCT identification	Species name	Relative abundance
	<i>Eucalyptus blakelyi</i> (Blakely’s Red Gum)	30%
	<i>Eucalyptus melliodora</i> (Yellow Box)	5%
	<i>Eucalyptus microcarpa</i> (Grey Box)	10%
	<i>Eucalyptus albens</i> (White Box)	5%
Justification of evidence used to identify the PCT	This PCT occurs along Back Creek on the Eastern end of the Development Site. Sections of the creek transition from a River Red Gum Woodland (PCT 9) into Blakely’s Red Gum, with scattered White Box, Grey Box and Yellow Box. This zone was not assessed thoroughly with vegetation plots as it fell outside the development footprint. The PCT was identified based on existing mapping, location in the landscape and dominant overstory species. It is likely a transition zone between existing and past plant communities.	
TEC Status	Forms part of the White Box - Yellow Box - Blakely’s Red Gum Woodland listed as endangered under the BC Act and Critically endangered under the EPBC Act.	
Estimate of percent cleared in NSW	Current extent – 6 000ha (80% cleared)	

PCT 278 – Riparian Blakely's Red Gum – box – sedge – grass tall open forest of the central NSW South Western Slopes Bioregion.

Examples



Figure 3-5 Riparian Blakely's Red Gum – box – sedge – grass tall open forest

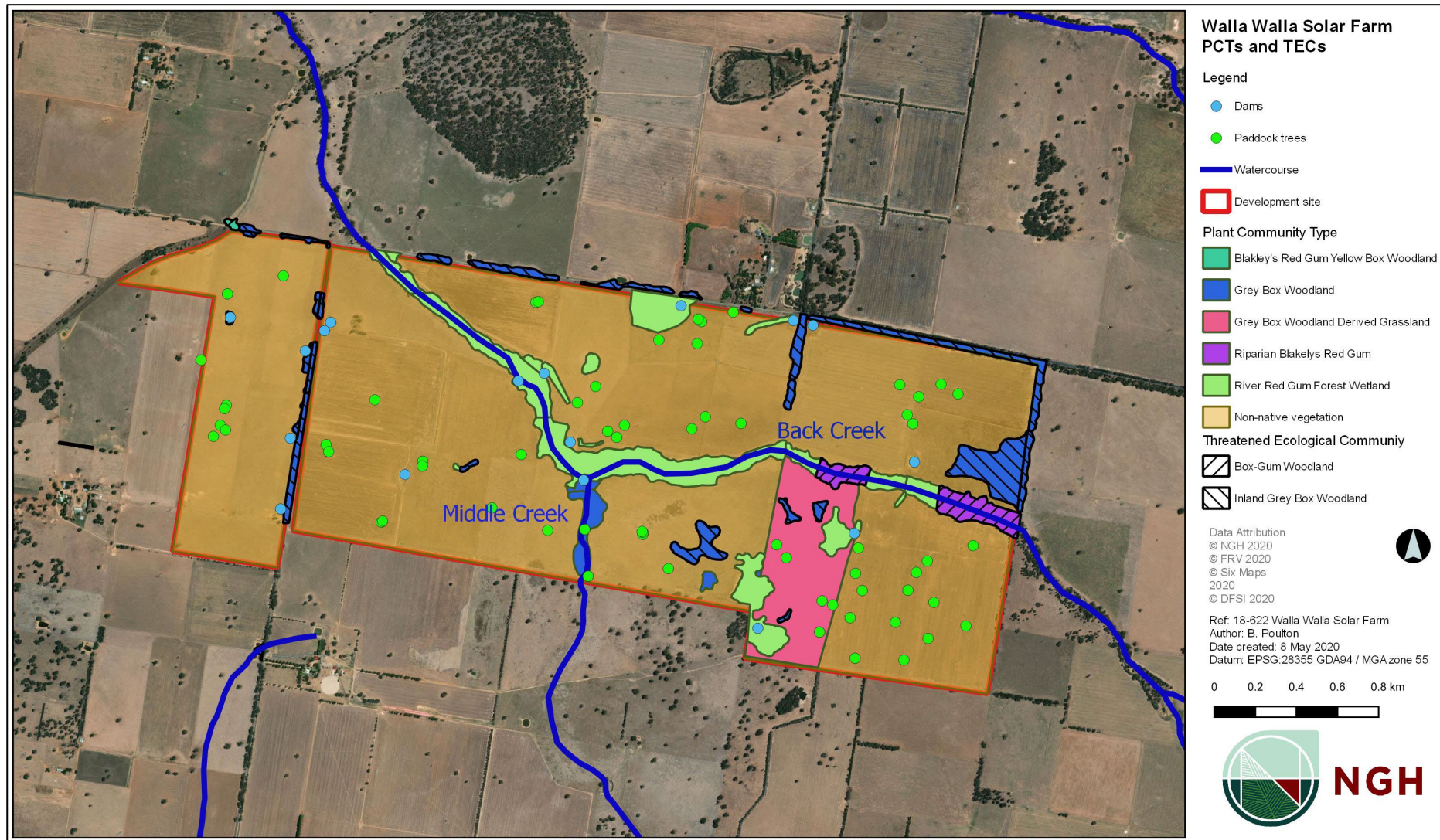


Figure 3-6 PCTS and TECS at the development site

3.4 Vegetation integrity assessment

3.4.1 Vegetation zones and survey effort

The random meander, overview inspection and detailed floristic plots have been used to assist the delineation of zones. Four PCTs were identified in the development site. Each of these PCTs was considered in terms of whether they should be further stratified into zones on the basis of current condition state/management or other environmental variables. PCT 76 was stratified into 4 zones dependent on the basis of tree cover, understory condition and land use. PCT 5 was stratified into 4 zones on the basis of tree cover, understory condition and land use. The other zones are considered homogenous and well represented by the plot data. Vegetation zones are shown in and mapped in Figure 3-6.

33 vegetation integrity plots were undertaken during the field surveys. Some of these plots subsequently fell outside the development site once the proposal layout was redesigned or were undertaken within Category 1 Land. These plots were not used for the BAM Calculations. The number of floristic plots undertaken in each zone was in line with the minimum plot requirements per zone area as specified in the BAM (2017).

Vegetation Zone 9 required four plots to be completed, of which three were undertaken due to survey constraints. An average of the other plots was used as data to be entered into the calculator, to allow for the generation of a vegetation integrity score. Vegetation Zone 10 required three plots to be completed which were entered into the BAM calculator to derive a vegetation integrity score.

Table 3-5 Vegetation zones within the development site

Zone ID	PCT ID	Stratification unit / condition	Area in development site (ha)	Survey effort (# plots)	Patch size (ha)	Example
1	277	Grazed This zone consists of mature Blakley's Red Gum (<i>E. blakelyi</i>) and Yellow Box (<i>E. melliodora</i>) trees over a disturbed understorey. Any native understorey has been eliminated through agricultural activities of cropping and grazing. This zone was considered to be of low condition. This zone forms part of the TEC listed under the BC Act as <i>White Box Yellow Box Blakely's Red Gum Woodland</i>.	0.2ha	1	0.2ha	
2	76	Grazed This zone consists of mature Grey Box (<i>E. microcarpa</i>) trees over a disturbed understorey. Any native understorey has been eliminated through agricultural activities of cropping and grazing. This zone forms part of the TEC listed under the BC Act as <i>Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions</i>	12.4ha	4	100+ha	

Zone ID	PCT ID	Stratification unit / condition	Area in development site (ha)	Survey effort (# plots)	Patch size (ha)	Example
3	76	Wetland This zone occurs along Middle Creek and some small depressions surrounding remnant Grey Box trees. These areas were dry at the time of survey but water-loving plants such as <i>Juncus usitatus</i>, <i>Cyperus</i> sp., and Lesser Joyweed (<i>Alternanthera denticulata</i>), were present indicating these areas hold moisture. These areas are heavily grazed and dominated by exotic species such as Phalaris (<i>*Phalaris aquatica</i>) and Barley Grass (<i>*Hordeum</i> sp.). Native grasses such as Windmill Grass (<i>Chloris truncata</i>), Couch (<i>Cynodon dactylon</i>) and Wallaby Grass (<i>Rytidosperma</i>) also persist in small numbers This zone form part of the TEC <i>Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions</i> as the understory is exotic dominated.	4ha	2	4ha	

Zone ID	PCT ID	Stratification unit / condition	Area in development site (ha)	Survey effort (# plots)	Patch size (ha)	Example
4	76	Derived grassland This zone consists of a disturbed grassland. It has undergone regular grazing by livestock, but there has been no evidence of cropping in the past. The grassland is dominated by a mix of exotic Barley Grass (<i>*Hordeum leporinum</i>) and native Windmill Grass (<i>Chloris truncata</i>). Some other natives such as Couch (<i>Cynodon dactylon</i>), Curly Windmill Grass (<i>Enteropogon acicularis</i>), Caustic Weed (<i>Euphorbia drummondii</i>) and Wallaby grass (<i>Rytidosperma spp.</i>) were also present in very small abundance (<1% cover). This zone is considered to form part of PCT 76 due to scattered and isolated Grey Box and Bulloak occurring in this paddock. It does not form part of the TEC <i>Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions</i> as the understory is exotic dominated and very few native grasses or forbs remain.	29.6ha	4	29.6ha	

Zone ID	PCT ID	Stratification unit / condition	Area in development site (ha)	Survey effort (# plots)	Patch size (ha)	Example
5	76	Roadside This zone consists of mature Grey Box trees along the road reserves surrounding the development site. These zones have not been subject to as much grazing pressure and native understory grasses and forbs are present in these zones. This zone forms part of the TEC listed under the BC Act as <i>Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions</i>	3.0ha (11.4ha in adjacent roadside reserve)	2	100+ha	
6	5	Grazed This zone consists of mature River Red Gum (<i>E. camaldulensis</i>) trees over a disturbed understory. Native understory has been eliminated through intense agricultural activities of cropping and grazing. This zone is considered to be in low condition. This zone does not form part of a TEC under the BC or EPBC Act.	0.7	1	0.7ha	

Zone ID	PCT ID	Stratification unit / condition	Area in development site (ha)	Survey effort (# plots)	Patch size (ha)	Example
7	5	Wetland This zone consists of a woodland of mature River Red Gum (<i>E. camaldulensis</i>) trees occurring in small drainage depressions in the landscape. These areas would hold water in times of substantial rainfall. Grazing occurs in these areas but native understory species such as <i>Juncus</i> sp. and Swamp Dock (<i>Rumex brownii</i>) persist. Fallen timber has been left in these areas, providing good fauna habitat. This zone does not form part of a TEC under the BC or EPBC Act.	12.2ha	3	12ha	
8	5	Low condition creekline This zone occurs along Back Creek within the fenced areas protected from cropping and grazing. This low condition zone comprises a sparse regenerating River Red Gum trees (<i>E. camaldulensis</i>). Groundcover is mostly exotic annuals with some scattered native grasses. This zone does not form part of a TEC under the BC or EPBC Act.	1.4ha	1	100+ha	

Zone ID	PCT ID	Stratification unit / condition	Area in development site (ha)	Survey effort (# plots)	Patch size (ha)	Example
9	5	Creekline This zone occurs along Back Creek. It is fenced off from stock, although has occasional grazing. It is dominated by River Red Gum (<i>E. camaldulensis</i>). River Red Gums are a mix of mature trees and juvenile trees with large stands of juvenile trees, likely germinated through past flooding events. Understory has been degraded through grazing. This zone does not form part of a TEC under the BC or EPBC Act.	28.4ha	3 + 1 average plot	100+ha	
10	278	Creekline This zone occurs along Back Creek. It is fenced off from stock although has occasional grazing.	6.9ha	3	100+ha	

Zone ID	PCT ID	Stratification unit / condition	Area in development site (ha)	Survey effort (# plots)	Patch size (ha)	Example
11	N/A	Exotic Vegetation Exotic vegetation within the development site is predominantly cropping land, comprised of Canola, Wheat and Barley. These lands are considered Category 1 land and are not assessed under the BAM. There are also some small stands of planted Sugar Gum (<i>Eucalyptus cladocalyx</i>) and Pepper Tree (<i>Schinus molle</i> var. <i>areira</i>) that are not native to NSW. Isolated Paddock Trees in this zone have been assessed under the Paddock Tree Assessment in Section 3.4.2 These areas are not considered to represent a PCT or TEC	502	3	502	

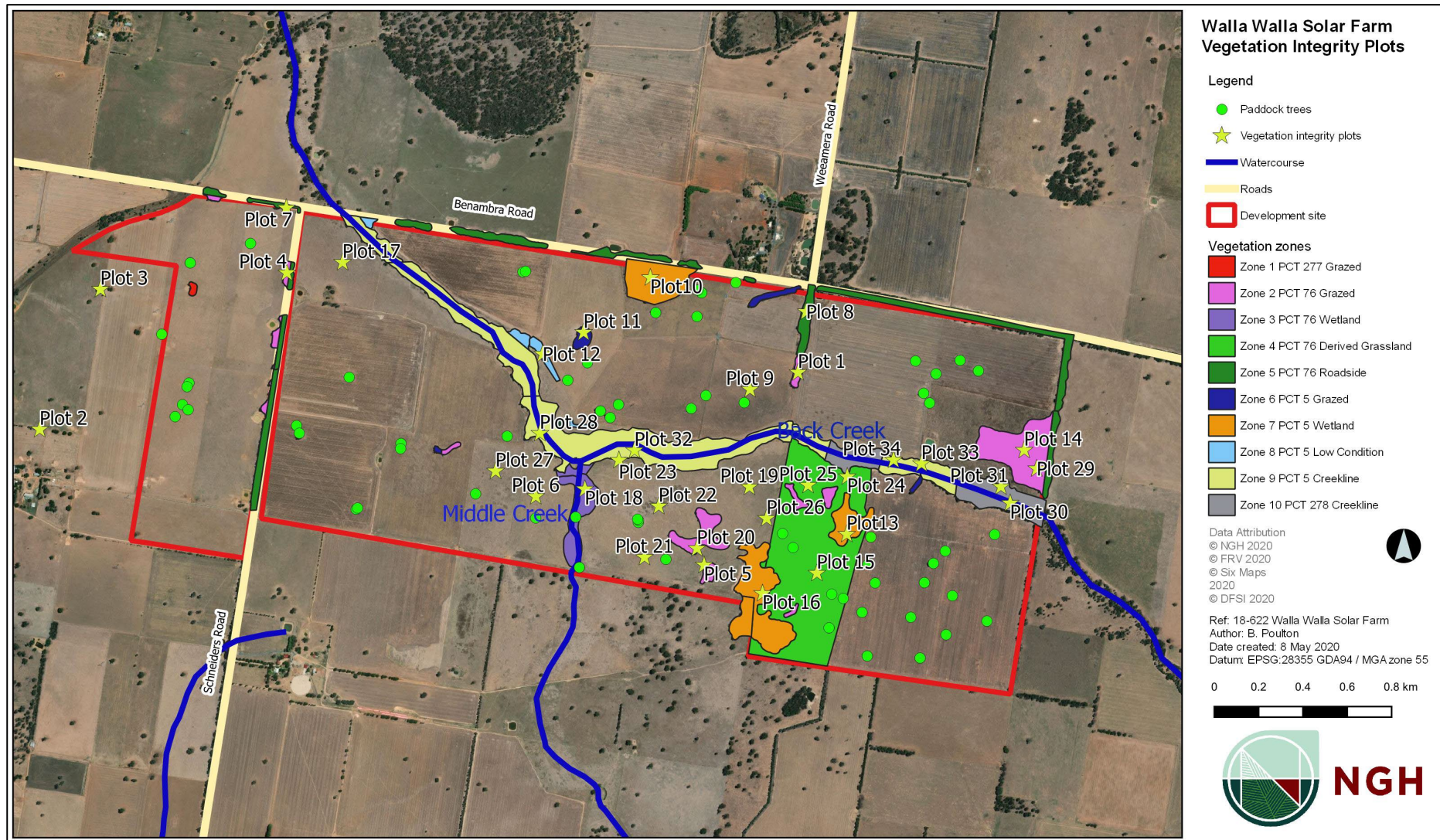


Figure 3-7 Vegetation zones at the development site and floristic plot locations

3.4.2 Scattered Paddock trees

There are 63 living paddock trees and two dead stags in the development site within the exotic vegetation in Zone 11. The paddock trees are a mix of mainly Grey Box (*E. microcarpa*), Yellow Box (*E. melliodora*), Blakely's Red Gum (*E. blakelyi*) with an occasional White Cypress (*Callitris glaucophylla*) and River Red Gum (*E. camaldulensis*)

The Grey Box paddock trees and occasional White Cypress are most likely remnant of the surrounding Grey Box tall Grassy woodland identified in the development site. As such, PCT 76 was assigned to the paddock trees comprised of Grey Box and White Cypress.

The Blakely's Red Gum and Yellow Box paddock trees are most likely remnant of the Blakely's Red Gum - Yellow Box grassy tall woodland identified in the development zone. As such, PCT277 was assigned to the Paddock Trees comprised of Yellow Box and Blakely's Red Gum.

Threatened species that would use the paddock trees are assumed to be the same threatened species that are returned by the BAM Calculator for the vegetation zones. Where targeted fauna surveys were required for the BAM Calculations, paddock trees were also included in the surveys. Assessments of threatened species that would use the paddock trees as habitat has been incorporated into this BDAR under Sections 4 and 5.

All paddock trees were mapped in the field using a handheld GIS Tablet. Trees were identified to genus and species. The Diameter at Breast Height (DBH) of the tree was assessed and assigned a scattered tree class relevant to the large tree benchmark. The large tree benchmark for PCT277 and PCT 76 is 50cm DBH. The trees were visually assessed from the ground to determine whether any hollows were present. Examples of scattered paddock trees occurring in the development site are shown in Figure 3-8 and listed in Appendix C.



Figure 3-8 Paddock trees within the development site

3.4.3 Vegetation integrity assessment results

90 plant species were identified within the 32 vegetation integrity survey plots comprising 26 native species and 64 exotic species. The results of the plot field data can be found in Appendix B.

The plot data from the vegetation integrity survey plots was entered into the BAM calculator by an accredited assessor. Vegetation integrity scores for the complete vegetation zones within the development site were entered in BAM-C case 00029035/BAAS18074/21/00029036. The results of the vegetation integrity assessment are provided in Table 3-6.

Table 3-6 Current vegetation integrity scores for each vegetation zone within the development site

Zone ID	Zone Description	Patch Size	Composition score	Structure score	Function score	Vegetation Integrity Score
1	PCT 277_ Grazed	0.18 ha	2.2	12.4	63.9	12.1
2	PCT 76_ Grazed	101 ha	7.6	23.4	46.3	20.2
3	PCT 76_ Wetland	4 ha	24.3	19.2	17.3	20.0
4	PCT 76_Derived Grassland	29.6 ha	11.8	34.1	10.6	16.2
5	PCT 76_Roadside	101 ha	22.7	69.8	42.1	40.5
6	PCT 5_ Grazed	0.6 ha	10.4	3	48.1	11.4
7	PCT 5_ Wetland	12 ha	32.1	30.6	75.1	41.9
8	PCT 5_Low Condition	101 ha	14.6	5.5	2.2	5.6
9	PCT 5_Creekline	101 ha	25.7	337.7	98.6	45.7
10	PCT 278_Creekline	101 ha	29.1	32.8	83.8	43.1

4. Threatened species

4.1 Ecosystem credit species

The following ecosystem credit species were returned by the calculator as being associated with the PCTs present on the development site. Two of these species were detected within the development site during field surveys. The Flame Robin was observed in the south of the site foraging in grassland and the Brown Tree Creeper was heard in the woodland vegetation along Back Creek. All other species are assumed to occur within the development site on occasion.

Table 4-1 Ecosystem credit species

Common Name	Associated PCT	NSW Listing Status	National Listing Status
Fauna			
Australian Painted Snipe <i>Rostratula australis</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland.	Endangered	Endangered
Barking Owl (Foraging) <i>Ninox connivens</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed
Black Falcon <i>Falco subniger</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed
Black-Chinned Honeyeater (Eastern Subspecies) <i>Melithreptus gularis gularis</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed
Brown Treecreeper (Eastern Subspecies) <i>Climacteris picumnus victoriae</i>	PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland. PCT 76 – Grey Box tall grassy woodland.	Vulnerable	Not listed
Diamond Firetail	PCT 5 – River Red Gum herbaceous – grassy very	Vulnerable	Not listed

Common Name	Associated PCT	NSW Listing Status	National Listing Status
<i>Stagonopleura guttata</i>	tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.		
Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed
Flame Robin <i>Petroica phoenicea</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed
Freckled Duck <i>Stictonetta naevosa</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland.	Vulnerable	Not listed
Gang Gang Cockatoo (foraging) <i>Callocephalum fimbriatum</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed
Gilbert’s Whistler <i>Pachycephala inornata</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland.	Vulnerable	Not listed
Grey Falcon <i>Falco hypoleucos</i>	PCT 76 – Grey Box tall grassy woodland.	Endangered	Not listed
Grey-crowned Babbler <i>Pomatostomus temporalis temporalis</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not Listed
Grey Headed Flying Fox (Foraging) <i>Pteropus poliocephalus</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland.	Vulnerable	Vulnerable

Common Name	Associated PCT	NSW Listing Status	National Listing Status
	PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.		
Grey-crowned Babbler (Eastern subspecies) <i>Pomatostomus temporalis temporalis</i>	PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed
Hooded Robin (South-eastern form) <i>Melanodryas cucullata</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed
Koala (Foraging) <i>Phascolarctos cinereus</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Endangered
Little Eagle (Foraging) <i>Hieraaetus morphnoides</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed
Little Lorikeet <i>Glossopsitta pusilla</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed
Little Pied Bat <i>Chalinolobus picatus</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed
Major Mitchell’s Cockatoo (Foraging) <i>Lophochroa leadbeateri</i>	PCT 76 – Grey Box tall grassy woodland.	Vulnerable	Not listed

Common Name	Associated PCT	NSW Listing Status	National Listing Status
Masked Owl (foraging) <i>Tyto novaehollandiae</i>	PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland. PCT 76 – Grey Box tall grassy woodland.	Vulnerable	Not listed
Painted Honeyeater <i>Grantiella picta</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Vulnerable
Purple-crowned Lorikeet <i>Glossopsitta porphyrocephala</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland.	Vulnerable	Not listed
Regent Honeyeater (foraging) <i>Anthochaera phrygia</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Critically Endangered	Critically Endangered
Scarlet Robin <i>Petroica boodang</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed
Speckled Warbler <i>Chthonicola sagittata</i>	PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland. PCT 76 – Grey Box tall grassy woodland.	Vulnerable	Not listed
Spotted Harrier <i>Circus assimilis</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Endangered

Common Name	Associated PCT	NSW Listing Status	National Listing Status
Square-tailed Kite (foraging) <i>Lophoictinia isura</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed
Superb Parrot (Foraging) <i>Polytelis swainsonii</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Vulnerable
Swift Parrot (Foraging) <i>Lathamus discolor</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Endangered	Critically Endangered
Turquoise Parrot <i>Neophema pulchella</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed
Varied Sittella <i>Daphoenositta chrysoptera</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed
White-bellied Sea-Eagle (foraging) <i>Haliaeetus morphnoides</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed
White-throated Needletail <i>Hirundapus caudacutus</i>	PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Not listed	Vulnerable

Common Name	Associated PCT	NSW Listing Status	National Listing Status
Yellow-bellied Sheathtail Bat <i>Saccolaimus flaviventris</i>	PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland. PCT 76 – Grey Box tall grassy woodland. PCT 277 – Blakely’s Red Gum – Yellow Box grassy tall woodland.	Vulnerable	Not listed

4.1.1 Species excluded from assessment

One species were excluded from the assessment based on habitat constraints

Glossy Black Cockatoo (*Calyptorhynchus lathami*) was excluded based on the lack of Allocasuarina and Casuarina species within the development site.

4.2 Species credit species

4.2.1 Candidate species to be assessed

The BAM Calculator predicted the following 32 species credit species to occur at the development site (Table 4-2). A desktop assessment was undertaken for habitat constraints and geographic restrictions to determine which species would be included or excluded for further targeted surveys in the development site. Eight species lacked suitable habitat or fell outside the known geographic range and were excluded from further assessment. These excluded species are highlighted in grey in the table below.

Table 4-2 Candidate species credit species requiring assessment

Credit species	Habitat and geographic restrictions ₁	Sensitivity to gain class	NSW listing status	National listing status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
Fauna							
Barking Owl (Breeding) <i>Ninox connivens</i>	Living or dead trees with hollows greater than 20cm diameter and greater than 4m above the ground.	High	Vulnerable	Not listed	Suitable hollow bearing trees within development site.	Included	Habitat components on site
Bush Stone-curlew <i>Burhinus grallarius</i>	Fallen/standing dead timber including logs.	High	Endangered	Not listed	Fallen timber in woodland areas in development site	Included	Habitat components on site
Eastern Pygmy-possum <i>Cercartetus nanus</i>	Broad range of habitat from rainforest through sclerophyll forest and woodland to heath, but in most areas woodlands and heath preferred.	High	Vulnerable	Not listed	Suitable habitat in woodland areas.	Included	Habitat components on site
Gang-gang Cockatoo (Breeding) <i>Callocephalon fimbriatum</i>	Eucalypt tree species with hollows greater than 9cm diameter.	High (breeding) / moderate (foraging)	Vulnerable	Not listed	Suitable hollow bearing trees within development site.	Included	Habitat components on site
Glossy Black Cockatoo	Living or dead tree with hollows greater than 15cm diameter and	High	Vulnerable	Not listed	Suitable hollow bearing trees	Included	Habitat components

Credit species	Habitat and geographic restrictions ₁	Sensitivity to gain class	NSW listing status	National listing status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
(Breeding) <i>Calyptrorhynchus lathamii</i>	greater than 5m above ground.				within the development site.		on site
Glossy Black Cockatoo, Riverina Population (Breeding) <i>Calyptrorhynchus lathamii</i>	Only in Carrathool, Griffith, Leeton and Narrandera LGA.	High	Endangered	Not Listed	Development site falls outside geographic restrictions.	Excluded	Not within geographic range
Grey-headed Flying-fox (Breeding) <i>Pteropus poliocephalus</i>	Range of vegetation communities including rainforest, open forest, and closed and open woodland. Roost sites usually near water, including lakes, rivers, and coastlines. Known to roost in locality. Breeding Camps	High	Vulnerable	Vulnerable	Woodland areas in development site	Included	Surveys required
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	Cliffs or within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops or crevices. Or within two kilometres of old mines or tunnels.	Very High	Vulnerable	Vulnerable	No cliff, rocky areas or tunnels within 2km of development site.	Excluded	No habitat components on or near site

Credit species	Habitat and geographic restrictions ₁	Sensitivity to gain class	NSW listing status	National listing status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
Koala (Breeding) <i>Phascolarctos cinereus</i>	Temperate, subtropical and tropical eucalypt woodlands and forests where suitable food trees grow, of which there are more than 70 eucalypt species and 30 non-eucalypt species that are particularly abundant on fertile clay soils. Known in subregion.	High	Vulnerable	Endangered	Woodland areas in development site	Included	Surveys required
Little Eagle (Breeding) <i>Hieraetus morphnoides</i>	Nest trees – live (occasionally dead) large old trees within vegetation. Paddock trees can provide important breeding habitat.	Moderate	Vulnerable	Not listed	Large old tree within development site	Included	Habitat components on site
Major Mitchell's Cockatoo (Breeding) <i>Lophochroa leadbeateri</i>	Living or dead tree with hollows greater than 10cm diameter.	High (breeding)/ moderate (foraging)	Vulnerable	Not listed	Suitable hollow bearing trees within development site.	Included	Habitat components on site
Masked Owl (Breeding) <i>Tyto novaehollandiae</i>	Living or dead trees with hollows greater than 20cm diameter.	High	Vulnerable	Not listed	Suitable hollow bearing trees within development site.	Included	Habitat components on site
Pink-tailed	Rocky areas or within 50m of rocky	High	Vulnerable	Vulnerable	No rocky areas within development	Excluded	No suitable

Credit species	Habitat and geographic restrictions ₁	Sensitivity to gain class	NSW listing status	National listing status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
Legless Lizard <i>Aprasia parapulchella</i>	areas.				site		habitat
Regent Honeyeater (Breeding) <i>Anthochaera phrygia</i>	Temperate woodlands and open forests of the inland slopes of south-east Australia, in particular dry open forest, woodland, Box-Ironbark woodland, and riparian forests of River Sheoak.	High	Critically Endangered	Critically Endangered	Development site not within mapped important areas (OEH, pers. com)	Excluded	Not within mapped important areas
Sloane's Froglet <i>Crinia sloanei</i>	Semi-permanent/ephemeral wet areas containing relatively shallow sections with submergent and emergent vegetation. Within 500m of wet areas, swamps or waterbodies.	Moderate	Vulnerable	Endangered	Farm dams present in development site	Included	Habitat components on site.
Southern Myotis <i>Myotis macropus</i>	Hollow Bearing Trees within 200m of riparian zone. Bridges, caves or artificial structures within 200m of riparian zone.	High	Vulnerable	Not listed	Hollow bearing trees within 200 m of Back Creek	Included	Habitat components on site.
Square-tailed Kite (Breeding)	Timbered habitats including dry woodlands and open forests, particularly timbered watercourses.	Moderate	Vulnerable	Not listed	Large old trees within development site	Included	Habitat components on site

Credit species	Habitat and geographic restrictions ₁	Sensitivity to gain class	NSW listing status	National listing status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
<i>Lophoictinia isura</i>	Known in subregion. Nest Trees.						
Squirrel Glider <i>Petaurus norfolcensis</i>	Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e., no more than 50m apart).	High	Vulnerable	Not listed	Suitable hollow bearing trees within development site.	Included	Habitat components on site
Superb Parrot (Breeding) <i>Polytelis swainsonii</i>	Living or dead <i>E. blakelyi</i> , <i>E. melliodora</i> , <i>E. albens</i> , <i>E. camaldulensis</i> , <i>E. microcarpa</i> , <i>E. polyanthemos</i> , <i>E. mannifera</i> , <i>E. intertexta</i> with hollows greater than 5cm diameter; greater than 4m above ground or trees with a DBH of greater than 30cm.	High (breeding)/ moderate (foraging)	Vulnerable	Vulnerable	Suitable hollow bearing trees within development site.	Included	Habitat components on site
Swift Parrot <i>Lathamus discolor</i>	On the coast and southwest slopes in areas with abundant flowering eucalypts or lerp. Feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Mugga Ironbark, and White Box. Known in subregion.	Moderate	Endangered	Critically Endangered	Development site not within mapped important areas (OEH, 2019)	Excluded	Not within mapped important areas
White-bellied Sea-	Living or dead mature trees within	High	Vulnerable	Not listed	Large dams within	Included	Suitable

Credit species	Habitat and geographic restrictions ₁	Sensitivity to gain class	NSW listing status	National listing status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
Eagle (Breeding) <i>Haliaeetus morphnoides</i>	suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines.				1km of development site. 1 known record within 10km of development site.		habitat within development site
Flora							
A spear-grass <i>Austrostipa wakoolica</i>	Alluvial plains and plains.	Moderate	Endangered	Endangered	Suitable habitat within woodland areas	Included	Within geographic range
Ausfeld's Wattle <i>Acacia ausfeldii</i>	Associated species include <i>Eucalyptus albens</i> , <i>E. blakelyi</i> and <i>Callitris</i> spp., with an understorey dominated by <i>Cassinia</i> spp. And grasses. Known in subregion.	High	Vulnerable	Not listed	Suitable habitat within woodland areas	Included	Within geographic range
Pine Donkey Orchid <i>Diuris tricolor</i>	Will grow in disturbed areas.	Moderate	Vulnerable	Not listed	Suitable habitat within woodland areas	Included	Within geographic range
Mossgiel Daisy <i>Brachyscome papillosa</i>	South and west of Coolamon-Ardlethan Road, west of Lockhart and north of Rand.	High	Vulnerable	Vulnerable	Development site not within geographic restrictions.	Excluded	Not within geographic range.

Credit species	Habitat and geographic restrictions ₁	Sensitivity to gain class	NSW listing status	National listing status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
Sand-hill Spider Orchid <i>Caladenia arenaria</i>	West of Lockhart and north of Rand.	High	Endangered	Endangered	Development site not within geographic restrictions.	Excluded	Not within geographic range
Silky Swainson-pea <i>Swainsona sericea</i>	Box-gum woodland in southern tablelands and South West Slopes. Sometimes in association with cypress pines. Known in subregion.	High	Vulnerable	Not listed	Suitable habitat within woodland areas	Included	Within geographic range
Slender Darling Pea <i>Swainsona murrayana</i>	Grows in a variety of vegetation types including Bladder Saltbush, Black Box and grassland communities on level plains, floodplains and depressions and is often found with <i>Maireana</i> spp.	Moderate	Vulnerable	Vulnerable	Suitable habitat within woodland areas	Included	Within geographic range
Spiny Peppercress <i>Lepidium aschersonii</i>	On ridges of Gilgai Clays.	High	Vulnerable	Vulnerable	No Gilgai clays in development site	Excluded	No suitable habitat on site
Small Purple-pea <i>Swainsona recta</i>	Predominantly grassy woodlands, but sometimes extends into grassy open forest, usually with tree cover including Blakely's Red Gum, Yellow Box, and White Box. Known in	Moderate	Not listed	Endangered	Suitable habitat within woodland areas	Included	Within geographic range

Credit species	Habitat and geographic restrictions ₁	Sensitivity to gain class	NSW listing status	National listing status	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
	subregion.						
Small Scurf-pea <i>Cullen parvum</i>	Grassland, River Red Gum woodland or Box-Gum woodland, sometimes on grazed land and usually on table drains or adjacent to drainage lines or watercourses, in areas with rainfall between 450mm and 700mm. Known in subregion.	High.	Endangered.	Not listed.	Suitable habitat within woodland areas.	Included.	Habitat components on site.
Spike-rush <i>Eleocharis obicis</i>	Semi-permanent/ephemeral wet areas. Periodically waterlogged sites, including table drains and farm dams.	High.	Vulnerable.	Vulnerable.	Farm dams and ephemeral wet areas in development site.	Included.	Habitat components on site.

4.2.2 Inclusions based on habitat features

A Bionet search was undertaken on 7 November 2018 to determine if any further threatened species are considered likely to occur on the development site.

No records occurred within or adjacent to the development site. The following species have been recorded within 10km of the development site since the year 2000.

- Bush Stone Curlew (5 records)
- Squirrel Glider (3 records)
- Superb Parrot (3 records)
- Sloane's Froglet (1 record)
- Spotted Harrier (1 record)
- Little Lorikeet (1 record)
- Brown Treecreeper (30 records)
- Black-chinned Honeyeater (1 record)
- Grey-crowned Babbler (4 records)
- Varied Sittella (1 record)
- Dusky Woodswallow (6 records)
- Flame Robin (8 records)
- Diamond Firetail (12 records)
- Hooded Robin (1 record).

These species were all generated as candidate species in the BAM Calculator and have been surveyed or considered for as part of the BAM.

One additional threatened species, the Corben's Long eared Bat (*Nyctophilus corbeni*) was generated from the EPBC protected matters search. Corben's Long Eared Bat is an ecosystem species under the BAM and can inhabit box eucalypt woodlands. As suitable habitat is present in the development site this species was added to the BAM Calculator as an ecosystem species.

4.2.3 Exclusions based on habitat quality

Under Section 6.4.1.17 of the BAM, a species credit species can be considered unlikely to occur on a development site (or within specific vegetation zones) if following field assessment, it is determined that the habitat is substantially degraded such that the species is unlikely to utilise the development site (or specific vegetation zones).

The following flora species (Table 4-3) were considered to have zones excluded on the basis of poor habitat quality. The habitats in these zones were no longer representative of the habitats in which these species could occur.

Table 4-3 Exclusions based on habitat quality

Species Credit Species	Zones Excluded	Reason for exclusion
Spike-rush <i>Eleocharis obicis</i>	Zone 1, 2, 4, 6 and 8	Spike-rush grows in ephemeral wet areas and these zones lack wet areas that could provide suitable habitat.
A spear-grass <i>Austrostipa wakoolica</i>	Zone 1, 2, 4, 6 and 8	These zones have undergone significant understory disturbance either through regular cropping or heavy grazing. The understory is dominated by exotic species or bare ground from heavy stock trampling. Very few native understory species are present, and those that are present are disturbance tolerant such as Curly Windmill Grass (<i>Enteropogon acicularis</i>), Windmill Grass (<i>Chloris truncata</i>) and Couch (<i>Cynodon dactylon</i>). The habitat is sufficiently degraded for native understory species and these species are unlikely to occur in these zones.
Small Scurf-pea <i>Cullen parvum</i>	Zone 1, 2, 4, 6 and 8	
Pine Donkey Orchid <i>Diuris tricolor</i>	Zone 1, 2, 4, 6 and 8	
Silky Swainson-Pea <i>Swainsona sericea</i>	Zone 1, 2, 4, 6 and 8	
Slender Darling Pea <i>Swainsona murrayana</i>	Zone 1, 2, 4, 6 and 8	
Small Purple Pea <i>Swainsona recta</i>	Zone 1, 2, 4, 6 and 8	

4.2.4 Candidate species requiring confirmation of presence or absence

The species listed in Table 4-2 are those considered to have habitats present at the development site. Surveys have been conducted for these species and the results are summarised in Table 4-4. Details of the survey methodologies and results are provided for each surveyed species in Section 4.2.5. One threatened species, the Squirrel Glider (*Petaurus norfolcensis*) (Figure 4-1) was detected within the development site. Three other threatened species were unable to be surveyed during the recommended survey time and are assumed to be present on the site.

Species polygons have been defined for the species present on the site as mapped on Figure 4-3 below.

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

Species credit species	Biodiversity risk rating	Survey period	Assumed to occur / survey / expert report	Present on site?	Species polygon area
FAUNA					
Bush Stone-curlew <i>Burhinus grallarius</i>	2.00	Jan-Dec	Surveyed November 2018	No	Nil
Major Mitchell's Cockatoo <i>Lophochroa leadbeateri</i>	2.00	Sep-Dec	Surveyed November 2018	No	Nil
Glossy Black-cockatoo <i>Calyptorhynchus lathami</i>	2.00	Mar-Aug	Surveyed June 2019	No	Nil
Eastern Pygmy Possum <i>Cercartetus nanus</i>	2.00	Oct-Mar	Surveyed November 2018	No	Nil
Square-tailed Kite <i>Lophoictinia isura</i>	1.50	Sep-Jan	Surveyed November 2018	No	Nil
Southern Myotis <i>Myotis macropus</i>	2.00	Oct-Mar	Surveyed November 2018 and October 2021	Yes	7.9ha (Impacted woodland areas within 200 m of water body)
Squirrel Glider <i>Petaurus norfolcensis</i>	2.00	Any	Surveyed November 2018 and June 2019.	Yes	15.0ha (Impacted woodland areas connected to Back Creek)
Barking Owl <i>Ninox connivens</i>	2.00	May-Dec	Surveyed November 2018	No	Nil
Koala <i>Phascolarctos cinereus</i>	2.00	Any	Surveyed November 2018	No	Nil
Superb Parrot <i>Polytelis swainsonii</i>	2.00	Sep-Nov	Surveyed November 2018	No	Nil
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	2.00	Oct – Dec	Surveyed November 2018	No	Nil
Masked Owl <i>Tyto novaehollandiae</i>	2.00	May-Aug	Surveyed June 2019	No	Nil

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Species credit species	Biodiversity risk rating	Survey period	Assumed to occur / survey / expert report	Present on site?	Species polygon area
Regent Honeyeater <i>Anthochaera phrygia</i>	3.00	Sep-Dec	Surveyed November 2018	No	Nil
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	2.00	Oct-Jan	Surveyed November 2018	No	Nil
Sloane's Froglet <i>Crinia sloanei</i>	1.50	Jul-Aug	Surveyed July 2019	No	Nil
Little Eagle <i>Hieraaetus morphnoides</i>	1.50	Aug – Oct	Surveyed October 2021	No	Nil
White-bellied Sea-eagle <i>Haliaeetus leucogaster</i>	2.00	Jul – Dec	Surveyed November 2018	No	Nil
FLORA					
Spike-rush <i>Eleocharis obicis</i>	2.00	Any	Surveyed November 2018 in Zone 3, 5 & 7	No	Nil
A spear-grass <i>Austrostipa wakoolica</i>	2.00	Sept-Dec	Surveyed November 2018 in Zone 3, 5 & 7.	No	Nil
Small Scurf-pea <i>Cullen parvum</i>	2.00	Dec-Jan	Surveyed January 2019 in Zone 3, 5 & 7.	No	Nil
Pine Donkey Orchid <i>Diuris tricolor</i>	1.50	Sept-Oct	Surveyed October 2021	No	Nil
Silky Swainson-Pea <i>Swainsona sericea</i>	2.00	Sept-Feb	Surveyed November 2018 in Zone 3, 5 & 7	No	Nil
Slender Darling-Pea <i>Swainsona murrayana</i>	1.50	Sept – Feb	Surveyed November 2018 in Zone 3, 5 & 7	No	Nil
Small Purple Pea <i>Swainsona recta</i>	2.00	Sept – Nov	Surveyed November 2018 in Zone 3, 5 & 7	No	Nil
Ausfeld's Wattle <i>Acacia ausfeldii</i>	2.00	Any	Surveyed November 2018	No	Nil

4.2.5 Survey methods

Weather conditions during the targeted surveys are summarised in Table 4-5 below.

Table 4-5 Weather conditions during targeted surveys

Date	Minimum (°C)	Maximum (°C)	Rainfall (mm)	Max Wind Gust (km/h Direction)
8 November 2018	6.8	19.6	0.2	35 WSW
9 November 2018	5.8	23.6	0	39 W
13 November 2018	14.2	26.9	0	24 SW
14 November 2018	16.9	27.7	12.2	30 W
15 November 2018	12.0	27.2	6.8	33 SSE
30 January 2019	23.2	31.7	0	37 SE
31 January 2019	19.3	34.1	0.4	50 NWW
11 June 2019	4.3	15.4	5.4	17 ENE
26 June 2019	-0.8	14.3	0	6 SE
3 July 2019	1.5	16.0	0	22 SE
4 July 2019	2.6	17.4	0	19 SE
5 October 2021	8.3	14.4	2.8	41 W
6 October 2021	3.5	20.5	0	24 NW
7 October 2021	8.1	18.5	0	43 WSW
8 October 2021	3.9	19.6	0	24 N

Nocturnal mammals: Eastern Pygmy Possum and Squirrel Glider

Survey effort

A targeted spotlight survey was completed on the evenings of 13 and 14 November 2018 for a total of approximately 8 person hours. Additional spotlighting surveys were taken on the 11 and 26 June 2019. A 100-watt spotlight was used from a slow-moving vehicle for visual searches of

remnant vegetation, grassland and isolated paddock trees. Diurnal searches of Eucalyptus trees were undertaken on the 14 and 15 November 2019 for signs of scratches and scats.

Survey results

No Eastern Pygmy-possums were observed during the targeted surveys. Two Brushtail Possums were observed during the site surveys.

Two Squirrel Gliders were observed in the River Red Gum Woodland along Back Creek. The vegetation along Back Creek and any adjacent woodland within 100m was considered to be suitable habitat for the Squirrel Glider. This area was calculated to be the threatened species polygon for the Squirrel Glider (Figure 4 3 to Figure 4 5).



Figure 4-1 Squirrel Glider identified on site

Grey-headed Flying Fox (breeding)

Survey effort

Surveys for breeding camps were undertaken within the woodland areas on 8 to 9 November 2018 and 13 to 15 November 2018. A search for known breeding camps was undertaken on the Department of Environment National Flying-fox Monitoring viewer.

Survey results

No Grey-headed flying fox breeding camps were observed within the development site. The nearest known Grey-headed Flying-fox camp is located at the Albury Botanic Gardens, approximately 35km south of the development site (DoE, 2018).

Southern Myotis

Survey effort

An ANABAT was located on a farm dam next to Back Creek for a period of five nights from 8 to 12 November 2018. An assessment of suitable waterbodies was undertaken to determine if suitable habitat is present within the development site.

Additional Field Surveys were undertaken on 5 to 8 October 2021. ANABATS were deployed in four locations with the development site for a collective total of eight survey records. ANABATS were left over a period of two nights and then moved to a new location for a period of two nights. ANABATS at Site 1 and Site 2 were set to record along Back Creek (Figure 4-3 - Figure 4-5) with pools of water on the evenings of the 5th and 6th October 2021. ANABATS at Site 3 and Site 4 were located near a small dam and an area of River Red Gum Forest and set to record on the evenings of 7 to 8 October 2021. (Figure 4-3 - Figure 4-5).

'2 Bank Austbat' Harp traps were utilised. Harp traps were set up over open bodies of water (farm dams) adjacent to or near areas identified as Southern Myotis polygon within the development site. Harp traps were opened at dusk and closed at dawn between the nights of 5 to 7 October. Harp traps were opened at dusk and closed between 10:30–11pm on the night of 8 October. Each harp trap was fully extended (Overall dimensions: 4m x 1.8m) with a general trapping area of around 2.4m x 1.8m. Harp traps were placed at least 3m from the bank edge to ensure trapping was conducted within suitable foraging habitat for Southern Myotis. A summary of trap locations and dates is provided below in Table 4-6.

Table 4-6 Harp trap survey

Harp Trap	Survey date
Dam 1	5 and 6 October 2021
Dam 2	5 and 6 October 2021
Dam 3	5 and 6 October 2021
Dam 4	7 and 8 October 2021
Dam 5	7 October 2021
Dam 6	7 and 8 October 2021
Dam 7	7 and 8 October 2021

Survey results

The Southern Myotis is dependent on waterbodies greater than 3m wide (TBDC, 2019). Back Creek and Middle Creek are ephemeral creeks which were dry at the time of survey. Their channel is less than 3m wide and are not considered suitable habitat for the Southern Myotis. 17 farm dams wider than 3m are present within the development site. All areas of woodland vegetation within 200m from a dam is considered suitable habitat for the Southern Myotis (TBDC, 2019). A 200m buffer was calculated around farm dams to determine the threatened species polygon (Figure 4-3 to Figure 4-5).

No fauna species were captured within the harp traps. Microbats were observed foraging over open pools of dams at dusk. Three threatened microbats were detected from the Anabat data, - Large Bent-winged Bat (*Miniopterus orianae oceanensis*), Southern Myotis (*Myotis Macropus*) and Yellow Bellied Sheathtail Bat (*Saccolaimus flaviventris*).

Southern Myotis was recorded in low numbers within Site 1 and Site 3 along Back Creek and potentially records in Site 2. Large Bent-winged Bat was recorded within Site 1, 2 and 3 and potential records in Site 4. Southern Myotis threatened species polygons were determined as suitable vegetation 200m from a waterway (TBDC, 2021). 8.64 ha of potential habitat for this species would be impacted and this area was added to the BAM-C.

Large Bent-winged Bat roosts in caves or cave-like structures such as tunnels, mines, culverts (TBDC, 2021). No suitable structures were present in the development site and the site is considered to provide foraging habitat only. No Threatened species polygon was considered for this species.

Yellow Bellied Sheathtail Bat was considered to potentially occur in the study area based on call profiles in ANAbat site 1 and Site 2. Yellow Bellied Sheathtail Bat is an ecosystem credit species and this species was added to the BAM-C as an ecosystem species.

A full description of Anabat analysis and recorded microbat species is shown in Appendix E

Sloane's Froglet (breeding)

Survey effort

Targeted surveys for the Sloane's Froglet were undertaken over two mornings on 3 and 4 July 2019. Sixteen farm dams were surveyed using call playback followed by a period of listening for ten minutes. Surveys were undertaken in line with the field Survey methods for Amphibians (DECC, 2009) with updated survey techniques listed on the Threatened Biodiversity Database Collection (Bionet, 2019).

Survey results

The Sloane's Froglet was not detected during the surveys. The farm dams lacked fringing vegetation and were heavily impacted by grazing stock. The poor condition of the vegetation is not considered optimal habitat for the Sloane's Froglet. One Beeping froglet (*Crinia parinsignifera*) was heard calling near Benambra Road.



Figure 4-2 Typical farm dam within development site

Little Eagle (breeding)

Survey effort

Surveys for the Little Eagle were undertaken between 5–8 October 2021. Stick nest surveys were conducted over areas of Grey Box woodland vegetation by two NGH Ecologists over a period of 4 hours, two 20-minute bird surveys were taken each morning of the October surveys.

Survey results

No large stick nests suitable for Little Eagle were observed within the woodland vegetation. Smaller stick nests were identified. These stick nests were generally less than 15cm in diameter and were generally made up of small twigs. Some nests were observed in active use by Australian Magpie (*Gymnorhina tibicen*) and Australian Raven (*Corvus coronoides*). These species were observed building and/or brooding on small stick nests.

Three raptors were observed during the bird surveys - Black-shouldered Kite (*Elanus axillaris*), Brown Falcon (*Falco berigora*) and Nankeen Kestrel (*Falco cenchroides*). One possible sighting of a Little Eagle occurred. A larger raptor was observed flying high up over the survey site, this species was too far away to be accurately identified using binoculars, however the underwing pattern observed may have been consistent with this species. However, only one individual was observed and no suitable breeding nests were detected. The species is not considered to be breeding within the development site and no threatened species polygon is required,

Nocturnal birds: Barking Owl and Bush-stone Curlew

Survey effort

Targeted surveys were completed on the nights of 13 and 14 November 2018 for a total of 8 person hours. A 100-watt spotlight was used from a slow-moving vehicle for visual searches along remnant vegetation, grassland and scattered paddock trees. Call playback of the calls of each species was played from a megaphone at three locations (Figure 4-3 to Figure 4-5), followed by a period of listening for responses.

Survey results

No threatened birds were seen or heard during the survey. Six Tawny Frogmouths (*Podargus strigoides*) were observed during the spotlighting surveys.

Masked Owl (breeding)

Survey effort

Targeted surveys for the Masked Owl were undertaken on the nights of 11 and 26 June 2019 for a period of approximately 8 person hours. Consecutive nights were unable to occur due to heavy rainfall on the 12 of June. A 100-watt spotlight was used from a slow-moving vehicle for visual searches along remnant vegetation and scattered paddock trees. Call playback of the calls of each species was played from a megaphone at three locations (Figure 4-3 to Figure 4-5) followed by a period of listening for responses.

Survey results

The Masked Owl was not detected during the night surveys.

Koala

Survey effort

Opportunistic surveys were undertaken on 8 to 9 November 2018. A targeted search for signs of the Koala was completed on 13 to 15 November 2018. Mature feed trees were searched for signs of Koalas (scats and scratches) taking a total of 2 person hours.

Survey results

No koalas or signs of koalas were seen over the five days of surveys. Scats underneath a River Red Gum were sent to a specialist consultant for identification; however, they were identified as a Brushtail Possum (*Trichosurus vulpecula*). (Pers. comm., G. Story, 2019). Five other scats found underneath River Red Gum trees were identified to be Brushtail Possum scats.

Based on the lack of scats or signs of the Koala, no nearby records the Koala and fragmented landscape, the Koala is not considered to use the habitats within the development site.

Woodland birds: Regent Honeyeater, Gang-Gang Cockatoo, Major Mitchell Cockatoo, Superb Parrot and Swift Parrot

Survey effort

A woodland bird census was completed at dusk on 13 and 14 November 2018 comprising three 20-minute surveys at multiple tree hollow locations within the development site, for a total of two hours over two days. Opportunistic surveys carried out over multiple site visits include traversing the site by car and on foot. Paddock trees and remnant trees were surveyed for evidence of nests.

Survey results

No threatened woodland birds were observed during the surveys. No evidence of nesting material was observed in remnant trees. A full list of bird species detected is shown in Appendix D.

While conducting surveys for the Pine Donkey Orchid between 5–8 October 2021, Superb Parrots were observed foraging along Back Creek. No evidence of species nesting or using hollows within the development site was observed. This species has been included within the ecosystem credits for as a foraging species.

Raptors: White-bellied Sea Eagle and Square-tailed Kite

Survey effort

Patches of remnant woodland vegetation and paddock trees were surveyed for the presence of stick nests over five days, for a total of eight person hours in November 2018. Cleared areas were also observed during daylight hours, opportunistically for hunting presence. Weather conditions recorded at the nearest weather station included minimum temperature 14.2°C, maximum temperature 27.7°C, and 12.2mm of rainfall received on 14 November and 6.8mm on 15 November 2019.

Survey results

No threatened raptors were observed during the field surveys. No evidence of large stick nests was observed in remnant trees.

Glossy Black Cockatoo (breeding)

Survey effort

Targeted surveys for breeding Glossy Black Cockatoo were undertaken on 11, 12 and 26 June 2019. Suitable hollow bearing trees were observed for signs of nesting. Woodland bird census was completed on 11 and 12 June 2019 comprising three 20-minute surveys at multiple tree hollow locations within the development site (Figure 4-3 to Figure 4-5).

Survey results

The Glossy Black Cockatoo was not observed during the targeted surveys.

Threatened Forbs and Grasses: Silky Swainson-pea (*Swainsona sericea*), Slender Darling Pea (*Swainsona murrayana*), Small Purple-pea (*Swainsona recta*), A spear-grass (*Austrostipa wakoolica*) and Spike Rush (*Eleocharis obicis*)

Survey effort

Targeted flora transects were undertaken of the woodland and grassland areas at 10m intervals in accordance with the NSW Guide to Surveying Threatened Plants (OEH, 2016) from

8 to 15 November 2018 for *Swainsona sericea*, *Swainsona murrayana*, *Swainsona recta*, *Austrostipa wakoolica* and *Eleocharis obicis*. Survey effort for these species total 16 person hours.

Survey results

No threatened forbs or grasses were detected within the survey area. No other pea species were detected. Two other *Austrostipa* species – *Austrostipa scabra* and *Austrostipa blackii* were present in the development site in the grassland areas and River Red Gum Woodland areas.

Small Scurf Pea – *Cullen parvum*

Survey effort

Surveys for the Small Scurf Pea were undertaken 30–31 January 2019. Surveys were undertaken using the parallel field traverse survey technique in accordance with the NSW guide to Surveying Threatened Plants (OEH, 2016). Areas of woodland vegetation were surveyed for a total of approximately 20 person hours.

Survey results

The Small Scurf pea was not detected during the field surveys. Two other pea species were detected in the roadside vegetation. These were identified from their seed pods as *Desmodium varians* and *Glycine tabacina*.

Pine Donkey Orchid – *Diuris tricolour*

Survey effort

Surveys for the Pine Donkey Orchid were undertaken from 5–8 October 2021. Surveys were undertaken using the parallel field traverse survey technique in accordance with the NSW guide to Surveying Threatened Plants (OEH, 2016). Areas of woodland vegetation with suitable habitat (Zone 3 and 7) were surveyed for a total of 4 hours per person over two days.

Survey results

The Pine Donkey Orchid was not detected during the field surveys. There was good autumn rainfall and weather conditions leading up to the surveys providing suitable germination for this species. Visibility in the understory was good, thus, the pine donkey orchid is considered unlikely to occur within the development site.

Threatened shrubs: Ausfeld's Wattle

Survey effort

Suitable habitat for this species could occur in areas of remnant woodland vegetation. Surveys were undertaken for this species on 9, 12 and 13 November 2018. Very few mid-storey species were present, and any shrubs would have been easily detected.

Survey results

Ausfeld's Wattle was not detected during the site surveys. Very few understory shrubs occurred within the remnant woodlands in the development site. It is considered unlikely that the species

would have been overlooked if present and they are not considered to occur within the development site.

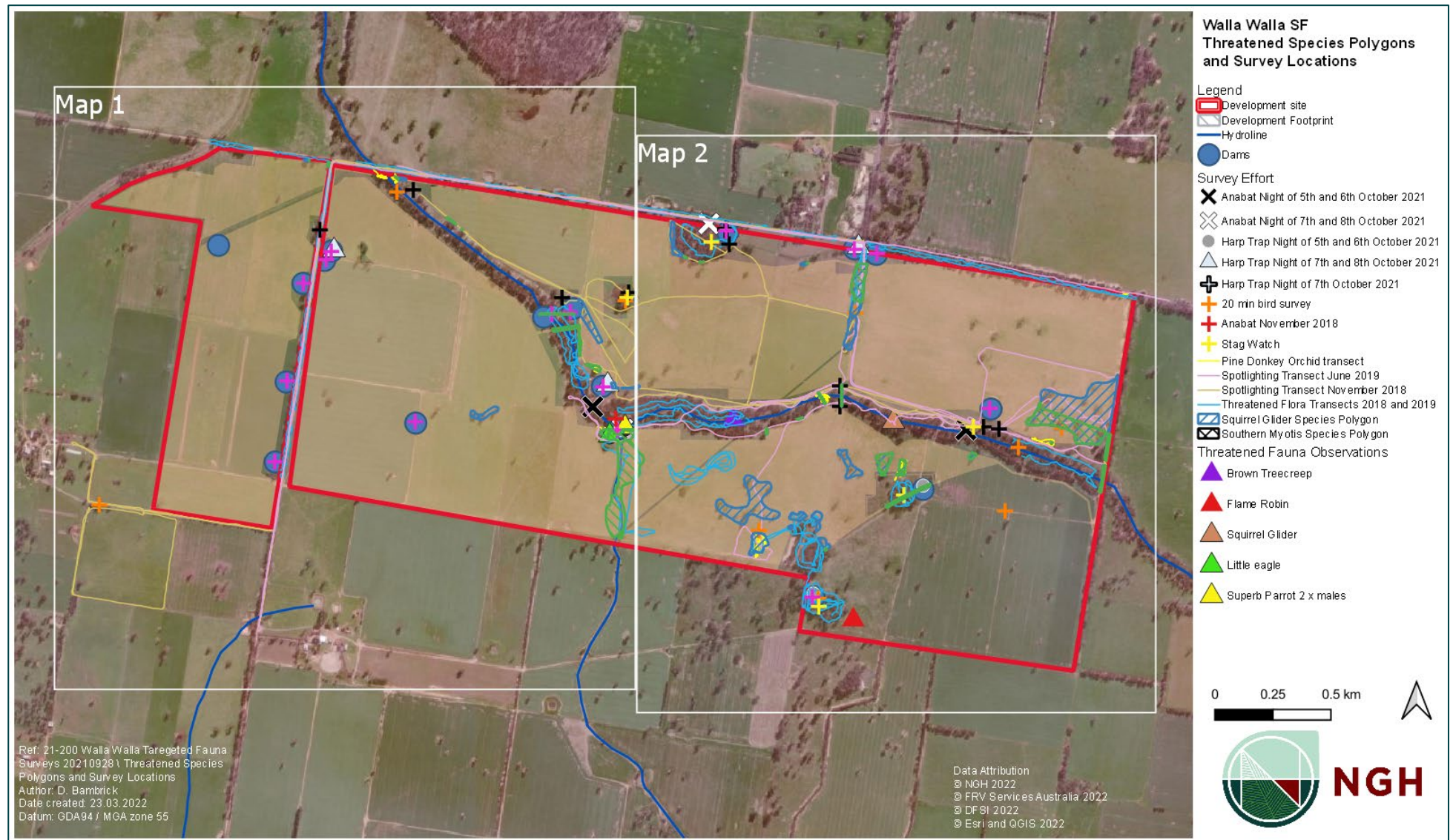


Figure 4-3 Threatened species polygons and targeted survey locations (overview)



Figure 4-4 Threatened species polygons and targeted survey locations (Map 1)



Figure 4-5 Threatened species polygons and targeted survey locations (Map 2)

4.3 Additional habitat features relevant to prescribed biodiversity impacts

Prescribed impacts relevant to the development site are shown in Table 4-7

Table 4-7 Prescribed Impacts relevant to the development site

Feature	Present	Description of feature characteristics	Threatened Species or community using or dependent on feature	Potential for impact
Karst, Caves, Crevices, Cliffs or other geological features of significance	No	n/a	n/a	n/a
Human-made structures	Yes	17 man-made farm dams.	- Sloane's Froglet (<i>Crinia sloanei</i>) - Southern Myotis (<i>Myotis macropus</i>) - Ecosystem species identified in section 4.1	Removal of habitat
Non-native vegetation	Yes	Cropped paddock and exotic pastures	Flame Robin (<i>Petroica phoenicea</i>)	Disturbance to foraging habitat
Habitat Connectivity	Yes	Riparian vegetation along Back Creek provides connectivity in an East West direction through the development site.	- Southern Myotis (<i>Myotis macropus</i>) - Squirrel Glider (<i>Petaurus norfolcensis</i>) - Ecosystem species identified in section 4.1	Disturbance on movement corridors
Waterbodies and hydrological processes	Yes	Back Creek	Southern Myotis (<i>Myotis macropus</i>)	Disturbance to foraging habitat
Wind farm development	No	No Wind farm development	n/a	n/a
Vehicle strikes	Yes	Increased traffic along Benambra Road.	Ecosystem species identified in section 4.1	Increased vehicle strikes

5. Matters of national environmental significance

An EPBC protected matters report was undertaken on 7 November 2018 and again on the 18 March 2022 (10km buffer of the development site) to identify Matters of National Environmental Significance (MNES) that have the potential to occur within the development site (Appendix F). Relevant to Biodiversity these include:

- Wetlands of International Importance – 7.
- Threatened Ecological Communities – 3.
- Threatened species – 34.
- Migratory species – 11.

Two species (Sloane's Froglet and White Throated Needletail) became newly listed as threatened species under the EPBC Act on 4 July 2019.

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

5.1 Wetlands of international importance

Seven wetlands of international importance were returned from the protected matters report. The nearest of these (within 180km of the development site) is Barmah Forest. NSW Central Murray State Forest occurs around 200km south-east of the development site. All other wetlands returned from the search are over 300km away.

5.2 Threatened Ecological communities

Three threatened ecological communities were returned from the protected matters report.

Characteristic tree species for two of these communities are present in the development site. These are:

- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia.
- White Box-Yellow Box-Blakley's Red Gum Grassy Woodland and Derived Native Grassland.

An assessment was undertaken to determine whether the vegetation met the condition threshold for these two federally listed ecological communities.

Grey Box grassy woodlands and derived native grasslands of South Eastern Australia

Remnant Grey Box (*E. microcarpa*) and Grey Box derived native grasslands are present in the development site. An assessment of the vegetation was made against the condition threshold for Grey Box Woodland listed in the EPBC Act (Table 5-1).

The remnant woodland patches are not considered to form part of the federally listed community due to being sufficiently degraded with too few trees. The derived grassland woodland patches are similarly not considered to form part of the federally listed community due to being sufficiently degraded with too few native species.

Table 5-1 Condition threshold assessment for federally listed Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia

EPBC Requirement	Woodland remnant	Derived Grassland
Is (or was previously) the most common tree species Grey Box	Yes, Grey Box dominant in 6 isolated patches.	Yes, Grey Box as scattered trees.
Is the patch at least 0.5ha in size	Yes – remnant patches range from 2.3ha to 7.1ha.	Yes, the extent of derived grassland is approximately 30 ha.
Do non-grass weeds make up more than 30% of the plant cover in the ground layer	No. Non grass weeds less than 5% cover.	No – Non grass weeds less than 5% cover.
Do trees cover at least 10% of the patch	Yes, approx. 15% overstory cover.	No. Derived Grassland with scattered trees.
Is the patch bigger than 2 ha	Yes, two patches are greater than 5 ha.	n/a.
Are there at least 8 trees/ha that contain hollows or have a DBH > 60cm	No, approx. 6 mature trees/ha.	n/a.
Are there at least 20 live trees/ha with a DBH >12cm.	No, approx. 6 mature trees per hectare. Not the listed community: degraded with too few trees.	n/a.
Is there evidence that Grey Box trees were once common in the patch	n/a.	Yes, scattered remnant Grey Box scattered trees.
Are there at least 12 perennial native species in the mid and ground layer	n/a.	No, 4 perennial native species in the mid and ground layer. Not the listed community: degraded with too few native species.

White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grasslands

A small patch of Yellow Box and Blakely's Red Gum is present on the western edge of the development site. An assessment was undertaken to determine if this community met the condition threshold for the federally listed community (Table 5-2).

The remnant woodland patch is not considered to meet the condition threshold for the federally listed community due to the predominantly exotic understory.

Table 5-2 Condition threshold assessment for the federally listed White Box – Yellow Box – Blakely’s Red Gum Grassy Woodlands and derived native grasslands

EPBC Requirement	Woodland remnant
Is, or was previously, at least one of the most common overstory species White Box, Yellow Bo or Blakely’s Red Gum.	Yes, Yellow Box and Blakely’s Red Gum common in the overstory.
Does the patch have a predominantly native understory	No – no native understory species present. The understory is dominated by exotic crop species. Not the listed ecological community

No federally listed ecological communities are considered to occur within the development site.

5.3 Threatened species

Thirty-four threatened species were returned from the protected matters report, comprising nine flora species, and 25 fauna species.

Site surveys did not detect any threatened flora species. Based on the highly disturbed understory from intensive grazing and cropping, no federally listed flora species are considered to occur on the development site.

Based on the fauna habitats in the development site, eight federally listed fauna species are considered to have the potential to utilise the habitats at the development site. These are:

Birds

- Regent Honeyeater (*Anthochaera phrygia*) – CE.
- Swift Parrot (*Lathamus discolor*) – CE.
- Superb Parrot (*Polytelis swainsonii*) – V.
- Painted Honeyeater (*Grantiella picta*) – V.
- White Throated Needletail (*Hirundapus caudacutus*) – V.

Mammals

- Koala (*Phascolarctos cinereus*) – E.
- Corben’s Long Eared Bat (*Nyctophilus corbeni*) – V.

Amphibians

- Sloane’s Froglet (*Crinia sloanei*) – E.

Surveys were undertaken for the five bird species during the field visits and were not detected on site. However, these species are highly mobile and may forage in the site on occasion. Potential impacts to these species are addressed in Section 7.4.3

Targeted Surveys were undertaken for Koala over a period of five days during the field visits. No signs, scats or traces of Koala were observed during the site visit. The site is highly fragmented and unlikely to constitute habitat for the Koala. There are no nearby records of the Koala and it is not considered to use the habitats within the development site.

ANABAT detectors were used on site at two locations for across four nights from November 2018 to detect microbat species present. Analysis of the Anabat data was undertaken and a *Nyctophilus* sp. was identified. However, the species present is not distinguishable and therefore, *Nyctophilus corbeni* is assumed to be present on site.

Targeted surveys for Sloane's Froglet were undertaken by NGH ecologists in July 2019 (see Section 4.2.5). 16 farm dams were surveyed using call playback followed by a period of listening for calls. Sloane's Froglet was not detected during the surveys. Farm dams lacked any fringing vegetation and were not considered optimal habitat for the Sloane's Froglet. It is not considered to occur in the development site.

5.4 Migratory species

Eleven migratory species were returned from the protected matters report. Of these, two species are considered to have the potential to occur in the development site. These are the:

- Fork-tailed Swift.
- White Throated Needletail.

Potential impacts to these species are addressed in Section 7.4.3

6. Avoid and minimise impacts

6.1 Avoiding and minimising impacts on native vegetation and habitat

6.1.1 Site selection – consideration of alternative locations/routes

During the development of the proposal, a number of alternatives were considered. These include the 'do nothing option' (not developing the solar farm), alternative proposal area locations, and developing different renewable technologies.

During the site selection process for the proposal, the proponent reviewed the solar generation potential of many areas in NSW using a combination of grid capacity, high level constraints analysis and experience of the proponent. The proposed site was selected because it provides the optimal combination of:

- Low environmental constraints (predominantly cleared cropping and grazing land).
- Level terrain for cost effective construction.
- Suitable quality solar resource.
- Compatible land use zoning (on the development site and considering adjacent land holdings).
- Manageable flood risk.
- Existing road access.
- Onsite connection to the transmission network.
- High levels of available capacity on the grid transmission system.
- Land availability and support from the landowner.

The development site is of a scale that allows for flexibility in the design, allowing site constraints identified during the EIS process to be avoided or effectively mitigated.

The remnant vegetation along Back Creek within the development site provides a wildlife corridor to Billabong Creek. Back Creek also connects with remnant vegetation along the eastern boundary of the subject land that extends along Benambra Road. The development footprint of the proposal was selected to avoid impacts to the remnant woodland along Back Creek. This would allow for existing connectivity across the landscape to be maintained.

The proposed layout achieves the objective of efficient electricity production while minimising environmental impacts overall.

Available grid capacity at a suitable voltage on the existing Jindera to Walla Walla transmission line was also instrumental in making Walla Walla an ideal choice for a renewable energy development.

6.1.2 Proposal components – consideration of alternate modes or technologies

The Australian Government's Large-scale Renewable Energy Target (LRET) and NSW Government's Renewable Energy Action Plan (REAP) outline the commitment by both Australia and NSW more specifically to reducing greenhouse gas (GHG) emissions and have set targets for increasing the supply of renewable energy. Other forms of largescale renewable energy accounted

for in the LRET include wind, hydro, biomass, and tidal energy. The feasibility of wind, solar, biomass, hydro and tidal projects depend on the availability of energy resources and grid capacity.

PV solar technology was chosen because it is cost-effective, low profile, durable and flexible regarding layout and siting. It is a proven and mature technology readily available for broadscale deployment at the site. Unlike wind farms, which are installed on elevated topography, solar energy farms can be effectively screened by vegetation to reduce the impact of visual disturbance, which would also provide additional habitat for local fauna. Solar energy farms also have few moving parts and are less likely to interfere with bird flight patterns.

Suitable solar resources have been identified in NSW, providing excellent opportunities for solar projects.

6.1.3 Proposal planning phase – detailed design

A preliminary constraints analysis was conducted by NGH, which informed the proposed site layout design. Impacts to vegetation constituting the highest ecological constraints was minimised as far as practical by:

- Reducing the clearing footprint of the project to avoid impacts to larger patches of remnant woodland where possible.
- Avoiding impacts to vegetation with the highest vegetation integrity score
- Locating ancillary facilities in areas where there are no biodiversity values.
- Avoiding impacts to Back Creek to allow for connectivity to be maintained across the landscape
- Maintaining the landscape to allow surface water to follow existing drainage routes.
- Avoiding impacts to ten farm dams and restoring and rehabilitating these as habitat for wildlife.
- Developing a biodiversity enhancement plan in consultation with local Landcare to make provision for the ecological restoration, rehabilitation and ongoing maintenance of retained native vegetation habitat on the development site.
- Establish plantings of native species to enhance connectivity between the riparian zone and roadside vegetation.

The final site layout and location has not been able to completely avoid all areas of biodiversity value because the length and size of the solar panel infrastructure means it is difficult to avoid small patches of vegetation and scattered paddock trees.

The substation and ancillary infrastructure would be located on a 4ha compound located on the north eastern corner of the development site, on previously cropped exotic vegetation with no impact on native vegetation.

No grading or permanent road infrastructure will be installed and sensitive areas of PCT 76 and PCT 278. Additional damage would be avoided by accessing the site via Benambra Road, which does not require any impact on native vegetation for widening.

The preferred option for the connection of the transmission line was directly into the existing 330 kV transmission line, running along the western boundary of the development site on previously cropped exotic vegetation. This option would completely avoid the need to remove native vegetation.

The proposed design footprint is detailed in Figure 6-1. While the south eastern corner of the development site would now no longer be impacted by the proposal, FRV is prepared to wear the responsibility to offset three paddock trees that would now be retained.

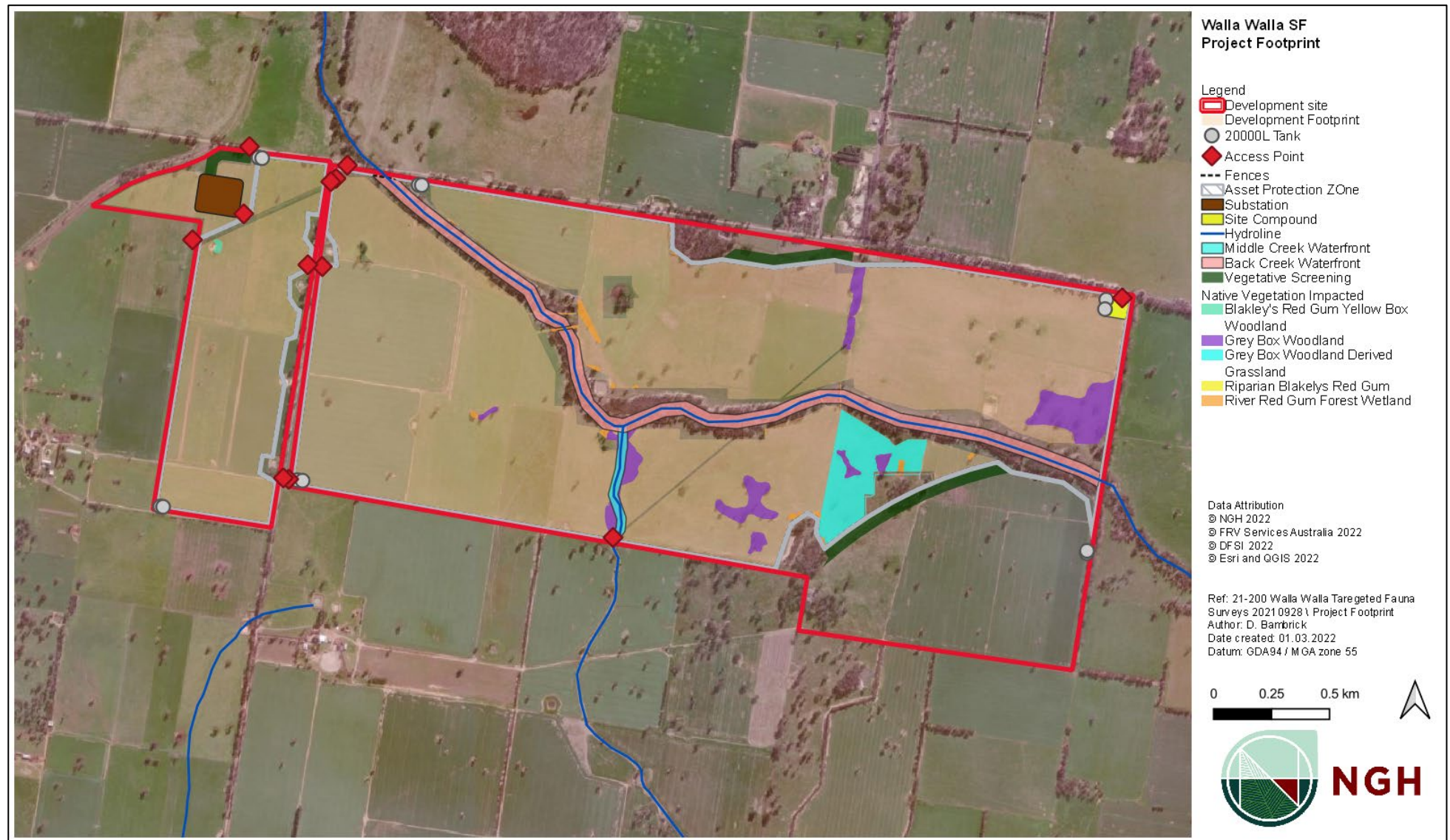


Figure 6-1 Final project footprint

6.2 Avoiding and minimising prescribed biodiversity impacts

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

- a) *associated with:*
 - i. *karst, caves, crevices, cliffs, rocks and other geological features of significance, or*
 - ii. *human made structures, or*
 - iii. *non-native vegetation.*
- b) *Impacts on areas connecting threatened species habitat, such as movement corridors.*
- c) *Impacts of development on water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining).*
- d) *Impacts on threatened and protected animals from turbine strikes from a wind farm*
- e) *Impacts of vehicle strikes on threatened species or on animals that are part of a TEC.*

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

6.2.1 Impacts of development on the habitat of threatened entities with karsts, caves, crevices, cliffs, rocks and other geological features of significance

There are no karsts, caves, crevices, cliffs or rocky outcrops within the development site.

6.2.2 Impacts of development on the habitat of threatened species or ecological communities associated with human made structures or non-native vegetation

There are 17 farm dams within the development site that could provide habitat for threatened Sloane's Froglet (*Crinia sloanei*) or foraging habitat for Southern Myotis (*Myotis macropus*). Targeted surveys were undertaken for Sloane's Froglet at each of the dams however they were not detected during field surveys. Southern Myotis was detected from ANABAT analysis in low numbers throughout the development site.

Non-native vegetation in the form of exotic grasses and crops is dominant in the development site. The Flame Robin (*Petroica phoenicea*) was detected in the development site in the South-East corner foraging in grassland areas adjacent to a River Red Gum woodland and fallen timber. Flame Robins often forage in open pastures and use fence posts or timber to pounce on invertebrate prey (OEH, 2017). As the priority within the development site was to reduce impacts to native vegetation and woodland areas, all open pastures and cleared land in the development site were utilised to form part of the development footprint and have not been avoided by the proposal. However, abundant open pastures are common in the adjacent paddocks outside the development site and surrounding area and provide ample similar habitat for the Flame Robin.

6.2.3 Impacts of development on movement corridors and areas connecting threatened species habitat

The proposal has been designed to retain the vegetation along Back Creek to maintain connectivity across the landscape to facilitate movement in an east west direction for mobile species. No impacts from solar infrastructure would occur within the riparian corridor of Back

Creek. Existing access tracks across the creek would be used for light vehicle movement, however one additional creek crossing would be required to allow for heavy vehicle traffic access. This crossing would be 12m wide and 180 long.

A Biodiversity Enhancement Plan will be implemented to improve the biodiversity values of the retained habitat such as strategic tree plantings to enhance connectivity and food source, installation of nest boxes, relocation of fallen timber and rehabilitation of farm dams for fauna habitat. Larger woodland patches would also be retained providing 'stepping-stone' refuges for mobile species in an existing highly cleared environment. This would enhance habitat for threatened species such as Squirrel Glider and Ecosystem Species defined in Section 4.1

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

Back Creek and Middle Creek run through the development site. The development footprint was selected to avoid developing the vegetated sections of Back Creek however one additional crossing would be required to allow movement of heavy vehicles. This crossing would create an impact 12 m wide and 180 m long. The proposed vehicle would be designed and constructed in accordance with the *Guidelines for Controlled Activities on Waterfront Land* (DPI, 2012) to minimise any impacts on the riparian corridor and hydrological flows.

Solar infrastructure may impact groundcover associated with Middle Creek (PCT 76 Derived Grassland) but this is not expected to impede natural surface water flows. The current site layout does not modify the topography of vegetation of ephemeral drainage lines, though this section of Middle Creek was already cleared of native vegetation.

Seventeen farm dams are present across the development site. Fifteen of these dams would be retained, with ten of these dams within woodland vegetation to be rehabilitated with native riparian vegetation. The remaining two would be filled by the proposal due to the size constraints of the solar trackers. These farm dams would be filled in during construction.

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

The proposal would not directly increase impacts of vehicle strikes on animals that are part of a TEC. No additional roads would be created, and threatened species would not be funnelled into transport corridors. However, an increase in vehicle traffic along Benambra Road may increase vehicle strikes on threatened species such as the Superb Parrot and Squirrel Glider outside of the study area. Site design would be unrelated to impacts of vehicle strikes as birds like the Superb Parrot generally fly above the canopy. Site management to enforce and reduce site speed limits would minimise impacts of vehicle strikes within the development site.

7. Impacts unable to be avoided

7.1 Direct impacts

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

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

Nature of impact	Extent	Frequency	Duration and timing	Consequence
Direct impacts				
Habitat clearance for permanent and temporary construction facilities (e.g., solar infrastructure, transmission lines, compound sites, stockpile sites, access tracks)	29.97ha	Once	Construction phase: short term	• Direct loss of native flora and fauna habitat. • Potential over-clearing of habitat outside proposed development footprint. • Injury and mortality of fauna during clearing of fauna habitat and habitat trees. • Disturbance to stags, fallen timber, and bush rock.
Removal of scattered paddock trees	47 trees	Once	Construction phase: short term	• Injury and mortality of fauna during clearing of fauna habitat and habitat trees. • Direct Loss of native flora and fauna habitat.
Displacement of resident fauna	Unknown	Regular	Construction & operation phase: long term	• Direct loss of native fauna. • Decline in local fauna populations.
Injury or death of fauna	Unknown	Regular	Construction Phase: Short Term	• Direct loss of native fauna. • Decline in local fauna populations.
Removal of habitat features e.g., HBTs	72 HBTs 2 farm dams	Regular	Construction phase: long term	• Direct loss of native fauna habitat. • Injury and mortality of fauna during clearing of habitat features.
Shading by solar infrastructure	330ha (70% of solar array)	Regular	Operational phase: long term	• Modification of native fauna habitat. • Potential loss of groundcover resulting in unstable ground surfaces and sedimentation of adjacent waterways.
Existence of permanent solar infrastructure	Total 438 ha	Regular	Operational phase: long-term	• Modification of habitat beneath array. • Reduced fauna movements across landscape due to fencing

Nature of impact	Extent	Frequency	Duration and timing	Consequence
(Fencing, array infrastructure).				Collision risks to birds and microbats (fencing).

7.1.1 Loss of native vegetation

29.97 ha of native vegetation would be removed by the development. Complete clearing is assumed of the woodland vegetation zones (Zone 1- 3 and Zones 5 -10). All overstory trees would be removed and any native groundcover composition is not expected to recover. The final vegetation integrity scores for these zones would be zero.

A summary of the changes in vegetation integrity scores as a result of vegetation clearing are documented for each vegetation zone in Table 7-2 below.

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

Zone ID	PCT	TEC and/or threatened species habitat?	Impact Area (ha)	Current vegetation integrity score	Future vegetation integrity score
1	PCT 277 _Grazed	Box-Gum Woodland EEC	0.18	12.1	0
2	PCT 76_Grazed	Inland Grey Box Woodland EEC	10.75	20.2	0
3	PCT 76_Wetland	Inland Grey Box Woodland EEC	3.30	14.1	0
4	PCT 76_Derived Grassland	Inland Grey Box Woodland EEC	11.47	16.2	0
5	PCT 76_Roadside	Inland Grey Box Woodland EEC	1.61	40.5	0
6	PCT 5_Grazed	-	0.16	11.4	0
7	PCT 5_Wetland	-	1.14	41.9	0
8	PCT 5_Low	-	0.65	5.6	0
9	PCT 5_Creekline	-	0.60	45.7	0
10	PCT 278_Creekline	Box-Gum Woodland EEC	0.11	43.1	0
TOTAL:			29.97		

7.1.2 Loss of scattered trees

63 living scattered trees were recorded within the development sites. 47 scattered trees are unable to be avoided by the development due to the size restrictions of the solar panels (Table 7-3). These trees would be removed by the proposal.

Table 7-3 Summary of loss of scattered trees

PCT	Scattered trees in development site (#)	Scattered trees impacted (#)
PCT 76 – Western Grey Box Tall Grassy Woodland	45	32
PCT 277 – Blakely's Red Gum – Yellow Box grassy tall Woodland	13	13
PCT 5 – River Red Gum herbaceous very tall open forest wetland on inner floodplains.	5	2
TOTAL:	63	47

7.1.3 Loss of species credit habitat

Two Squirrel Gliders were detected in the River Red Gum Woodland along Back Creek. This creekline would provide core habitat. Grey Box woodland areas within 100m of the creekline are considered to provide some secondary habitat and have been considered in the offset calculations. Southern Myotis was detected within the ANABAT detectors along Back Creek. Woodland areas within 200m of a waterbody within the development site has been considered in the offset calculations. The loss of species credit species habitat as a result of clearing is documented in Table 7-4 below.

Table 7-4 Summary of species credit species loss at the development site

Species Credit Species	Biodiversity risk weighting	Area of habitat lost	Species Credits
Squirrel Glider <i>Petaurus norfolcensis</i>	2.00	15.0ha	184
Southern Myotis <i>Myotis Macropus</i>	2.00	7.9ha	100

7.1.4 Loss of hollow-bearing trees

Hollow-bearing trees provide nesting and breeding habitat for arboreal mammals, birds and microbats. It is estimated 72 hollow-bearing trees would be removed by the proposal (Table 7-5).

Table 7-5 Hollow-bearing trees impacted by the proposal

Zone ID	PCT	Impact Area (ha)	Average HBTs / plot (0.1ha)	Estimated HBTs removed/zone
1	PCT 277 _Grazed	0.18	6	6
2	PCT 76_Grazed	10.77	1	10
3	PCT 76_Wetland	1.76	1	4
4	PCT 76_Derived Grassland	29.62	0	0

Zone ID	PCT	Impact Area (ha)	Average HBTs / plot (0.1ha)	Estimated HBTs removed/zone
5	PCT 76_Roadside	2.26	2	6
6	PCT 5_Grazed	0.59	2	2
7	PCT 5_Wetland	1.39	2	2
8	PCT 5_Low	0.62	0	0
9	PCT 5_Creekline	0.19	0	0
10	PCT 278_Creekline	0.24	0	0
	Scattered trees	47 trees	n/a	46
TOTAL:				76

7.2 Indirect impacts

Indirect impacts can occur when the proposal or activities relating to the construction or operation of the proposal affect native vegetation, threatened ecological communities or threatened species habitat beyond the development site. Table 7-6 below details the indirect impacts required to be assessed by the BAM.

Table 7-6 Potential impacts on biodiversity during the construction and operational phases

Nature of impact	Impact	Duration and timing	Vegetation communities, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Indirect impacts (those listed below are included in the BAM)				
Inadvertent impacts on adjacent habitat or vegetation.	Possible – clearing may inadvertently extend into retained vegetation patches.	Construction phase: short term.	• PCT 76 – Western Grey Box tall grassy woodland. • PCT 5 - River Red Gum herbaceous-grassy very tall open forest. • PCT 277 – Blakely’s Red Gum-Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion. • PCT 278 – Riparian Blakely’s Red Gum – box – sedge – grass tall open forest of the central NSW South Western Slopes Bioregion. • Squirrel Glider.	• Direct loss of native flora and fauna habitat. • Injury and mortality of fauna during clearing of fauna habitat and habitat trees. • Disturbance to stags, fallen timber. • Increased edge effects.
Reduced viability of adjacent habitat due to edge effects.	Unlikely – retained vegetation is currently isolated and surrounded by exotic vegetation.	n/a.	n/a.	n/a
Reduced viability of adjacent habitat due to noise, dust, heat or light spill.	Possible – construction works may impact on habitat quality in retained vegetation.	Operational phase: short-term.	• Squirrel Glider. • Southern Myotis. • Flame Robin. • Brown Tree Creeper.	• May alter fauna activities and/or movements. • Loss of foraging or breeding habitat. • Inhibit the function of plant species, soils and dams.
Transport of weeds and pathogens from the site to adjacent vegetation.	Possible – may be brought in soils or unclean machinery.	Construction & operational phase: long-term.	• PCT 76 – Western Grey Box tall grassy woodland. • PCT 5 - River Red Gum herbaceous-grassy very tall open forest. • PCT 277 – Blakely’s Red Gum-Yellow	• Degradation of community biodiversity and integrity. • Weed encroachment (remnant veg). • Movement of weeds by water to downstream habitats.

Nature of impact	Impact	Duration and timing	Vegetation communities, threatened species and habitats likely to be affected	Consequence for bioregional persistence
			Box grassy tall woodland of the NSW South Western Slopes Bioregion. PCT 278 – Riparian Blakely's Red Gum – box – sedge – grass tall open forest of the central NSW South Western Slopes Bioregion.	
Increased risk of starvation, exposure and loss of shade or shelter.	Unlikely – Food sources still abundant.	n/a.	n/a.	n/a.
Loss of breeding habitats.	Possible.	Construction phase: long term.	- Squirrel Glider. - Southern Myotis. - Flame Robin. - Brown Treecreeper.	Loss of potential breeding habitat.
Trampling of threatened flora species.	Unlikely – no known threatened flora species in adjacent vegetation.	n/a.	n/a.	n/a.
Inhibition of nitrogen fixation and increased soil salinity.	Unlikely – Ground water table unlikely to change. Majority of site is currently under cropping rotation.	n/a.	n/a.	n/a.
Fertiliser drift.	Unlikely – Fertilisers unlikely to be applied.	n/a.	n/a.	n/a.
Rubbish dumping.	Unlikely – Development site will be fenced.	n/a.	n/a.	n/a.
Wood collection.	Unlikely – Development site will be fenced.	n/a.	n/a.	n/a.

Nature of impact	Impact	Duration and timing	Vegetation communities, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Bush rock removal and disturbance.	Unlikely – No bush rock in development site.	n/a.	n/a.	n/a.
Increase in predatory species populations.	Possible – additional shelter habitat for predatory invasive species.	Construction & operational phase: long term.	• Squirrel Glider. • Flame Robin. • Brown Treecreeper.	• Injury and mortality of fauna from predatory species.
Increase in pest animal populations.	Possible - additional shelter habitat for invasive species.	Construction & operational phase: long term.	• Squirrel Glider. • Flame Robin. • Brown Treecreeper.	• Injury and mortality of fauna from predatory species. • Disturbance to native flora and fauna. • Loss of foraging or breeding habitat.
Increased risk of fire.	Unlikely – No battery storage in proposal.	n/a.	n/a.	n/a.
Disturbance to specialist breeding and foraging habitat.	Unlikely – No specialist breeding or foraging habitat.	n/a.	n/a.	n/a.
Earthworks and mobilisation of sediments.	Possible - loss of groundcover during construction may increase mobilisation of sediments.	Construction: short term.	• PCT 5 - River Red Gum herbaceous-grassy very tall open forest. • PCT 76 – Western Grey Box tall grassy woodland. • PCT 277 – Blakely's Red Gum-Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion. • PCT 278 – Riparian Blakely's Red Gum – box – sedge – grass tall open forest of the central NSW South Western Slopes Bioregion.	• Erosion and sediment deposition pollution on downstream habitats. • Alternation of surface watercourses (isolating high biodiversity value communities).

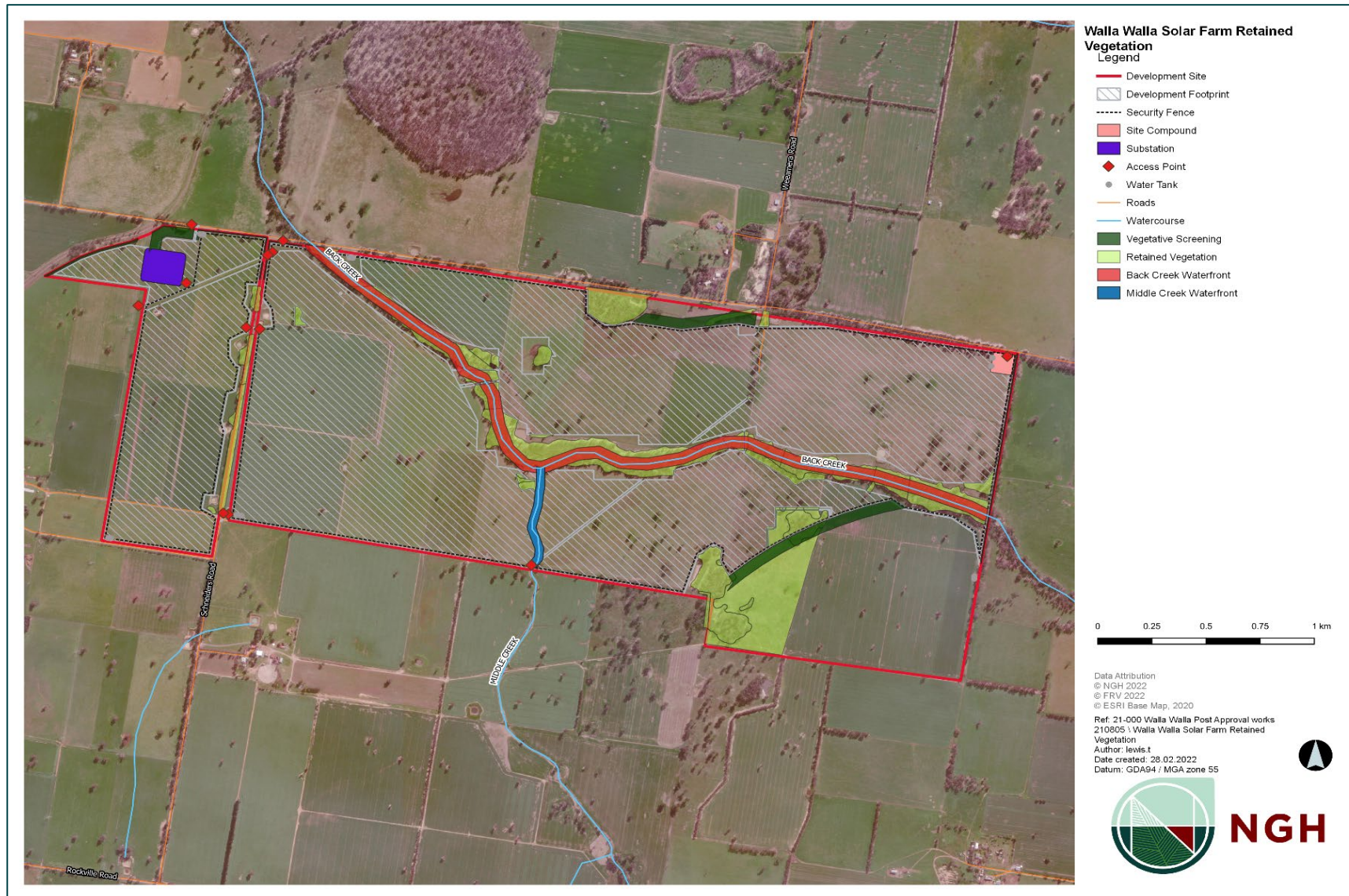


Figure 7-1 Estimated zones of indirect impact for the proposal

7.3 Prescribed impacts

The following prescribed biodiversity impacts are relevant to the proposal:

- Impacts of development on the habitat of threatened species or ecological communities associated with human made structures and non-native vegetation.
- Impacts of the development on habitat connectivity for threatened species.
- Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities.
- Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC.

7.3.1 These are discussed in detail below, Impacts of development on human made structures and non-native vegetation

Two human made dams would be filled in within the development site. Farm dams may provide habitat for the Sloane's Froglet, Southern Myotis or Ecosystems listed in Section 4.1. Surveys were undertaken for the Sloane's Froglet during breeding season, and they were not detected within the development site. Southern Myotis occurred in the development site and may utilise farm dams for foraging. The removal of these two dams could impact on foraging or refuge habitat that threatened species may use on occasion.

Fifteen farm dams would be retained for any threatened species that may use farm dams for refuge sites or foraging sources. Ten of these farm dams would be enhanced with native plantings and partial fencing from stock. These dams would contain better habitat and maintain habitat for threatened species within the development site.

No other human made structures would be impacted within the development site.

Non-native groundcover species occupying much of the development site would be disturbed and shaded by solar infrastructure.

Flame Robins detected in the development site were observed foraging in exotic pastures. Flame Robins are known to forage in exotic and native pastures. The breeding habitat of the Flame Robin is tall moist eucalypt forests and woodlands, with nests built in sheltered sites dominated by native grasses (OEH, 2017). The non-native vegetation does not support breeding habitat for the Flame Robin and provides foraging habitat only. The Flame Robin is highly mobile, being migratory, and abundant in open pastures and cleared lands that occurs in the surrounding and adjacent paddocks outside the development site. Woodland vegetation would be retained and enhanced within the development site. It is not anticipated any impacts would occur to the Flame Robin for the clearing of non-native vegetation. The extent of cleared agriculture land in the region is considerable and native animals foraging in cleared exotic vegetation environments have ample access to suitable habitat in the surrounding areas. FRV considers that retained habitat for the Flame Robin will be improved as a result of the proposal.

7.3.2 Impacts of development on habitat connectivity

Vegetation along Back Creek provides habitat connectivity between the development footprint, the development site and surrounding locality. This habitat could be utilised by threatened species such as Southern Myotis, Squirrel Glider and Ecosystem species listed in section 4.1 to facilitate movement throughout the landscape.

Retaining the vegetation along Back Creek in the development site will maintain connectivity across the landscape to facilitate movement in an east-west direction. This creekline also connects to the remnant roadside vegetation that would be retained. Larger woodland patches would also be retained providing 'stepping-stone' refuges for mobile species in an existing highly cleared environment and strategic plantings of native tree and shrub species will be used to enhance connectivity. Due to the highly cleared and fragmented landscape within the development site the proposal is not likely to disrupt the movement of any threatened species.

7.3.3 A biodiversity enhancement plan will be implemented to improve the biodiversity values of the retained habitat such as strategic tree plantings to enhance connectivity and food source, installation of nest boxes, relocation of fallen timber and rehabilitation of farm dams for fauna habitat. Impacts on development on water quality, waterbodies and hydrological processes

The majority of the riparian vegetation along would be retained minimising impacts to water flow and water quality. A creek crossing across Back Creek would impact the Back Creek riparian corridor and adjoining woodland. This crossing would impact an area of 0.19ha of native vegetation. The remaining crossings utilise existing track crossings which are cleared of native vegetation. The proposed vehicle crossings would both be designed and constructed in accordance with the *Guidelines for Controlled Activities on Waterfront Land* to minimise impacts on hydrological flows.

Minimal infrastructure including solar arrays may intersect Middle Creek, but this is not expected to impede natural surface water flows.

The construction of the proposal would involve a range of activities that would disturb soils and potentially lead to sediment laden runoff affecting local waterways during rainfall events. These potential impacts are unlikely to significantly impact water quality with the implementation of recommended mitigation measures including erosion and sedimentation controls. The use of fuels and other chemicals on site during construction poses a risk of surface water contamination in the event of a spill. Mitigation measures to implement spill management procedures would minimise impacts to waterways and hydrological processes.

7.3.4 Impacts of vehicle strikes

The proposal would not directly increase impacts of vehicle strikes on threatened species. The development site is surrounded by country roads that mobile threatened species would currently be crossing. However, an increase in vehicle traffic may increase vehicle strikes on these threatened species outside of the study area. Site management to enforce and reduce site speed limits would minimise impacts of vehicle strikes within the subject land. Impacts to Matters of National Environmental Significance

7.4 Impacts to Matters of National Environmental Significance

7.4.1 Wetlands of international importance

No wetlands of international importance would be impacted by the development.

7.4.2 Threatened Ecological Communities

No federally listed communities would be impacted by the development site.

7.4.3 Threatened species

Based on a habitat assessment and site surveys six federally listed species could occur in the development site. These are:

- Superb Parrot (*Polytelis swainsonii*) – V.
- Painted Honeyeater (*Grantiella picta*) – V.
- Swift Parrot (*Lathamus discolor*) – CE.
- Regent Honeyeater (*Anthochaera phrygia*) – CE.
- Corben's Long-eared Bat (*Nyctophilus corbeni*) – V.
- White-throated Needletail (*Hirundapus caudacutus*) – V.

Superb Parrot, Painted Honeyeater, Corben's Long-eared Bat and White-throated Needletail

These species are listed as vulnerable under the EPBC Act. Suitable Woodland habitat is present for the Swift Parrot, Painted Honeyeater, Corben's Long-eared Bat and White-throated Needletail in the development site. Surveys were undertaken for this species and they were not detected. However, it is considered these species may forage in the development site on occasion.

EPBC assessments of significance (AoS) were completed for these four fauna species (refer Appendix H). These concluded that a significant impact was unlikely, on the basis that the proposal would not:

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

A referral to the Federal Department of Environment is not considered necessary for these species.

Specific mitigation and management measures have been recommended in Section 8 to avoid impacts to these species. With the implementation of these measures, impacts to these species are unlikely and no further assessment is required.

Regent Honeyeater and Swift Parrot

These species are listed as Critically Endangered under the EPBC Act. Suitable woodland habitat is present for the Swift Parrot and Regent Honeyeater in the development site. It is considered these species may forage in the development site on occasion.

EPBC AoS were completed for these two fauna species (refer Appendix H). These concluded that a significant impact was unlikely, on the basis that the proposal would not:

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

A referral to the Federal Department of Environment is not considered necessary for these species.

Specific mitigation and management measures have been recommended in Section 8 to avoid impacts to these species. With the implementation of these measures, impacts to these species are unlikely and no further assessment is required.

7.4.4 Migratory species

Based on a habitat assessment, the development site contains habitat that could be potentially used by two federally listed migratory species could occur in the development site. These are:

- Fork-tailed Swift (*Apus pacificus*).
- White-throated Needletail (*Hirundapus caudacutus*).

An AoS was undertaken for these species (Appendix H) and determined that the project is unlikely to cause a significant impact to any criteria. The proposal is therefore considered unlikely to significantly impact the Fork-tailed Swift or the White-throated Needletail and no referral to the Federal Department of Environment is considered necessary.

7.5 Limitations to data, assumptions and predictions

The floristic plots are based on a single visit survey. Floristic surveys were undertaken during the optimal flowering time for species in spring 2018, however it is possible that not all plant species were detected that may be present at the site due to seasonal and climatic constraints. In particular, inconspicuous or geophytic species which flower outside the surveyed period may not have been recorded.

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

8. Mitigating and managing impacts

8.1 Mitigation measures

A general summary of the key measures required to mitigate the impacts of the proposal is provided below. FRV is committed to maximising opportunities to enhance the biodiversity value of retained habitat features and has commissioned a Biodiversity Enhancement Plan for the development site, developed by Holbrook Landcare. This Biodiversity Enhancement Plan is provided in Appendix J Mitigation measures proposed to manage impacts, including proposed techniques, timing, frequency, responsibility for implementing each measure, risk of failure and an analysis of the consequences of any residual impacts are provided in Table 8-1.

8.1.1 Impacts from the clearing of vegetation and habitats

1. Timing of works to avoid critical lifecycle events.
2. Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or wildlife handler.
3. Relocate habitat features (fallen timber, hollow logs) into retained vegetation patches within the development site.

8.1.2 Indirect impacts

1. Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed.
2. Noise barriers or daily/seasonal timing of construction and operation activities to reduce impacts of noise.
3. Light shields or daily/seasonal timing of construction activities to reduce impacts of light spill.
4. Adaptive dust monitoring programs to control air quality.
5. Temporary fencing to protect significant environmental features such as riparian zones.
6. Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas.
7. Staff training and site briefing to communicate environmental features to be protected and measures to be implemented.
8. Preparation of a Biodiversity Management Plan to regulate activity in clearing of vegetation, demonstrate adaptive management to reduce indirect and cumulative impacts in retained vegetation, undertake pest animal management and weed management.

8.1.3 Prescribed impacts

1. Screening and landscaping plantings to be comprised of local indigenous species representative of the vegetation in the development site. The food potential for fruit, pollen and nectar feeders will be considered in selecting component species.
2. Install approximately 120 nesting boxes for birds and mammals across the development site.
3. 10 retained dams would be planted with native riparian vegetation and transformed into small, created wetlands to benefit native amphibians, birds, reptiles and invertebrates.
4. Sediment barriers and spill management protocols to control the quality of water runoff from the site into the receiving environment.
5. Enforce site speed limits to reduce impacts of vehicle strikes on threatened fauna.
6. Involve a local Landcare group or educational institution in ongoing biodiversity monitoring and enhancement.
7. No barbed wire to be used on any fencing within the development site.
8. Continue to liaise with Holbrook Landcare and local plant nurseries to ensure plantings are native and in keeping with the locality.

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

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Displacement of resident fauna through vegetation clearing and habitat removal						
Time works to avoid critical lifecycle events.	- Hollow-bearing trees would not be removed during breeding season (spring to summer). - If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken to ensure no impacts to fauna would occur.	Construction.	Regular.	Contractor.	Moderate.	Species not detected during pre-clearing surveys may be impacted.
Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecologist or wildlife handler.	- Pre-clearing checklist. - Tree clearing procedure.	Construction.	Regular.	Contractor.	Moderate.	Species not detected during pre-clearing surveys may be impacted.
Relocate habitat features (fallen timber, hollow logs) from within the development site.	Tree-clearing procedure including relocation of habitat features to adjacent area for habitat enhancement.	Construction.	Regular.	Contractor.	Low.	None.
Indirect impacts on native vegetation and habitat						
Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance: for example, removal of native vegetation by chainsaw, rather than heavy machinery, is	- Approved clearing limits to be clearly delineated with temporary fencing or similar prior to construction commencing. - No stockpiling or storage within dripline of any mature trees.	Construction.	Regular.	Contractor.	Low.	None.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
preferable in situations where partial clearing is proposed.	- In areas to clear adjacent to areas to be retained, chainsaws would be used rather than heavy machinery to minimise risk of unauthorised disturbance. - Access to the Box-Gum Woodland EEC would not be permitted via vehicles to reduce understorey impacts and clearing.					
Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise.	A Construction Environmental Management Plan would include measures to avoid noise encroachment on adjacent habitats such as avoiding night works as much as possible.	Construction.	Regular.	Contractor.	Low.	None.
Light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill.	- Avoid night works. - Direct lights away from vegetation.	Construction/ Operation.	Regular.	Contractor.	Low.	None.
Adaptive dust monitoring programs to control air quality.	- Daily monitoring of dust generated by construction activities. - Construction would cease if dust observed being blown from site until control measures were implemented. - All activities relating to the proposal would be undertaken with the objective of preventing visible dust emissions from the	Construction.	Regularly.	Contractor.	Moderate.	Sedimentation in ephemeral waterways and dams.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	development site.					
Temporary fencing to protect significant environmental features such as riparian zones.	Prior to construction commencing, exclusion fencing, and signage would be installed around habitat to be retained.	Construction.	Regularly.	Contractor.	Low.	None.
Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas.	- A Weed Management procedure would be developed for the proposal to prevent and minimise the spread of weeds. This would include: - Management protocol for declared priority weeds under the <i>Biosecurity Act 2015</i> during and after construction. - Weed hygiene protocol in relation to plant, machinery, and fill. - Any occurrences of pathogens such as Myrtle Rust and Phytophthora would be monitored, treated, and reported. - The weed management procedure would be incorporated into the Biodiversity Management Plan.	Construction/operation.	Regular.	Contractor.	Moderate.	Weed encroachment.
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented.	- Site induction. - Toolbox talks.	Construction.	Regular.	Contractor.	Moderate.	Impacts to native vegetation or threatened species for staff training not being followed.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Preparation of a Biodiversity Management Plan to regulate activity in vegetation and habitat adjacent to the proposed development.	- Preparation of a Biodiversity Management Plan that would include protocols for: - Protection of native vegetation to be retained. - Best practice removal and disposal of vegetation. - Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist. - Weed management. - Pest animal management - Unexpected threatened species finds. - Exclusion of vehicles through sensitive areas. - Rehabilitation of disturbed areas.	Construction.	Regular.	Contractor.	Moderate.	Impacts to native vegetation or threatened species for staff training not being followed.
Prescribed biodiversity impacts						
Screening and landscaping plantings to be comprised of local indigenous species representative of the vegetation in the development site.	Screening and landscaping plantings (up to 50 m where practicable) to be comprised of local indigenous species representative of the vegetation in the development site.	Operation.	Regular.	Client.	Moderate.	Plants not surviving.
Install approximately 120 nesting boxes for birds and mammals across the development site.	Nesting boxes would be designed to meet the requirements of target species including Squirrel Gliders, bats,	Construction.	Regular.	Client.	Low.	Use of nesting boxes by exotic pest animals.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	parrots and owls. Nesting boxes would be monitored periodically for use and/or replacement.					
10 retained dams would be planted with native riparian vegetation and transformed into small, created wetlands for wildlife.	Riparian plantings would comprise local native sedges, rushes, grasses and small shrubs.	Construction.	Regular.	Client.	Moderate.	Plants not surviving or being overtaken by weeds.
Sediment barriers and spill management procedures to control the quality of water runoff released from the site into the receiving environment.	- An erosion and sediment control plan would be prepared in conjunction with the final design and implemented. - Spill management procedures would be implemented.	Construction.	Regular.	Contractor.	Moderate.	Impacts may occur to waterway if erosion and sedimentation control plan not implemented.
Staff training and site briefing to communicate impacts of traffic strikes on native fauna.	- Awareness training during site inductions regarding enforcing site speed limits. - Site speed limits to be enforced to minimise fauna strike.	Construction/operation.	Regular.	Contractor.	Moderate.	Fauna strikes from vehicles.
Involve a local Landcare group or educational institution in ongoing biodiversity monitoring and enhancement.	- Involve a third party organisation to monitor and maintain biodiversity enhancement activities. - Communicate outcomes with third parties to contribute knowledge of how biodiversity can be preserved on solar farms.	Operation.	Regular.	Contractor.	Moderate.	Lack of interest from third parties.
Plain wire instead of barbed	Security fencing would be	Construction.	Regular.	Client.	Low.	None.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
used on top of the perimeter fence and stock fencing to reduce impacts on birds and Squirrel Glider.	comprised of approximately 2 m high cyclone fencing. Use plain wire perimeter fencing where this intersects woodland to avoid potential entrapment of fauna on fence.					
Perimeter fence would be located to avoid, where possible, segmenting patches of native vegetation to facilitate native fauna movements.	The final 'for construction' design would include the perimeter fencing avoiding rather than intersecting patches or retained woodland.	Construction.	Regular.	Client.	Low.	None.

9. Serious and Irreversible Impacts (SAIL)

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

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

9.1 Potential Serious and Irreversible Impact entities

9.1.1 Threatened ecological communities

One threatened ecological community will be impacted by the proposal that is listed as a potential SAIL entity in the *Guidance to assist a decision-maker to determine a serious and irreversible impact*. This is the:

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

The Box-Gum Woodland TEC is potentially at risk of a serious and irreversible impact according to Principles 1 and 2:

1. It will cause a further decline of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to be in a rapid rate of decline
2. It will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very small population size

An assessment of impacts to this TEC is provided in section 9.2.

9.1.2 Threatened species

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

9.1.3 Additional potential entities

No further species were considered to be potential SAIL entities.

9.1.4 Data and information used in SAIL assessment

The following information sources were used in the SAIL Assessment:

- DPE Riverina VIS Mapping: VIS_ 4469.
- DPE Threatened Species Profile: *White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland*,

Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions.

- NSW threatened Species Scientific Committee (TSSC), (2020) Final determination - White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, NSW Government
- Threatened Biodiversity Database Collection (TBDC), NSW Government accessed at <https://www.environment.nsw.gov.au/AtlasApp/Default.aspx> March 2022
- Commonwealth Conservation Advice – Box Gum Grassy Woodland and derived native grasslands

9.2 Assessment of Serious and Irreversible Impacts

9.2.1 White Box – Yellow Box – Blakely's Red Gum woodland (Box Gum woodland)

An assessment of the impacts to Box-gum Woodland was undertaken. Figure 9-1 shows the location of the Box-gum Woodland within the development site.

Criteria for assessment of TECs at risk of serious and irreversible impacts	
1. The assessor is required to provide further information regarding the impacts on each TEC at risk of SAIL. This must include the actions and measures taken to avoid the direct and indirect impact on the TEC at risk of an SAIL.	
The impacts to Box-Gum Woodland within the development site is comprised of clearing a small 0.2 ha isolated patch within the middle of a cleared agricultural paddock that undergoes regular cropping and grazing (Zone 1 - PCT 277), and an Asset Protection Zone of approximately 0.11 ha within a 6.9 ha riparian corridor (Zone 10 - PCT 278). Impacts to this SAIL TEC have been avoided where possible, with a maximum of 0.29ha (4.2 % of TEC within Development Site) proposed to be impacted, the large majority of the patch will be retained (95.8% of TEC within the Development Site will be retained) The 0.2 ha patch is of low quality that comprises of four remnant trees over an almost completely exotic groundcover. Small, isolated patches of woodland vegetation are unable to be avoided because the size constraints of the solar panels and trackers are unable to adapt around small patches of vegetation. Additionally, retained vegetation in the development site create potential shadowing effects reducing the capacity of the solar panels. Avoiding the small 0.2 ha patch would have required moving solar panels into larger more intact patches of remnant vegetation. Impacts to the 0.11 ha riparian form of the TEC will be limited to 0.09ha for fencing of site infrastructure.	
a)	1. The assessor must consult the TBDC and/or other sources to report on the current status of the TEC, including:
b)	a) Evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW AND the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal).
The reduction in Geographic Distribution is defined as greater than 80% in ten years or three generations.	

Criteria for assessment of TECs at risk of serious and irreversible impacts

(TBDC, 2022). The current total geographic extent of the TEC in NSW and the estimated reduction in geographic extent of the TEC since 1970 is not defined in the TBDC, however a search of Bionet PCT data was undertaken. The percent reduction in extent for PCT 277 is 94% with an estimated 500,000ha pre-European extent and current extent to be 30,000 ha. The percent reduction in extent for PCT 278 is 80% with an estimated 30000ha pre-European extent and current extent to be 6000 ha.

b) Extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by:

- i) change in community structure**
- ii) change in species composition**
- iii) disruption of ecological processes**
- iv) invasion and establishment of exotic species**
- v) degradation of habitat, and**
- vi) fragmentation of habitat.**

The TEC has been subjected to grazing and clearing for agricultural purposes since the early 1800s due to its occurrence on moderate to high fertility soils, leading to extensive structural and compositional degradation, including loss of the upper stratum during land clearing activities, and failure of the stratum to regenerate. Grazing is also associated with ground compaction, erosion, and ground enrichment of the topsoil, leading to degradation of the lower stratum, including the partial or complete replacement of tussock forming grasses, shrubs and forbs, and the proliferation in many places of bracken thickets. Grazing impacts have been further exacerbated by the application of chemical fertilisers, removal of large trees, tilling of the soil and sowing of exotic crop species.

Remnants are placed further at threat by the invasion of naturalised exotic plants, dryland salinity due to elevated water tables, and elevated soil nitrogen as a result of the application of chemical fertilizers.

c) Provide evidence of restricted geographic distribution (Principle 3, clause 6.7(2) BC Regulation), based on the TEC's geographic range in NSW according to the:

- i) extent of occurrence**
- ii) area of occupancy, and**
- iii) number of threat-defined locations.**

According to the Final Determination to list the TEC as Critically Endangered, the distribution of Box Gum Woodland is not restricted. The extent of occurrence of the TEC is 702,800 square km based on a minimum convex polygon enclosing known occurrences of the community using the method of assessment recommended by IUCN. The estimated area of occupancy (AOO) is 151,100 square km based on 10x10 km grid cells, the scale recommended for assessing AOO by IUCN and applying a minimum occupancy threshold of 1% (NSW TSSC, 2020).

c) d) Provide evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation).

The TEC is not listed as an SAIL under Principle 4. The NSW Profile for this TEC.

Criteria for assessment of TECs at risk of serious and irreversible impacts

(https://www.environment.nsw.gov.au/AtlasApp/UI_Modules/TSM_/ProfileEdit.aspx?pld=10837&pType=Other) lists several management actions that can be undertaken to assist the TEC.

2. In relation to the impacts from the proposal on the TEC at risk of an SAIL, the assessor must include data and information on:

a) The impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal

i) I in hectares, and

ii) as a percentage of the current geographic extent of the TEC in NSW

0.29 ha of Box-Gum Woodland would be directly impacted by the proposal through vegetation clearing, comprised of 0.2 ha of PCT 277 and 0.1 ha of PCT 278.

No indirect impacts are considered to occur with the no changes in fire regime, fragmentation or changes to species composition anticipated for retained vegetation.

NSW Threatened Species Scientific Committee (2020) estimates the AOO is 151, 100km² of Box-gum Woodland remaining in the NSW South Western Slopes IBRA Region. Approximately 0.29 ha is proposed to be removed which is <0.001% of the estimated extent remaining.

b) The extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by

i) estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500 m of the Development footprint or equivalent area for other types of proposals

0.29 ha of Box-gum Woodland would be removed. It is likely the remaining 6.6 ha of Box gum woodland within the development footprint will be avoided by the development which would improve in condition through biodiversity enhancement proposed by the proponent and reduced impacts of cropping. The loss of cropping adjacent to the Box-gum woodlands will reduce fertiliser and herbicide impacts and erosion. NGH estimates that there may be approximately 99 ha of this TEC within 500 m of the development footprint, comprising of 34ha of Woodland and 65ha of Derived Grassland based on State Vegetation Mapping (VIS_4469) (Figure 9-1).

ii) describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by:

*** Detailing the distance between isolated areas of the TEC, presented as the average distance if the remnant is retained AND the average distance if the remnant is removed as proposed**

*** Estimating maximum dispersal distance for native flora species characteristic of the TEC**

*** Providing other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the Development.**

The Box-Gum Woodland within the development site and locality is highly fragmented occurring in small, isolated patches (Figure 9-1) due to previous clearing for agricultural purposes. Currently, the small patch of PCT 277 is around 600m away from the nearest patch to the North. Removing of this patch would increase distances between the nearest patches to around 1100m. However, the small 0.2ha patch of 277 to be removed is highly degraded with low composition of species and is unlikely to be a key patch for flora species dispersal. Eucalypts have low seed dispersal distances usually similar to the height of the tree

Criteria for assessment of TECs at risk of serious and irreversible impacts

(around 20m) so the patch is unlikely to be contributing to seed dispersal.

The 0.11 ha of PCT 278 to be removed occurs within a larger patch of 6.6m. The removal of this vegetation for an Asset Protection Zone would fragment the patch by 10m. This small fragmentation is unlikely to impact on seed dispersal.

iii) describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone(s) (Chapter 4.3), including the relevant composition, structure and function condition scores for each vegetation zone.

0.29 ha of Box-Gum Woodland would be impacted by the proposal, comprising 0.18ha of PCT 277 and 0.11ha of PCT 278.

PCT 277 is comprised of a small, isolated patch of mature Yellow Box and Blakely's Red gum within a cropped paddock. The understory is highly degraded from intense agricultural practices and here is no native understory remaining. Native diversity is low and is limited to the canopy species only. There is limited recruitment in new overstory species however the site provides some habitat function in the form of hollows. The vegetation integrity score for this patch is 12.1. This vegetation integrity score is below the threshold for requiring assessment in the BDAR.

PCT 278 occurs along the Eastern end of Back Creek. This area is in good condition having mostly been fenced from cattle and a range of age classes and recruitment of canopy species is present. A shrub layer of Acacia species is also present. VIS score for this zone is 43.1 and impacts to this vegetation patch generate a credit requirement.

Table 9-1 Box-Gum Woodland impacted

Zone ID	Zone Description	Impact Area	Composition score	Structure score	Function score	Vegetation Integrity Score
1	PCT 277_ Grazed	0.18	2.2	12.4	63.9	12.1
10	PCT 278_ Creekline	0.11	29.1	32.8	83.8	43.1

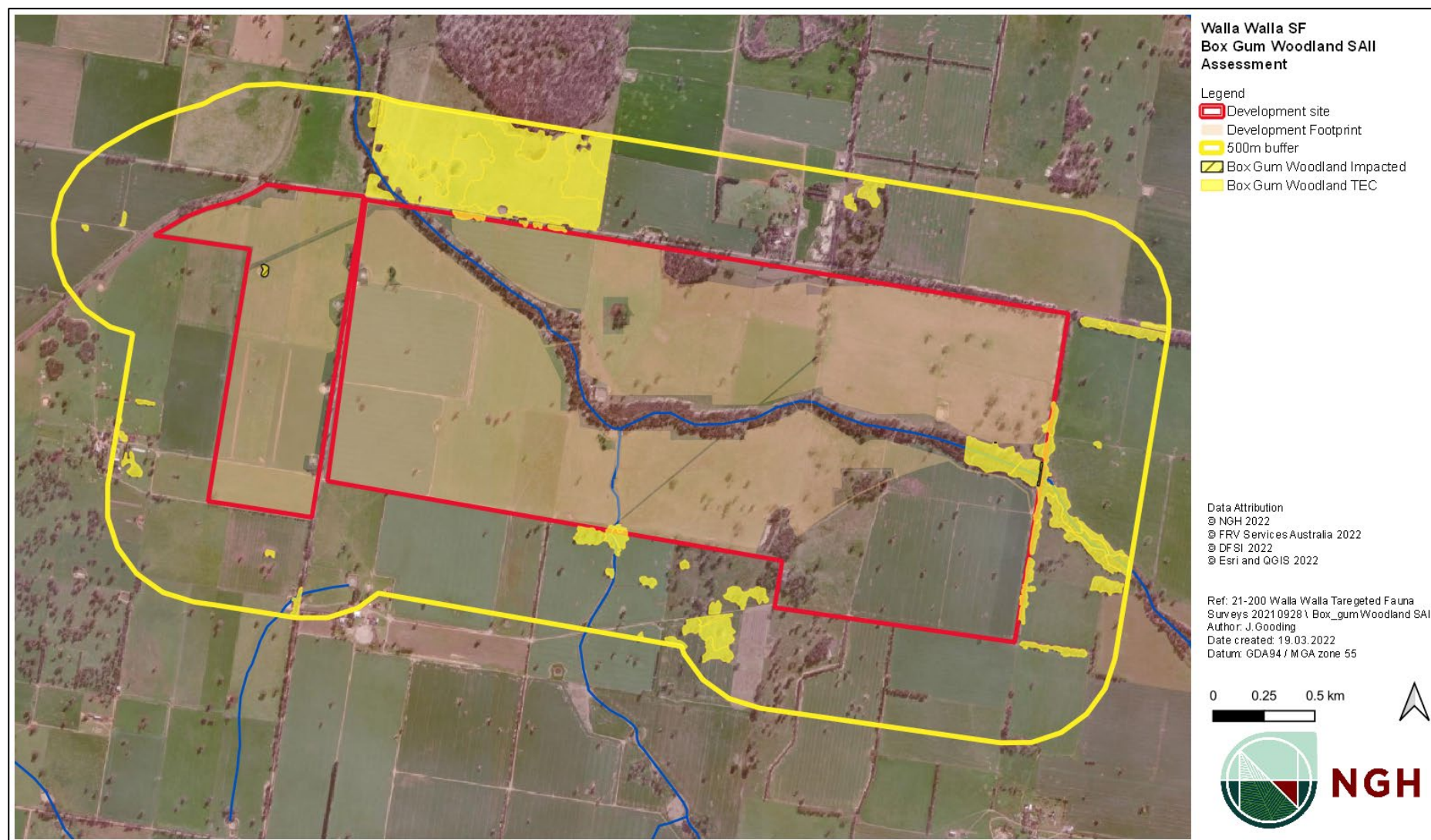


Figure 9-1 Location of Serious and Irreversible Impacts

10. Requirement to offset

10.1 Impacts requiring and offset

10.1.1 Ecosystem credits

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

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

The PCTs and vegetation zones requiring offset and the ecosystem credits required are documented in Table 10-1 and mapped on Figure 10-1. The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix I

Table 10-1 PCTs and vegetation zones that require offsets

Zone ID	PCT ID	Zone Name	Impact area (ha)	Vegetation Integrity Score	Future Vegetation Integrity Score	Ecosystem credits required
PCT 76: Western Grey Box tall grassy woodland						
2	76	Grazed	10.8	20.2	0	109
3	76	Wetland	3.3	20	0	33
4	76	Derived Grassland	11.5	16.2	0	93
5	76	Roadside	1.6	40.5	0	33
SUBTOTAL:						268
PCT 5: River Red Gum herbaceous grassy very tall open forest wetland						
7	5	Wetland	1.1	41.9	0	18
9	5	Creekline	0.6	45.7	0	10
					SUBTOTAL:	28
PCT 278 - Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest						
10	278	Creekline	0.1	43.1	0	3
					Subtotal	3
TOTAL:						299

10.1.2 Scattered Tree credits

Offsets are required for the clearing of Class 2 and Class 3 scattered trees. 47 Class 2 and Class 3 scattered trees would be removed by the proposal. The scattered trees form part of three different PCTS. PCT 76: Western Grey Box tall grassy Woodland, PCT 277: Blakely's Red Gum – Yellow Box grassy tall woodland and PCT 5: River Red Gum herbaceous – grassy very tall open forest wetland on inner floodplains. Ecosystem credits are calculated as per the streamlined assessment defined in the BAM – Appendix 1 and Table 12. These ecosystem credits required are documented in Table 10-2. The credit profile for the paddock trees is shown in Appendix I.

Forty-five ecosystem credits are required for the clearing of the scattered paddock trees.

Table 10-2 Scattered trees that require offsets

Class of Scattered Tree being cleared	Hollows Present	Number of Scattered Trees to be cleared	Number of Credits Required	Ecosystem credits required
PCT 76 – Western Grey Box tall grassy woodland				
Class 3 >50cm DBH	No	8	0.75	6
Class 3 >50cm DBH	Yes	24	1	24
			SUBTOTAL:	30
PCT 277 – Blakely's Red Gum – Yellow Box grassy tall woodland				
Class 3 >50cm DBH	No	3	0.75	3
Class 3 >50cm DBH	Yes	10	1	10
			SUBTOTAL:	13
PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland on inner floodplains				
Class 3 >50cm DBH	No	1	0.75	1
Class 3 >50cm DBH	Yes	1	1	1
			SUBTOTAL:	2
			TOTAL:	45

10.1.3 Species credits

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

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

Table 10-3 Species credit species that require offsets

Species Credit Species	Biodiversity risk weighting	Area of habitat lost (ha)	Species credits required
Squirrel Glider <i>Petaurus norfolcensis</i>	2.00	15.0 ha	184
Southern Myotis <i>Myotis Macropus</i>	2.00	7.90 ha	100

10.1.4 Offsets required under the EPBC Act

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

10.2 Impacts not requiring an offset

Impacts to PCTs that do not meet the thresholds identified in Section 10.1.1 do not require offsets.

Three zones in the development site did not meet the Vegetation Integrity Score threshold (Shown in Table 10-4). These zones are highly disturbed from intense agricultural activities of cropping and grazing. Zones 1 and Zones 6 are small, isolated patches comprised of remnant overstory trees but have no other native components remaining. The groundcover is comprised of exotic grasses and no regeneration of overstory tree species has occurred. Zone 8 occurs within the fenced creekline area in the centre of the development site. These areas have been cleared in the past through agricultural activities and no mature overstory canopy remains. Some scattered River Red Gums have regenerated; however, the understory is dominated by exotic annual grasses. This zone lacks structure and diversity to meet the vegetation integrity score threshold.

These three zones identified are considered to be sufficiently degraded and not required to be offset.

Table 10-4 Impacts not requiring an offset

Zone ID	PCT ID	Zone name	Impact area (ha)	Vegetation Integrity Score	Future Vegetation Integrity Score	Ecosystem credits required
PCT 277: Blakley's Red Gum – Yellow Box grassy tall woodland						
1	277	Grazed	0.2	6.1	0	0
PCT 5: River Red Gum herbaceous grassy very tall open forest wetland						
6	5	Grazed	0.2	11.4	0	0

Zone ID	PCT ID	Zone name	Impact area (ha)	Vegetation Integrity Score	Future Vegetation Integrity Score	Ecosystem credits required
8	5	Low	0.7	5.6	0	0

10.3 Areas not requiring assessment

Approximately 447.08ha of exotic vegetation comprised of agricultural crops and pastures and considered to be Category 1 Land would be impacted by the proposal. These areas are not considered native vegetation and do not require offsetting or further assessment. The three paddock trees in the south eastern corner of the development site would be offset but retained and not directly impacted by the proposal.

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

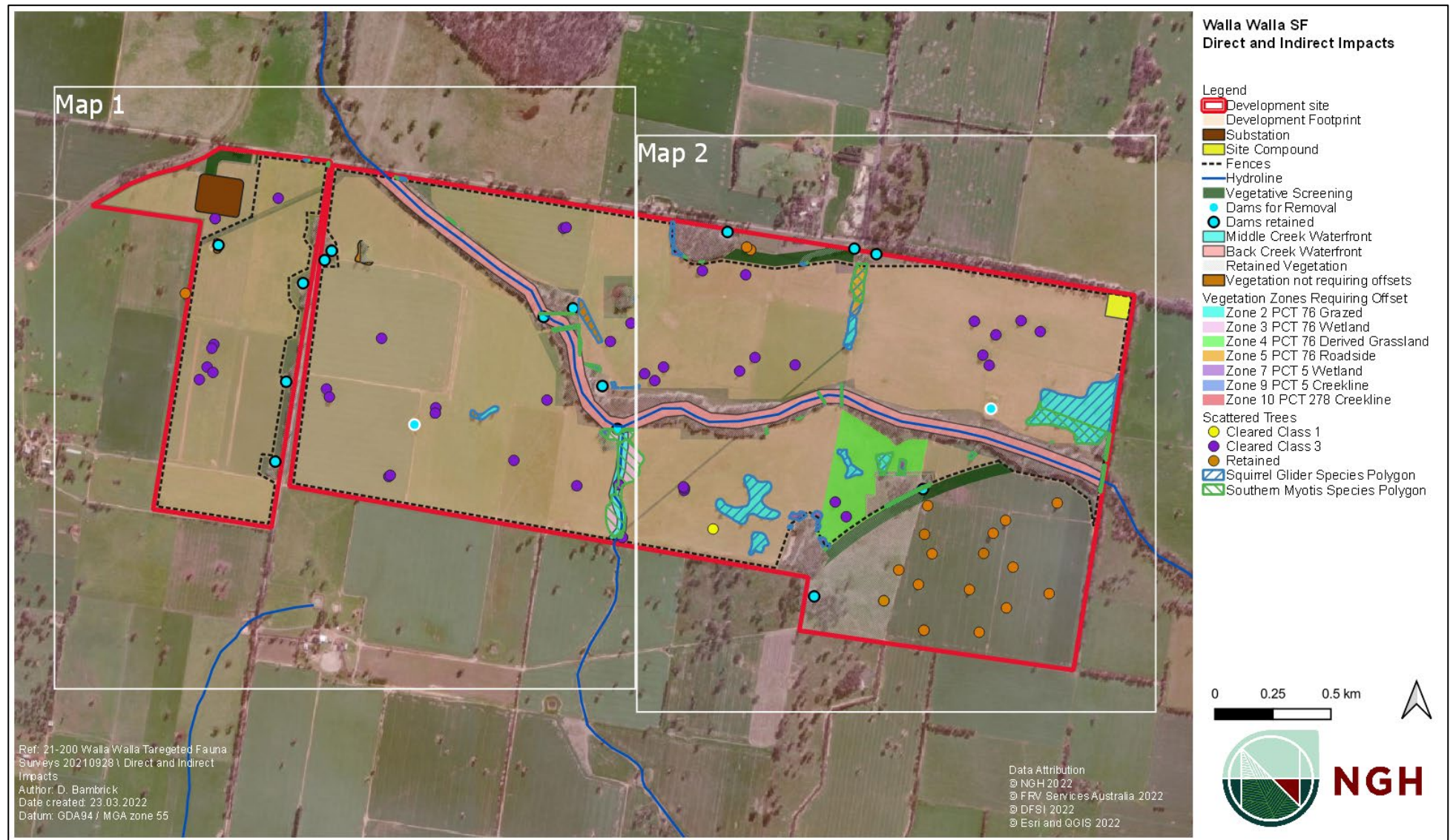


Figure 10-1 Impacts requiring offset, not requiring offset and not requiring assessment (overview map)



Figure 10-2 Impacts requiring offsets and not requiring offsets (Map 1)



Figure 10-3 Impacts requiring offsets and not requiring offsets (Map 2)

10.4 Summary of offset credits required

Table 10-5 Summary of offset credits required

Ecosystem Credits	Offset credits required
PCT 76: Western Grey Box tall grassy woodland	268
PCT 76: Western Grey Box tall grassy woodland – Scattered Trees	30
SUBTOTAL:	298
PCT 277: Blakley's Red Gum – Yellow Box grassy tall woodland - Scattered Trees	13
SUBTOTAL:	13
PCT 278 - Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest	3
SUBTOTAL	3
PCT 5: River Red Gum herbaceous – grassy very tall open forest wetland on inner floodplains	28
PCT 5: River Red Gum herbaceous – grassy very tall open forest wetland on inner floodplains –Scattered Trees	2
SUBTOTAL:	30
TOTAL:	344
Species Credits	Offset required credits
Squirrel Glider <i>Petaurus norfolcensi</i>	184
Southern Myotis <i>Myotis macropus</i>	100
TOTAL:	284

11. Conclusions

NGH has prepared this BAR on behalf of FRV for the proposed Walla Walla Solar Farm, 4.3km northeast of Walla Walla, NSW. The purpose of this BDAR is to satisfy the assessment requirements of the BOS and BAM as set out under the BC Act for the proposal and to address the biodiversity matters raised in the SEARs. In this BDAR, biodiversity impacts have been assessed through:

- Comprehensive mapping and assessment completed in accordance with the BAM.
- Identification of four plant community types and one threatened species within the development site, the impacts to which have been adequately assessed.
- Mitigation measures which have been outlined to reduce the impacts to biodiversity
- The generation of 344 ecosystem credits within the development site, and 192 species credits.

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

- a) Retiring credits under the Biodiversity Offsets Scheme based on the like-for-like rules, or
- b) Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or
- c) Funding a biodiversity action that benefits the threaten entity(ies) impacted by the development.

12. References

- DECC (2002) Descriptions for NSW (Mitchell) Landscapes Version 2. NSW Department of Environment and Climate Change.
- DECC (2009) Threatened Species Survey and Assessment Guidelines: field survey methods for fauna, NSW Department of Environment and Climate Change
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- Environment Australia (2001) A Directory of Important Wetlands in Australia. 3rd Edition. Environment Australia, Canberra.
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- Office of Environment and Heritage (OEH) (2016a) NSW Guide to Surveying Threatened Plants, State of NSW and Office of Environment and Heritage
- Office of Environment and Heritage (OEH) (2016b) Riverina State Vegetation Mapping VIS_ID_4469 Accessed online at <http://www.environment.nsw.gov.au/research/VISmap.htm>.
- Office of Environment and Heritage (OEH) (2017) Biodiversity Assessment Methodology (BAM). Office of Environment and Heritage for the NSW Government, Sydney, NSW.
- Office of Environment and Heritage (OEH) (2017) BioNet Vegetation Information System: Classification Database. Accessed online at <http://www.environment.nsw.gov.au/research/Visclassification.htm>
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- Story, Georgeanna (2019) Scatsabout, personal communication
- Thackaway and Creswell (1995) An Interim Biogeographic Regionalisation for Australia, Australian Nature Conservation Agency, Canberra
- TBDC (Threatened Biodiversity Data Collection) (2022), Office of Environment and Heritage accessed at <https://www.environment.nsw.gov.au/AtlasApp/>

Appendix A Category 1 land assessment



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Dear Miranda,

RE – Identification of Category 1 -exempt land – Walla Walla Solar Farm BDAR

1.1 INTRODUCTION

A BDAR is being prepared for the proposed Walla Walla Solar Farm. The development site is located on Lots 16, 17, 20, 21, 87, 88, 89, 108, 109 & 118 of DP 753735 and Lot 1 DP 1069452. (Figure 1).

Section 6.8(3) of the Biodiversity Conservation Act determines that the Biodiversity Assessment Method (BAM) is to exclude the assessment of the impacts of clearing of native vegetation on Category 1-exempt land (within the meaning of Part 5A of the *Local Land Services Act 2013*). Boundaries mapping Category 1-exempt land on the Native Vegetation Regulatory Mapping are not yet publicly available. During the transitional period, accredited assessors may establish the categorisation of land for the consent authority to consider following the method utilised to develop the Native Vegetation Regulatory Map.

Category 1 -exempt land is defined under the LLS act as;

- Land cleared of native vegetation as at 1 January or lawfully cleared after 1 January 2019.
- Low Conservation Grasslands
- Land containing only low conservation groundcover (Not being grasslands)
- Native Vegetation identified as regrowth in a Property Vegetation Plan under the repealed Native Vegetation Act 2003
- Land Bio-certified under the Biodiversity Conservation Act 2016

This letter report establishes the methodology, results and conclusions to evaluate the land categorisation for the development site. It is anticipated that OEH would support this approach and provide endorsement for the land categorisation of the development site for Walla Walla Solar Farm.



1.2 METHODOLOGY

An initial field assessment was undertaken over the development site to determine the ecological constraints and native vegetation communities on site. A vegetation map was produced from the results of the initial field surveys and shown in Figure 2.

Areas of woody vegetation have been assessed using the BAM methodology. Areas of cropped land have been identified as exotic vegetation. Aerial imagery supports that these areas are frequently cropped.

However, three paddocks (Lots 21, 88 and 16 of DP 753735) shown in Figure 2 consisted of a low condition grassland (VIS score 21) at the time of field assessment. These areas are dominated with Barley Grass (**Hordeum leporinum*) but have recolonised with around a 5 -30% cover of Windmill Grass (*Chloris truncata*). Some other natives such as Couch (*Cynodon dactylon*), Curly Windmill Grass (*Enteropogon acicularis*), Caustic Weed (*Euphorbia drummondii*) and Wallaby grass (*Rytidosperma spp.*) were also present in very small abundance (<1% cover). In communication with the landholder, it was revealed that these paddocks had been cultivated cropped to Clover (*Trifolium spp.*) and Phalaris 8 years ago.

Assessment of whether this grassland area is Category 1-exempt or Category 2 -regulated land was undertaken using the following data sources;

- Aerial imagery of historical land use (Sourced from Google Earth and Department of Finance, Services and Innovation Spatial Services)
- 2017 Land Use Dataset (Australian Land Use and Management (ALUM) Classification Version 7 (OEH, 2017).
- NSW Woody vegetation extent and FPC 2011 (OEH, 2015)
- Sensitive regulated and vulnerable regulated lands on the Native Vegetation Regulatory Map portal
- Riverina State Vegetation Mapping (VIS_ID_4469, OEH)

1.3 RESULTS

Analysis of the above data sources showed the following information;

- Aerial imagery shows the grassland areas in Lot 16 and 21 of DP 753735 have been cultivated in years 2007 & 2010 (Figure 3 and Figure 4). There is no evidence of cropping from the aerial images in Lot 88 //753735.
- Aerial imagery shows the grassland areas in Lot 21//753735 being cultivated in 2003 (Figure 5). There are slight cultivation lines in the western portion of Lot 16//DP 753735, however are not 100 % conclusive.
- It is not 100% conclusive whether the grassland areas have been cropped from aerial images in 1990 and 1996, however there are slight cultivation lines in the western end of Lot 21//753735. The paddock trees from 1990 are still present now. Had the site not been continually used for agriculture over the past 29 years, regrowth would have occurred more substantially in these areas like that as has occurred along the creek and some woodland areas which have been fenced from agricultural practices. The grassland area has not improved in woody vegetation extent indicating it has been continually managed for agricultural purposes.
- The 2017 Land Use Dataset reveals Lot 16 and 21 are mapped as 'Cropping' and Lot 88 mapped as 'Grazing Modified Pastures'. (Figure 8)
- 2011 Woody Vegetation extent shows scattered paddock trees in these areas. These areas have been mapped as paddock trees within the BAM assessment. (Figure 2 and Figure 8)
- Native Vegetation Regulatory Map identifies the ephemeral waterways; Back creek and Middle Creek, as Category 2 - sensitive regulated land. Middle Creek is a tributary running through the grassland area. (Figure 9)
- Riverina State Vegetation mapping identifies grassland areas as non-native vegetation. (Figure 10).
- Field surveys identified areas of exotic vegetation. In particular, in the North East Corner of the development site, a small patch of woodland was identified to be planted Sugar Gum (**Eucalyptus cladocalyx*) which is not native to NSW.

1.4 CONCLUSION

Based on the above data sources, there is evidence to suggest that Lot 16 & Lot 21 of DP//753735 have been under regular rotational cropping or pasture improvement since 1990. The 2017 Land Use Mapping data also supports that the primary landuse for these lots as Cropping. These two lots are considered to meet the definition of Category 1 – exempt Land. The grassland area of Middle Creek is categorised as Category 2 -sensitive land.

It is not so conclusive that Lot 88//753735 has been regularly cropped in the past, and so as a precautionary approach, the grassland vegetation in this lot has been assigned to Category 2 – regulated land. A draft map of areas considered to be Category 1 Land and Category 2 Land has been produced and shown in Figure 11.

If you have any questions, please contact me on the number below. I would be pleased to discuss this report with you further.

Yours sincerely,

Julie Gooding
Environmental Consultant - Ecologist

Accredited Assessor BAAS 18074

Ph: 6923 1534
NGH Environmental Pty Ltd

FIGURES

Figure 1 Location Map

Figure 2 Native Vegetation mapping from field Inspection Nov 2018

Figure 3 Aerial Imagery 2010

Figure 4 Aerial Imagery 2007

Figure 5 Aerial Imagery 2003

Figure 6 Aerial Imagery 1996

Figure 7 Aerial Imagery 1990

Figure 8 Woody Vegetation Extent and 2017 Landuse Mapping

Figure 9 Native Vegetation Regulatory Mapping

Figure 10 State Vegetation Mapping

Figure 11 Land Categorisation Map

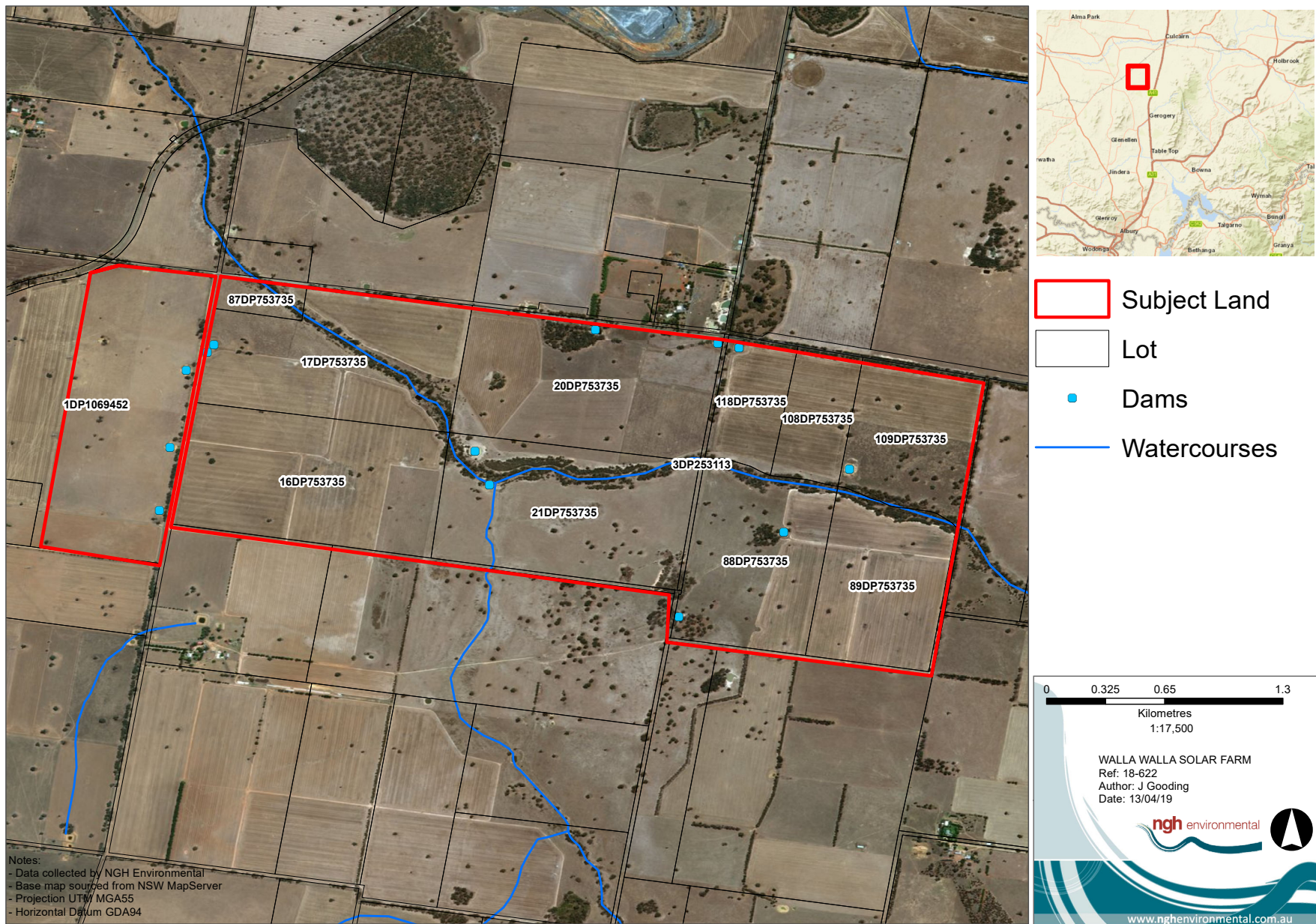


Figure 1 Location Map

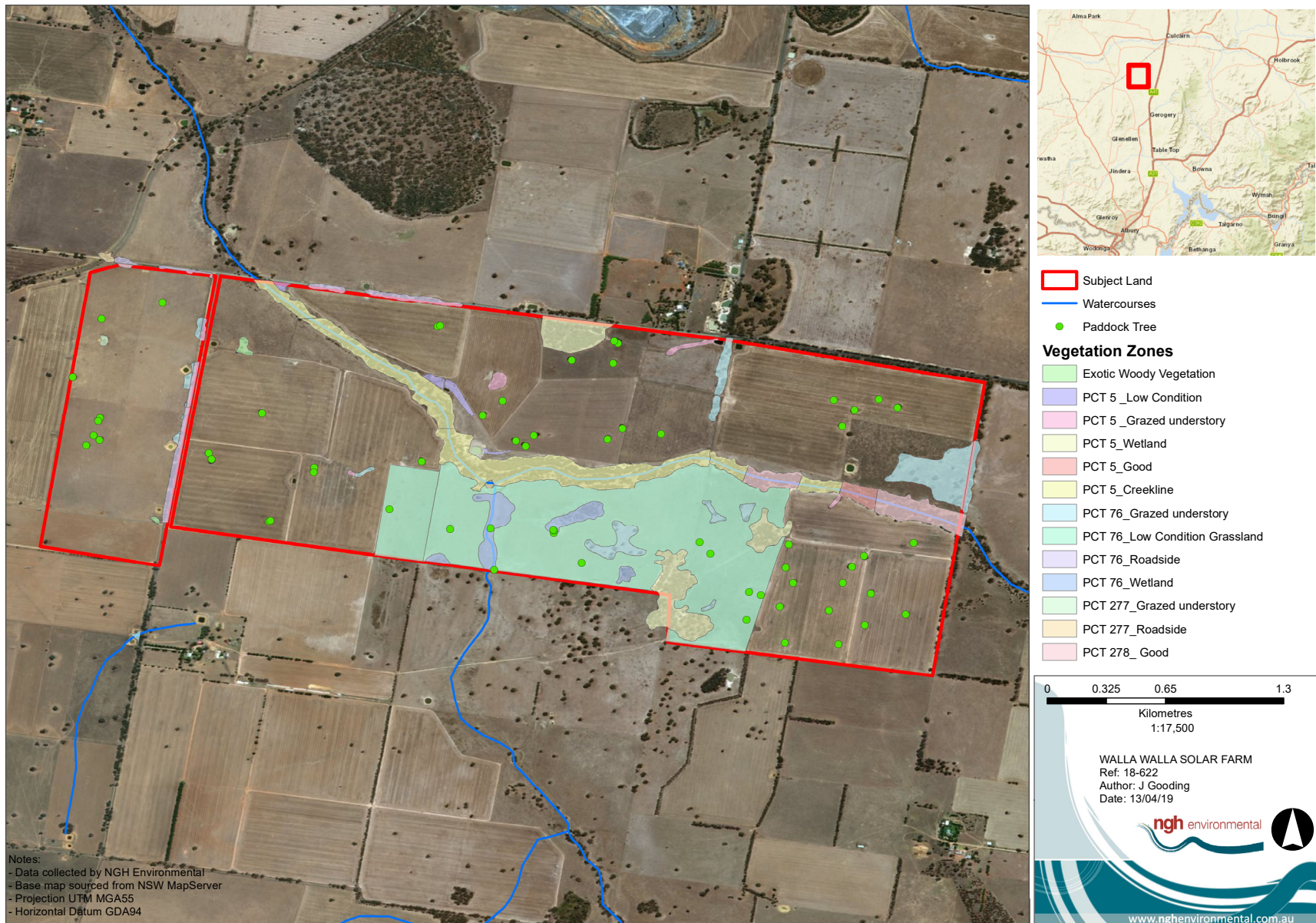


Figure 2 Native Vegetation mapping from field Inspection Nov 2018

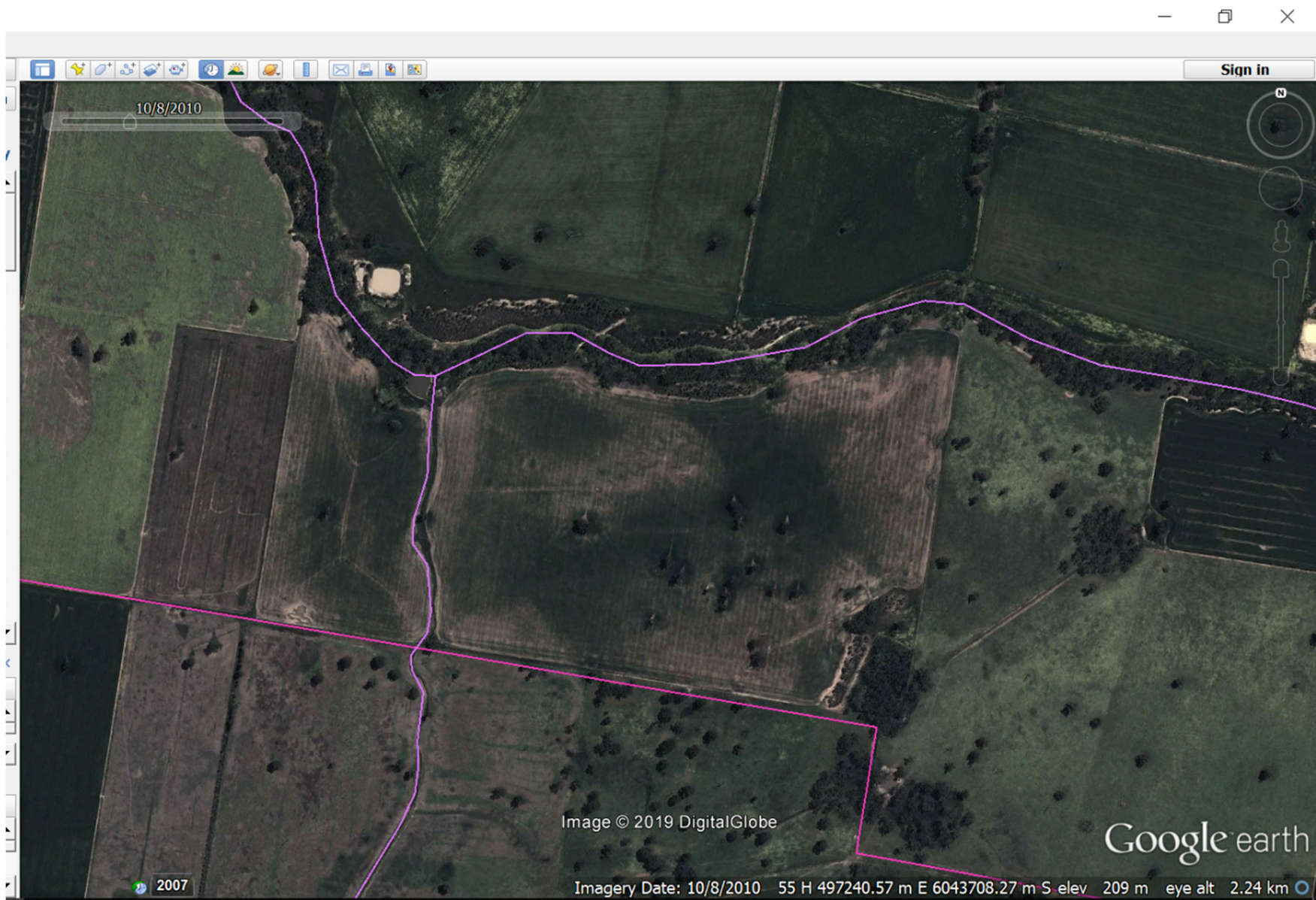


Figure 3 Aerial Imagery 2010

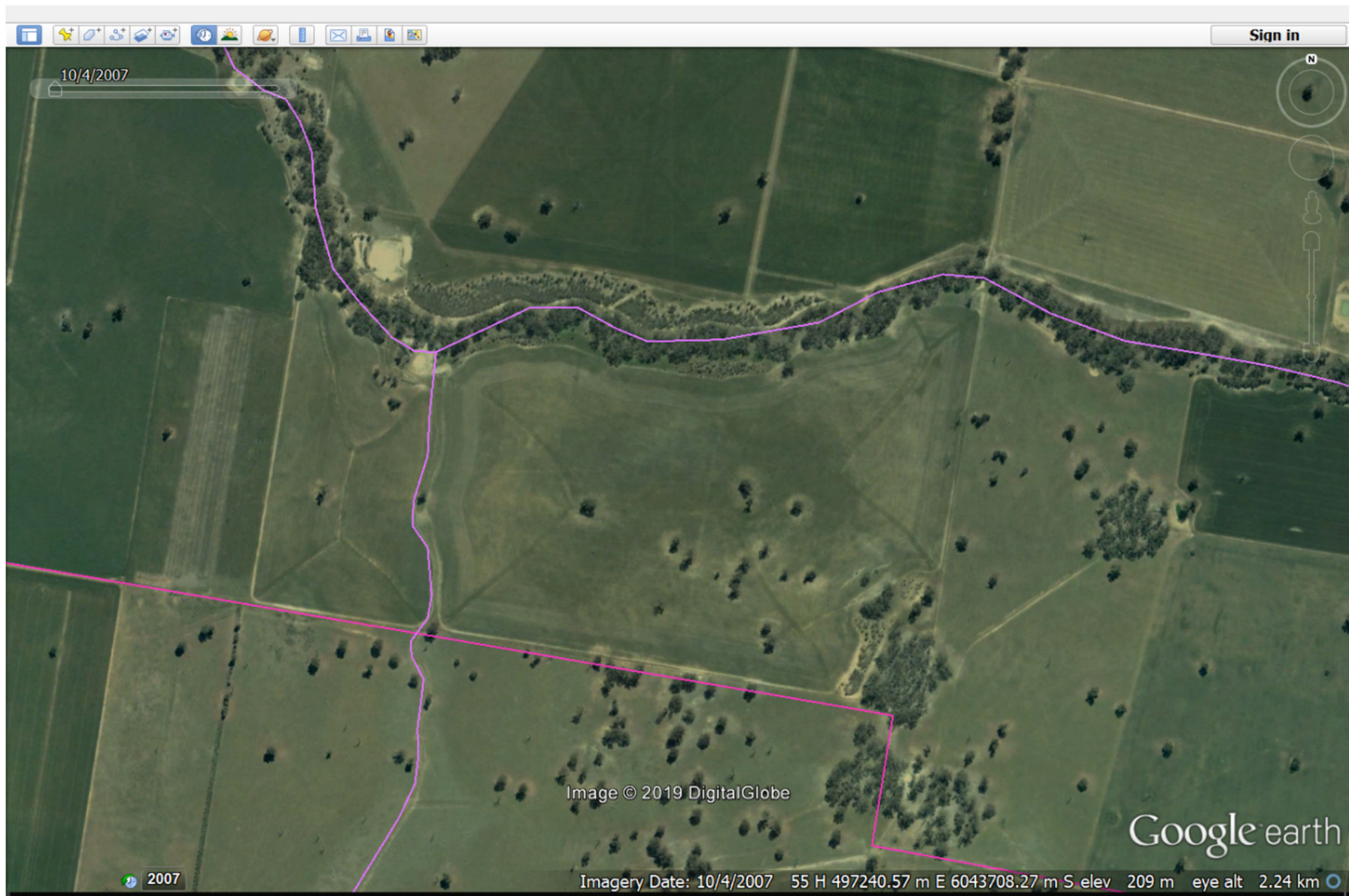


Figure 4 Aerial Imagery 2007

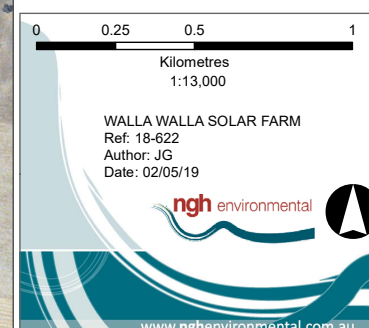
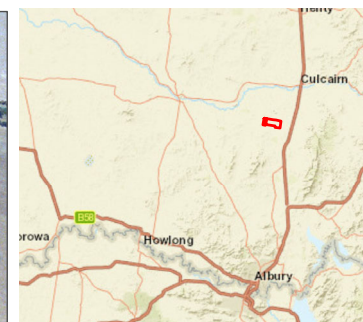
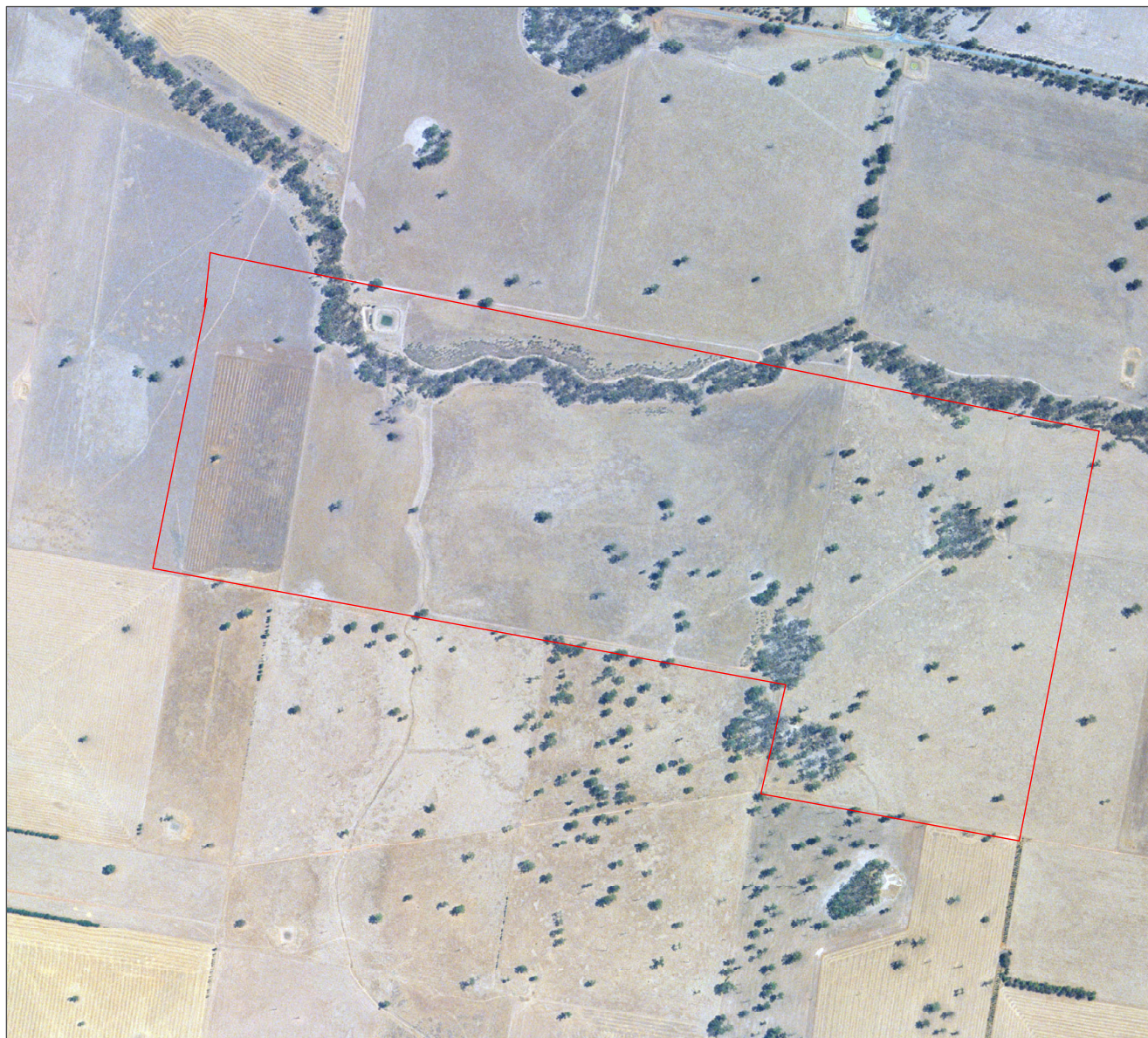


Figure 5 Aerial Imagery 2003

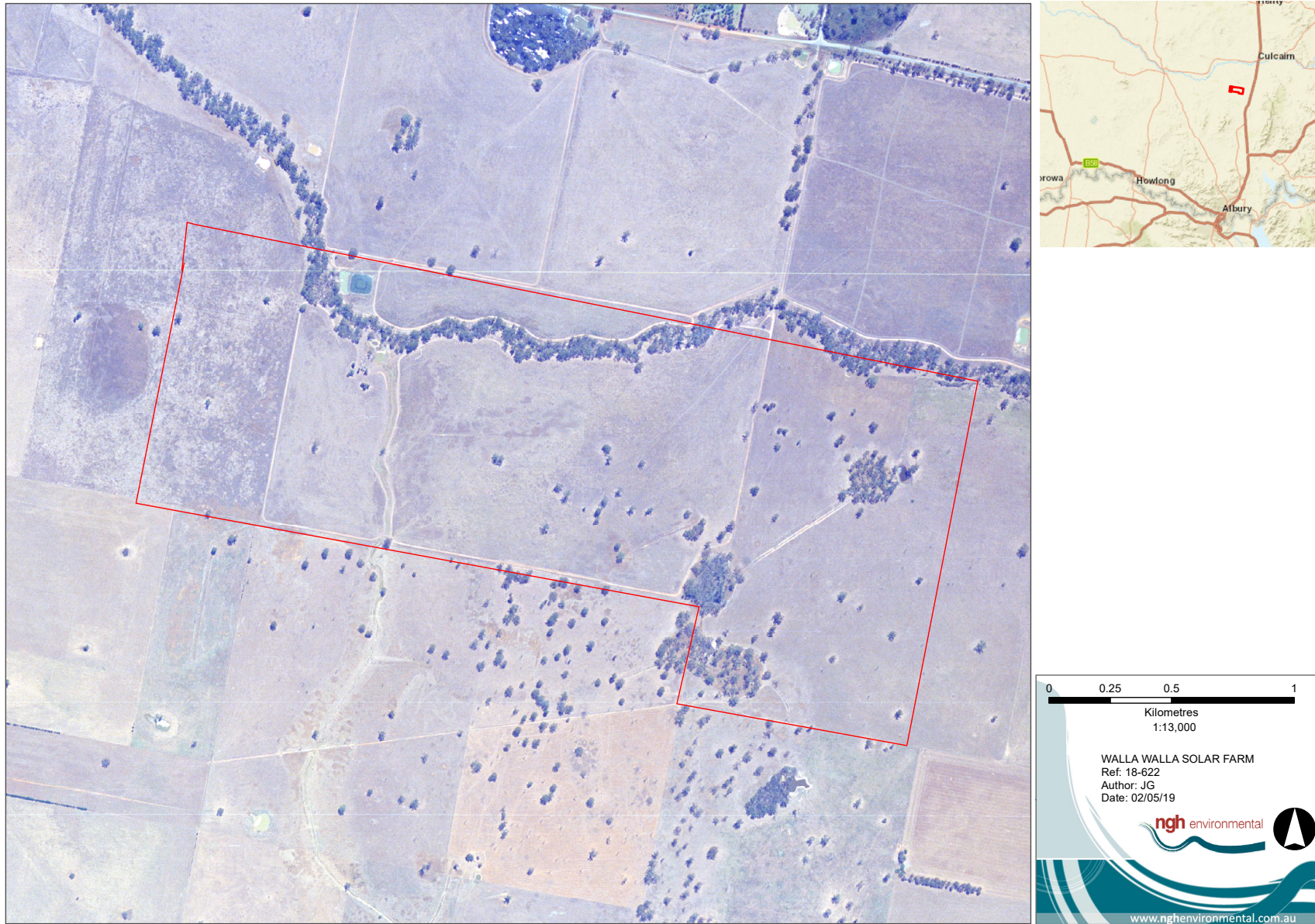


Figure 6 Aerial Imagery 1996



Figure 7 Aerial Imagery 1990



Figure 8 Woody Vegetation Extent and 2017 Landuse Mapping

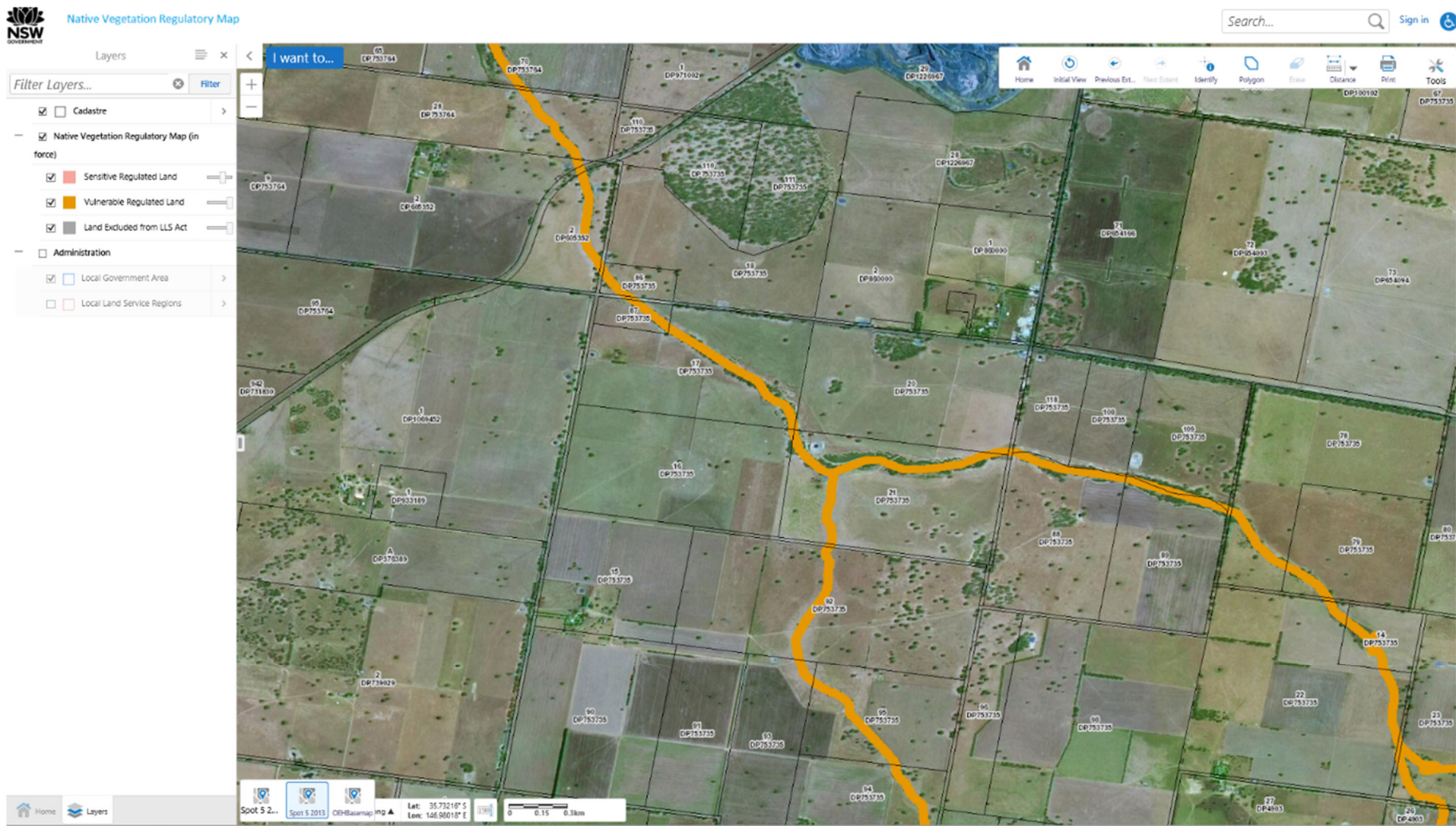


Figure 9 Native Vegetation Regulatory Mapping

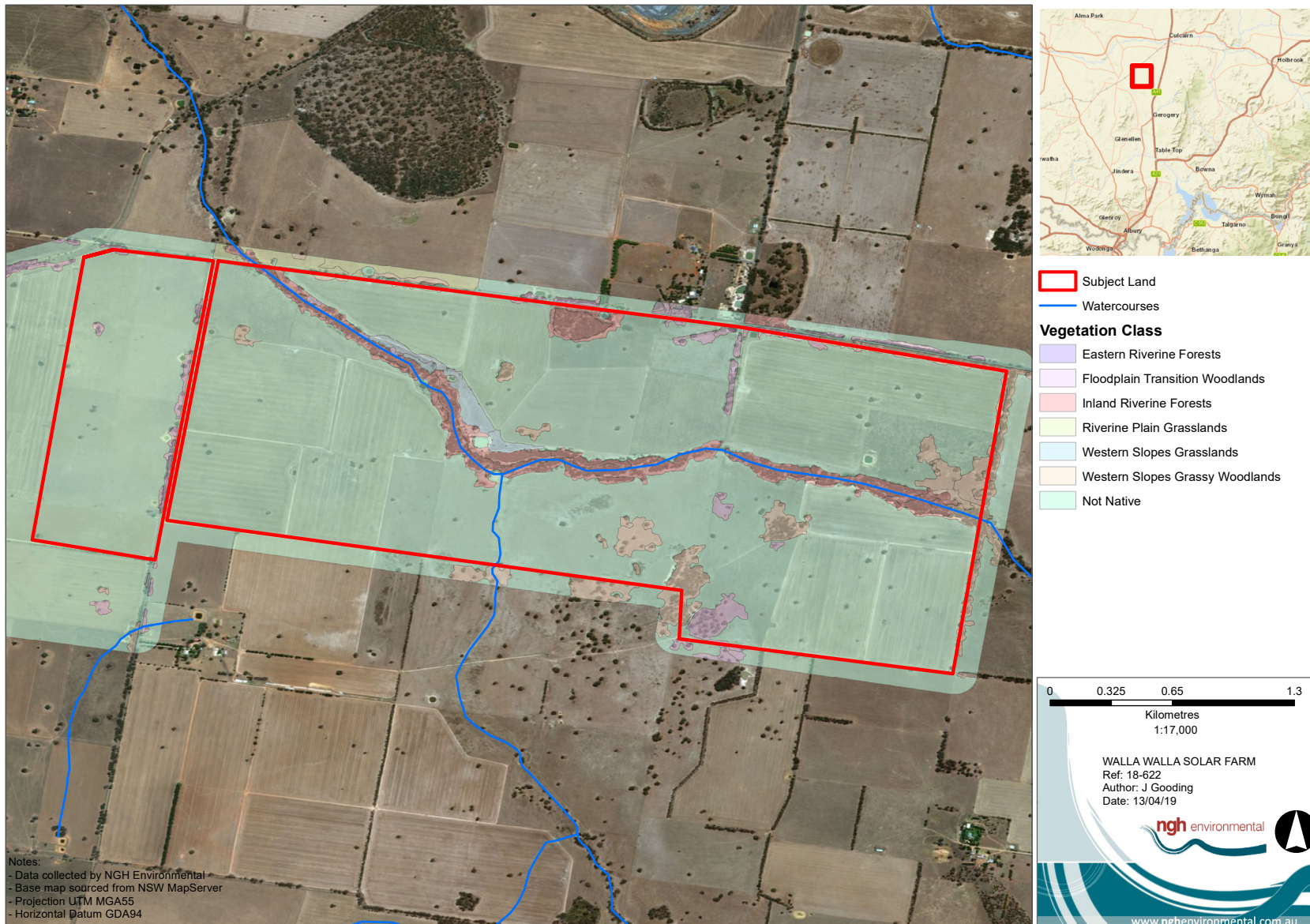


Figure 10 State Vegetation Mapping

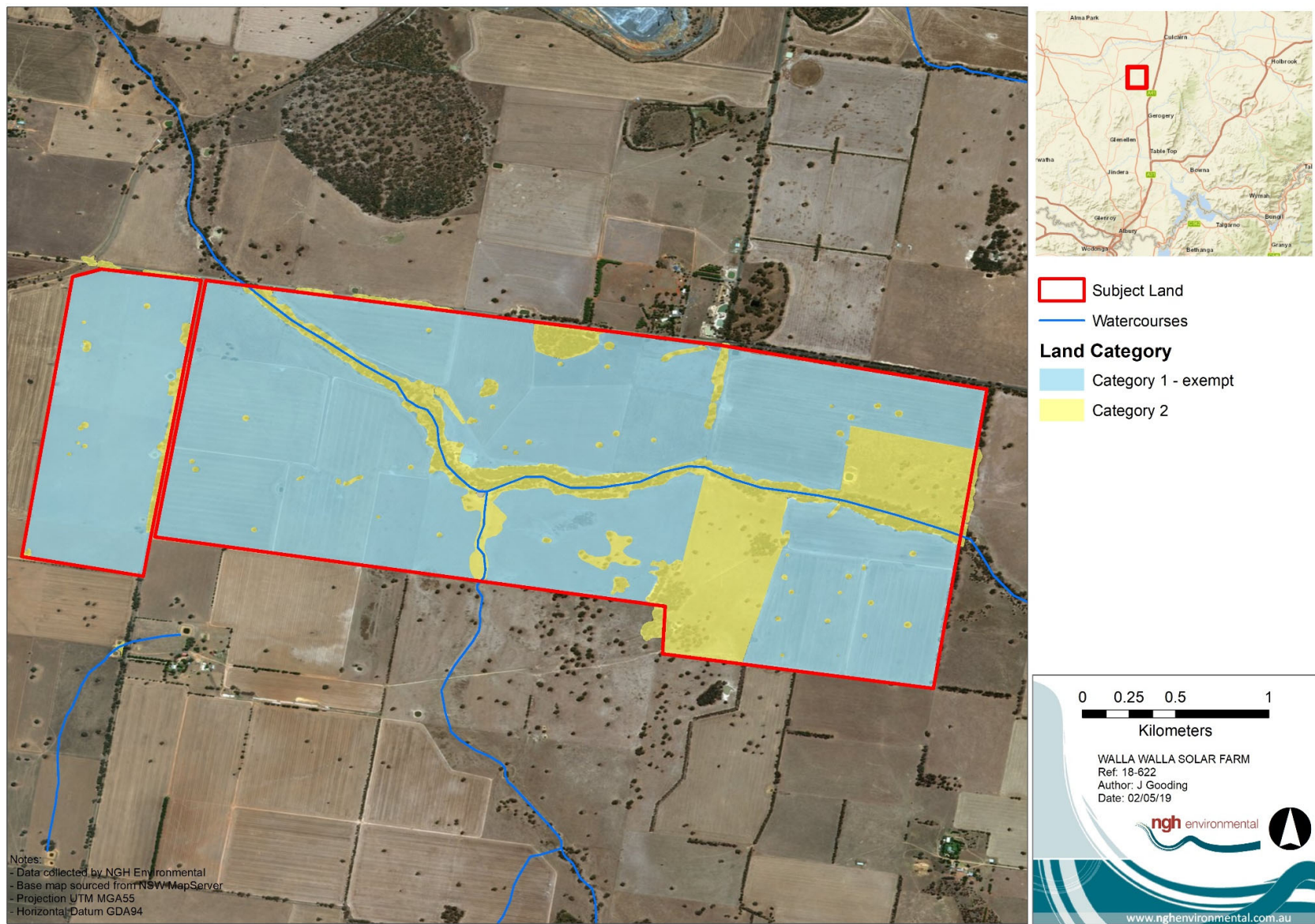


Figure 11 Land Categorisation Map



Your reference: SSD 9874
Our reference: DOC19/309449
Contact: Miranda Kerr
Ph 02 6022 0607
Date: 29 May 2019

Julie Gooding
Environmental Consultant - Ecologist
NGH Environmental
Wagga Wagga

Via email: julie.g@nghenvironmental.com.au

Dear Julie

RE: Walla Walla Solar Farm BDAR – Identification of category 1-exempt land

I refer to your emails dated 13 and 20 May 2019 seeking comment from the Office of Environment and Heritage (OEH) about the identification of category 1-exempt land on the site of the proposed Walla Walla Solar Farm in Greater Hume Shire.

We have reviewed the letter dated 20 May 2019 describing the methods used to evaluate land categorisation for the proposal site, noting that the original submission dated 13 May was revised based on verbal feedback provided by Miranda Kerr on Monday 20 May. This response relates to guidance provided by OEH to NGH Environmental for identifying category 1-exempt land at the proposed Finley South Solar Farm on 9 April 2019 (**Attachment A**).

OEH considers the determination of category 1-exempt and category 2-regulated land as shown in Figure 11 'Land Categorisation Map' to be a reasonable approximation of those categories likely to be mapped on the Native Vegetation Regulatory (NVR) map.

As recommended by OEH, the method used by NGH Environmental for determining these categories includes multiple lines of evidence, i.e. aerial imagery with multiple dates, 2017 land use data OEH 2011 woody vegetation extent, and information from the NVR map portal. We support the precautionary approach to classifying Lot 88 into category 2-regulated land.

We note that the NVR Map Method assigns landuse category 2.1.0 'Grazing native vegetation' to category 2-regulated land. Part of Lot 109 DP 753735 is mapped by the 2017 Land Use dataset as 2.1.0.

Use of mapping products to determine presence of exotic vegetation does not follow the NVR Map method. Any identification of non-native vegetation on land where the Biodiversity Assessment Method (BAM) applies is not relevant to the determination of category 1-exempt land. This information, including reference to the Riverina State Vegetation Mapping (VISID_4469), is part of the BAM assessment.

Recommended actions:

- Consistent with the information provided on the OEH Biodiversity Reforms FAQ website, the area of land determined to be category 1-exempt land should be clearly indicated in the application for planning approval submitted to a consent authority.
- We suggest that the document be revised to remove Figure 2 and Figure 10 and any text relating to identification of non-native vegetation undertaken for the BAM assessment. This information would be relevant to the Biodiversity Development Assessment Report (BDAR).

Please note that a development on category 1-exempt land may involve other biodiversity impacts for which a BDAR will still be required if:

- The development will have a prescribed impact on land mapped on the biodiversity values map (prescribed impacts are listed in clause 6.1 of the BC Regulation), not including native vegetation clearing associated with the prescribed impact.
- A test of significance finds that a significant impact on threatened species, ecological communities or their habitats is likely to result from the proposed development.

If you have any questions regarding this matter, please contact Miranda Kerr on (02) 6022 0607 or email rog.southwest@environment.nsw.gov.au.

Yours sincerely



ANDREW FISHER
Senior Team Leader Planning
South West Branch
Conservation and Regional Delivery
Office of Environment & Heritage

ATTACHMENT A Emailed guidance from OEH to NGH Environmental for approximating the NVR map 'category 1-exempt land' (Finley South Solar Farm).

APPENDIX B PLOT FIELD DATA

Exotic	Scientific Name	Common Name	plot 1		plot 2		plot 3		plot 4		plot 5		plot 6		plot 7		plot 8		plot 9		plot 10	
			76_grazed		277_planted		277_grazed		76_grazed		76_wetland		76_grassland		76_roadside		76_roadside		exotic		5_wetland	
			%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#
*	<i>Rumex obtusifolius</i>	Broadleaf Dock																				
*	<i>Rumex sp. Exotic</i>										0.1	1										
	<i>Rumex sp. native</i>																					
	<i>Sida corrugata</i>	Corrugated Sida													0.2	50	0.5	45				
	<i>Sida cunninghamii</i>	Ridge Sida																				
*	<i>Silybum marianum</i>	Variegated Thistle																				
*	<i>Sonchus oleraceus</i>	Sow Thistle									0.1	1			0.1	2						
*	<i>Tribulus terrestris</i>	Cat-head																				
*	<i>Trifolium sp.</i>	Clover			1	100					0.5	100	0.1	20					20	6000		
*	<i>Trifolium subterraneum</i>	Subterranean Clover																	0.1	150		
	<i>Unidentified forb</i>	Unidentified																	0.1	1	0.1	1
	<i>Unidentified forb</i>	Unidentified																			0.2	5
*	<i>Sanguisorba minor subsp. muricata</i>	Sheep's Burnet													0.1	25						
	GRASSES AND GRASSLIKE																					
*	<i>Anthosachae scabra</i>	Native Wheat													0.1	100						
	<i>Aristida behriana</i>	Bunch Wiregrass																				
	<i>Auistrostipa blackii</i>														0.2	30						
	<i>Auistrostipa scabra</i>	Speargrass													0.1	30						

Exotic	Scientific Name	Common Name	plot 1		plot 2		plot 3		plot 4		plot 5		plot 6		plot 7		plot 8		plot 9		plot 10	
			76_grazed		277_planted		277_grazed		76_grazed		76_wetland		76_grassland		76_roadside		76_roadside		exotic		5_wetland	
			%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#
*	<i>Lolium sp.</i>	Rye Grass	1	100			10	1000	2	1000	10	1000	15	1000	0.5	1000	0.1	200	5	1000	0.1	80
	<i>Lomandra filiformis</i>	Wattle Matt-rush													0.5	100						
	<i>Panicum effusum</i>	Hairy Panic																				
	<i>Panicum sp.</i>																				0.2	50
*	<i>Paspalum dilatatum</i>	Paspalum													0.1	2						
*	<i>Pentachistus aeoides</i>	False Hair Grass									0.1	20										
*	<i>Phalaris aquatica</i>	Phalaris							0.1	10	5	50	2	50			0.1	5	60	500		
	<i>Rytidosperma auriculatum</i>	Lobed Wallaby Grass																				
	<i>Rytidosperma sp. 1</i>	Wallaby Grass									1	20	1	100	0.1	100	25	750				
	<i>Rytidosperma sp. 2</i>	Wallaby Grass													0.2	150						
	<i>Rytidosperma sp. 3</i>	Wallaby Grass																				
*	<i>Triticum aestivum</i>	Wheat													0.5	1000						
*	<i>Vulpia myuros</i>	Rats Tail Grass											15	1000								
	<i>Vulpia sp.</i>	Silver Grass																	0.1	20		

[illegible]

Exotic	Scientific Name	Common Name	plot 11		plot 12		plot 13		plot 14		plot 15		plot 16		plot 17		plot 18		plot 19		plot 20	
			5_grazed		5_low		5_wetland		76_grazed		76_grassland		5_wetland		exotic		76_wetland		76_grassland		76_woodland	
			%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#
	<i>Juncus subsecundus</i>	Finger Rush					15	200														
	<i>Juncus usitatus</i>	Rush																				
*	<i>Lolium sp.</i>	Rye Grass	60	2000	10	1000	2	1000	5	1000	0.5	1000	1	1000	0.5	500	1	1000	0.5		1	200
	<i>Lomandra filiformis</i>	Wattle Matt-rush																				
	<i>Panicum effusum</i>	Hairy Panic											0.5	150								
	<i>Panicum sp.</i>												2	150								
*	<i>Paspalum dilatatum</i>	Paspalum																				
*	<i>Pentachistus aeoides</i>	False Hair Grass																				
*	<i>Phalaris aquatica</i>	Phalaris	0.1	100	0.1	11	0.1	4	3	150	0.5	30				200					30	200
	<i>Rytidosperma auriculatum</i>	Lobed Wallaby Grass									0.1	500										
	<i>Rytidosperma sp. 1</i>	Wallaby Grass					1	300	0.1	10							5	0.1			0.1	4
	<i>Rytidosperma sp. 2</i>	Wallaby Grass																			0.1	2
	<i>Rytidosperma sp. 3</i>	Wallaby Grass			0.1	1																
*	<i>Triticum aestivum</i>	Wheat																				
*	<i>Vulpia myuros</i>	Rats Tail Grass									5	5000	0.1	15								
	<i>Vulpia sp.</i>	Silver Grass			0.1	200			5	1000					20	1000	0.5	50	10			

Exotic	Scientific Name	Common Name	plot 21		plot 22		plot 23		plot 24		plot 25		Plot 26		Plot 27		Plot 28		Plot 29		Plot 30	
			76_grassland		76_wetland		76_grassland		76_grassland		76_grassland		76_grassland		76_grassland		5_Creekline		76_woodland		277_Grazed	
			%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#
	TREES																					
	Brachychiton populneus	Kurrajong																				
	Eucalyptus blakelyi	Blakely's Red Gum																		7	1	
	Eucalyptus camaldulensis	River Red Gum							10	8							20	36				
	Eucalyptus melliodora	Yellow Box									12	1										
	Eucalyptus microcarpa	Western Grey Box																	30	3		
	Eucalyptus sideroxylon	Mugga Ironbark																				
*	Schinus molle var. areira	Pepper Tree																				
	Melia azedarach	White Cedar																				
	SHRUBS																					
*	Prunus sp.																					
	FORBS																					
	Alternanthera denticulata	Lesser Joyweed																				
*	Arctotheca calendula	Capeweed																		5	50	
*	Brassica sp.																					
*	Brassica napus	Canola																				
*	Carthamus lanatus	Saffron Thistle	0.1	1									0.1	5								
*	Cirsium Vulgare	Spear Thistle																				
*	Citrullus lanatus lanatus	Camel Melon													0.1	1						

[illegible]

Exotic	Scientific Name	Common Name	plot 21		plot 22		plot 23		plot 24		plot 25		Plot 26		Plot 27		Plot 28		Plot 29		Plot 30	
			76_grassland		76_wetland		76_grassland		76_grassland		76_grassland		76_grassland		76_grassland		5_Creekline		76_woodland		277_Grazed	
			%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#
	<i>Rytidosperma sp. 1</i>	Wallaby Grass	0.1	8	0.1	50	0.1	1									20	1000				
	<i>Rytidosperma sp. 2</i>	Wallaby Grass																				
	<i>Rytidosperma sp. 3</i>	Wallaby Grass																				
*	<i>Triticum aestivum</i>	Wheat																				
*	<i>Vulpia myuros</i>	Rats Tail Grass																				
	<i>Vulpia sp.</i>	Silver Grass	0.1	20	0.1	6	10	500	1	1000			2	1000								

Exotic	Scientific Name	Common Name	Plot 31		Plot 32		Plot 33	
			Exotic		76_Grassland		76_Grassland	
			%	#	%	#	%	#
	TREES							
	<i>Brachychiton populneus</i>	Kurrajong						
	<i>Eucalyptus blakelyi</i>	Blakely's Red Gum						
	<i>Eucalyptus camaldulensis</i>	River Red Gum						
	<i>Eucalyptus melliodora</i>	Yellow Box						
	<i>Eucalyptus microcarpa</i>	Western Grey Box						
	<i>Eucalyptus sideroxylon</i>	Mugga Ironbark						
*	<i>Schinus molle var. areira</i>	Pepper Tree						

Exotic	Scientific Name	Common Name	Plot 31		Plot 32		Plot 33	
			Exotic		76_Grassland		76_Grassland	
			%	#	%	#	%	#
	<i>Melia azedarach</i>	White Cedar						
	SHRUBS							
*	<i>Prunus sp.</i>							
	FORBS							
	<i>Alternanthera denticulata</i>	Lesser Joyweed						
*	<i>Arctotheca calendula</i>	Capeweed	10	1000	15	200	40	1000
*	<i>Brassica sp.</i>							
*	<i>Brassica napus</i>	Canola					0.1	1
*	<i>Carthamus lanatus</i>	Saffron Thistle						
*	<i>Cirsium Vulgare</i>	Spear Thistle						
*	<i>Citrullus lanatus lanatus</i>	Camel Melon						
*	<i>Conyza sp.</i>	Fleabane						
*	<i>Cucumis myriocarpus</i>	Paddy Melon						
	<i>Cymbonotus preissianus</i>	Austral Bear's Ear						
	<i>Dichondra sp.</i>	Kidney Weed						
*	<i>Echium plantagineum</i>	Patterson's Curse	5	100				
	<i>Einadia nutans</i>	Climbing Saltbush						
	<i>Erodium sp.</i>	Stork'sbill						
*	<i>Erodium botrys</i>	Long Storksbill	10	100	20	500	10	500

Exotic	Scientific Name	Common Name	Plot 31		Plot 32		Plot 33	
			Exotic		76_Grassland		76_Grassland	
			%	#	%	#	%	#
	<i>Euphorbia drummondii</i>	Caustic weed	0.1	1				
*	<i>Hypochaeris radicata</i>	Catsear			2	20		
*	<i>Lactuca serriola</i>	Prickly Lettuce						
*	<i>Lepidium africanum</i>	Common Peppergrass						
	<i>Lythrum hyssopifolia</i>	Hyssop Loosestrife						
*	<i>Malva parviflora</i>	Mallow						
*	<i>Malva sp.</i>							
*	<i>Medicago arabica</i>	Spotted Burr Medic					20	200
*	<i>Medicago sativa</i>	Lucerne						
*	<i>Medicago sp.</i>							
	<i>Mentha sp.</i>							
	<i>Oxalis perennans</i>							
	<i>Oxalis sp.</i>							
	<i>Persicaria sp.</i>	Knot weed						
*	<i>Plantago lanceolata</i>							
*	<i>Portulaca oleracea</i>	Pigweed	0.5	10				
*	<i>Polygonum aviculare</i>	Wireweed						
	<i>Pratia sp.</i>							
*	<i>Romulea rosea</i>	Onion Grass	40	1000	45	1000	15	1000
	<i>Rumex brownii</i>	Swamp Dock						

Exotic	Scientific Name	Common Name	Plot 31		Plot 32		Plot 33	
			Exotic		76_Grassland		76_Grassland	
			%	#	%	#	%	#
*	<i>Rumex obtusifolius</i>	Broadleaf Dock						
*	<i>Rumex sp. Exotic</i>							
	<i>Rumex sp. native</i>							
	<i>Sida corrugata</i>	Corrugated Sida						
	<i>Sida cunninghamii</i>	Ridge Sida						
*	<i>Silybum marianum</i>	Variegated Thistle						
*	<i>Sonchus oleraceus</i>	Sow Thistle						
*	<i>Tribulus terrestris</i>	Cat-head						
*	<i>Trifolium sp.</i>	Clover	0.1	1	5	100		
*	<i>Trifolium subterraneum</i>	Subterranean Clover						
	<i>Unidentified forb</i>	Unidentified						
	<i>Unidentified forb</i>	Unidentified						
*	<i>Sanguisorba minor subsp. muricata</i>	Sheep's Burnet						
*	<i>Xanthium spinosum</i>	Bathurst Burr						
GRASSES AND GRASSLIKE								
*	<i>Anthosachae scabra</i>	Native Wheat						
	<i>Aristida behriana</i>	Bunch Wiregrass						
	<i>Austrostipa blackii</i>							

Exotic	Scientific Name	Common Name	Plot 31		Plot 32		Plot 33	
			Exotic		76_Grassland		76_Grassland	
			%	#	%	#	%	#
	<i>Austrostipa scabra</i>	Speargrass						
*	<i>Avena fatua</i>	Wild Oats						
*	<i>Avena sp.</i>	Unidentified						
*	<i>Briza minor</i>	Shivery Grass						
*	<i>Bromus catharticus</i>	Praire Grass						
*	<i>Bromus diandrus</i>	Great Brome						
*	<i>Bromus molliformis</i>	Soft Brome						
	<i>Carex sp.</i>							
*	<i>Cenchrus clandestinus</i>	Kikuyu						
	<i>Chloris truncata</i>	Windmill Grass			5	1000		
	<i>Cynodon dactylon</i>	Common Couch						
	<i>Cyperus sp.</i>							
	<i>Eleocharis sp.</i>							
	<i>Enteropogon ramosus</i>	Curly Windmill Grass			5	100	5	50
	<i>Eragrostis sp.</i>	A love Grass						
*	<i>Hordeum leporinum</i>	Barley Grass					3	150
*	<i>Isolepis marginata</i>	Green Sedge						
	<i>Juncus sp. 1</i>	Rush			0.1	1	0.1	1
	<i>Juncus sp. 2</i>	Rush						
	<i>Juncus subsecundus</i>	Finger Rush						

Exotic	Scientific Name	Common Name	Plot 31		Plot 32		Plot 33	
			Exotic		76_Grassland		76_Grassland	
			%	#	%	#	%	#
	<i>Juncus usitatus</i>	Rush						
*	<i>Lolium sp.</i>	Rye Grass					3	150
	<i>Lomandra filiformis</i>	Wattle Matt-rush						
	<i>Microlaena stipoides</i>	Weeping Meadow Grass						
	<i>Panicum effusum</i>	Hairy Panic						
	<i>Panicum sp.</i>							
*	<i>Paspalum dilatatum</i>	Paspalum						
*	<i>Pentachistus aeoides</i>	False Hair Grass						
*	<i>Phalaris aquatica</i>	Phalaris	5	50	2	50	5	50
	<i>Rytidosperma auriculatum</i>	Lobed Wallaby Grass						
	<i>Rytidosperma sp. 1</i>	Wallaby Grass						
	<i>Rytidosperma sp. 2</i>	Wallaby Grass						
	<i>Rytidosperma sp. 3</i>	Wallaby Grass						
*	<i>Triticum aestivum</i>	Wheat						
*	<i>Vulpia myuros</i>	Rats Tail Grass						
	<i>Vulpia sp.</i>	Silver Grass						

Appendix C Scattered Paddock trees

Scattered Tree	Latitude	Longitude	Species Name	PCT	DBH (Cm)	Above Benchmark (50cm)	Hollows Present	Scattered Tree Class	Removal Required
1	146.953263	-35.745388	Yellow Box	277	200	Yes	No	Class 3	Yes
2	146.961932	-35.741106	Grey Box	76	90	Yes	Yes	Class 3	Yes
3	146.964167	-35.745513	Grey Box	76	300	Yes	Yes	Class 3	Yes
4	146.965147	-35.744801	Grey Box	76	200	Yes	Yes	Class 3	Yes
5	146.965799	-35.746765	Grey Box	76	69	Yes	No	Class 3	Yes
6	146.966283	-35.747035	Grey Box	76	70	Yes	No	Class 3	Yes
7	146.966699	-35.746506	Grey Box	76	100	Yes	Yes	Class 3	Yes
8	146.970326	-35.746664	Grey Box	76	200	Yes	Yes	Class 3	Yes
9	146.97106	-35.746136	Grey Box	76	100	Yes	Yes	Class 3	Yes
10	146.97297	-35.746428	White Cypress	76	60	Yes	No	Class 3	Yes
11	146.970617	-35.742922	Grey Box	76	85	Yes	Yes	Class 3	Yes
12	146.968554	-35.742765	Grey Box	76	90	Yes	Yes	Class 3	Yes
13	146.94834	-35.739938	Grey Box	76	90	Yes	Yes	Class 3	Yes
14	146.945336	-35.740729	Yellow Box	277	100	Yes	Yes	Class 3	No
15	146.943913	-35.743634	Blakely's Red Gum	277	100	Yes	No	Class 3	Yes
16	146.945269	-35.745619	Yellow Box	277	90	Yes	Yes	Class 3	Yes
17	146.945174	-35.745768	Yellow Box	277	100	Yes	Yes	Class 3	Yes
18	146.944946	-35.7465	Blakely's Red Gum	277	100	Yes	Yes	Class 3	Yes

Scattered Tree	Latitude	Longitude	Species Name	PCT	DBH (Cm)	Above Benchmark (50cm)	Hollows Present	Scattered Tree Class	Removal Required
19	146.945226	-35.746707	Yellow Box	277	90	Yes	Yes	Class 3	Yes
20	146.944576	-35.746987	Blakely's Red Gum	277	100	Yes	Yes	Class 3	Yes
21	146.961145	-35.74779	Grey Box	277	100	Yes	Yes	Class 3	Yes
22	146.977335	-35.754221	River Red Gum	5	200	Yes	Yes	Class 3	Yes
23	146.977909	-35.754398	Grey Box	76	100	Yes	Yes	Class 3	No
24	146.977199	-35.755594	Stag	0	0	n/a	No	Class 1	No
25	146.975406	-35.752328	Grey Box	76	90	Yes	No	Class 3	Yes
26	146.974884	-35.751756	Grey Box	76	90	Yes	No	Class 3	Yes
27	146.981923	-35.746048	Grey Box	76	300	Yes	Yes	Class 3	Yes
28	146.982541	-35.745257	Grey Box	76	300	Yes	No	Class 3	Yes
29	146.983742	-35.744708	Grey Box	76	200	Yes	Yes	Class 3	Yes
30	146.984655	-35.745134	Yellow Box	277	100	Yes	Yes	Class 3	Yes
31	146.979287	-35.7519	Unknown	76	30	Yes	No	Class 3	Yes
32	146.983	-35.752471	Grey Box	76	200	Yes	Yes	Class 3	Yes
33	146.98241	-35.752971	Grey Box	76	200	Yes	Yes	Class 3	Yes
34	146.981958	-35.753756	Grey Box	76	48	No	Yes	Class 2	Yes
35	146.981279	-35.755164	Grey Box	76	200	Yes	Yes	Class 3	Yes
36	146.981742	-35.756821	Grey Box	76	80	Yes	Yes	Class 3	Yes

Biodiversity Development Assessment Report

Walla Walla Solar Farm

Scattered Tree	Latitude	Longitude	Species Name	PCT	DBH (Cm)	Above Benchmark (50cm)	Hollows Present	Scattered Tree Class	Removal Required
37	146.98304	-35.755875	Grey Box	76	100	Yes	Yes	Class 3	Yes
38	146.983356	-35.754288	Grey Box	76	200	Yes	Yes	Class 3	Yes
39	146.985464	-35.751797	Grey Box	76	200	Yes	Yes	Class 3	Yes
40	146.985078	-35.755321	Grey Box	76	100	Yes	Yes	Class 3	Yes
41	146.979107	-35.756742	Grey Box	76	200	Yes	Yes	Class 3	Yes
42	146.978845	-35.754963	Grey Box	76	200	Yes	Yes	Class 3	Yes
43	146.979136	-35.753015	White Cedar	5	20	No	No	Class 2	Yes
44	146.979498	-35.753769	Grey Box	76	100	Yes	Yes	Class 3	Yes
45	146.969059	-35.752803	Stag	0	n/a	n/a	No	Class 1	Yes
46	146.967685	-35.751302	Grey Box	76	100	Yes	Yes	Class 3	Yes
47	146.967695	-35.751217	Grey Box	76	100	Yes	Yes	Class 3	Yes
48	146.967649	-35.751169	Grey Box	76	90	Yes	Yes	Class 3	Yes
49	146.96456	-35.751082	Grey Box	76	95	Yes	Yes	Class 3	Yes
50	146.964741	-35.753132	Grey Box	76	100	Yes	Yes	Class 3	Yes
51	146.962565	-35.751122	Grey Box	76	100	Yes	No	Class 3	Yes
52	146.959568	-35.750134	Grey Box	76	80	Yes	Yes	Class 3	Yes
53	146.955843	-35.748087	Grey Box	76	200	Yes	Yes	Class 3	Yes

Biodiversity Development Assessment Report*Walla Walla Solar Farm*

Scattered Tree	Latitude	Longitude	Species Name	PCT	DBH (Cm)	Above Benchmark (50cm)	Hollows Present	Scattered Tree Class	Removal Required
54	146.955823	-35.748293	Grey Box	76	200	Yes	Yes	Class 3	Yes
55	146.953604	-35.75076	Yellow Box	277	80	Yes	Yes	Class 3	Yes
56	146.953676	-35.75071	Yellow Box	277	300	Yes	Yes	Class 3	Yes
57	146.950635	-35.747355	Blakely's Red Gum	277	100	Yes	No	Class 3	Yes
58	146.950773	-35.747663	Yellow Box	277	100	Yes	No	Class 3	Yes
59	146.981517	-35.744734	Grey Box	76	90	Yes	Yes	Class 3	Yes
60	146.970849	-35.741955	River Red Gum	5	80	Yes	No	Class 3	No
61	146.970667	-35.741847	River Red Gum	5	80	Yes	Yes	Class 3	No
62	146.962061	-35.741079	Grey Box	76	65	Yes	No	Class 3	Yes
63	146.98222	-35.746444	Grey Box	76	90	Yes	Yes	Class 3	Yes

Appendix D Fauna species

Species Group	Scientific Name	Common Name	Threatened Species	14/11/18 Opportunistic	11/06/19 Opportunistic	11/06/19 Plot a	11/06/19 Plot b	11/06/19 Plot c
Aves	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill			O			
Aves	<i>Chenonetta jubata</i>	Wood Duck						O
Aves	<i>Climacteris picumnus</i>	Brown Treecreeper	Vulnerable BC Act		H			
Aves	<i>Colluricincla harmonica</i>	Grey Shrike-thrush			H			
Aves	<i>Corvus coronoides</i>	Australian Raven		O			H	H
Aves	<i>Corvus mellori</i>	Little Raven					H	O
Aves	<i>Cracticus nigrogularis</i>	Pied Butcherbird						O
Aves	<i>Cracticus tibicen</i>	Australian Magpie		O		O	O	O
Aves	<i>Cracticus torquatus</i>	Grey Butcherbird					H	
Aves	<i>Eolophus roseicapillus</i>	Galah		O		O		O
Aves	<i>Grallina cyanoleuca</i>	Peewee				H	H	O
Aves	<i>Manorina melanocephala</i>	Noisy Miner					O	
Aves	<i>Pardalotus striatus</i>	Striated Pardalote		O				
Aves	<i>Petrochelidon nigricans</i>	Tree Martin		O				
Aves	<i>Petroica phoenicea</i>	Flame Robin	Vulnerable BC Act		O			
Aves	<i>Platycercus eximius</i>	Eastern Rosella		O		O		O

Species Group	Scientific Name	Common Name	Threatened Species	14/11/18 Opportunistic	11/06/19 Opportunistic	11/06/19 Plot a	11/06/19 Plot b	11/06/19 Plot c
Aves	<i>Podargus strigoides</i>	Tawny Frogmouth		O	O			
Aves	<i>Psephotus haematonotus</i>	Red-rumped Parrot			O			
Aves	<i>Rhipidura leucophrys</i>	Willy Wagtail			O			
Aves	<i>Sturnus vulgaris</i>	Common Starling		O	O			
Mammals	<i>Macropus giganteus</i>	Eastern Grey Kangaroo			O			
Mammals	<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum			O			
Mammals	<i>Trichosurus vulpecula</i>	Common Brushtail Possum		O				
Reptiles	<i>Varanus varius</i>	Lace-Monitor		O				
Amphibians	<i>Crinia parinsignifera</i>	Beeping Froglet						H

O=Observed

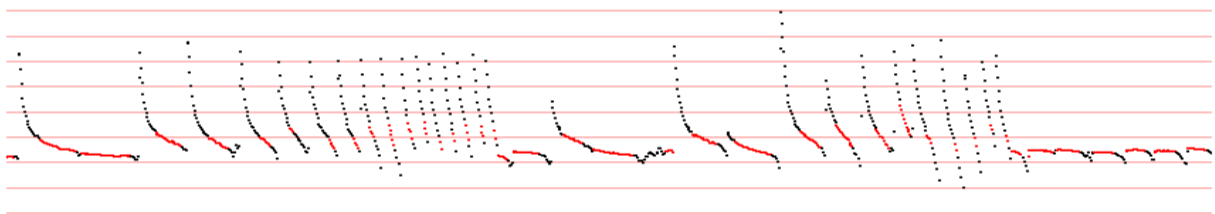
H= Heard

Appendix E Anabat data analysis

Walla Walla Solar Farm Microbat Ultrasonic Call Identification Report

RA Environmental Consultants

ABN – 63 6685 875 27



Walla Walla Solar Farm Microbat Ultrasonic Call Identification Report

Methods

The microbat ultrasonic call data received for analysis was collected from two Anabat Swift detectors that were passively deployed by NGH Consultants at four locations for a collective total of eight survey nights within the Walla Walla Solar Farm study area(hereafter, the study area). The study area is located near Walla Walla, which is located approximately 40 Km north of Albury, NSW.

Four sites were surveyed over four consecutive nights, as described below:

- Surveys between 5 and 6 October
 - Site 1 (Anabat 1 - detector serial # 576053) and Site 2 (Anabat 2 - detector serial # 605425) were set to record microbat calls along a *Eucalyptus camaldulensis* (River Red Gum) lined creek line near to pools of water (potential *Myotis macropus* (Southern Myotis) forage habitat).
- Surveys between 7 and 8 October 2021
 - Site 3. (Anabat 1 - detector serial # 576053) was set to record microbat calls near to a small dam outlet.
 - Site 4. (Anabat 2 - detector serial # 605425) – was set to record microbat calls at a large, flooded area of open River Red Gum Forest.

Call identifications were made using the microbat echolocation call guides that have been developed for New South Wales (Pennay *et al* 2004) and the south-east Queensland and north-east New South Wales (Reinhold *et al* 2001). The Study area is located within the Riverina biogeographical region as described in Pennay *et al.* 2004. The identification of a species as being likely to be present at the study area was further supported by the known distribution of each

species as presented in Churchill (2008); Pennay *et al.* (2011); Van Dyck and Strahan (2008); Van Dyck *et al.* (2013) and the Australian Bat Society BatMap web page located at [BatMap - Ausbats](#). Microbat calls were recorded in the WAV files and were analysed in both full spectrum and zero-crossing formats using the software program Anabat Insight (Version 2.0.1-0-g1ca0e76) (Titley Scientific).

While analysing the recorded microbat ultrasonic call data, the following protocols were applied:

- Short and low-quality calls with less than three pulses were removed from data through the Decision Tree filter function that is available in Anabat Insight, or manually.
- For those calls that could be used to identify a species or genus making the call, two categories of confidence are used:
 - A microbat genus or species was identified as being ‘definitely present’ when the quality and the structure of the call profile was of sufficient length (e.g., more than three pulses) and quality that the identity of the bat species making the calls is not in doubt.
 - Microbat genus or species was identified as being ‘potentially present’ if the quality and structure of the call profile cannot be resolved to species because the call is of sufficient length (e.g., less than three pulses), is of poor quality or is a species that produces a call profile that is similar to another species.

Results and Discussion

A total of 2, 658 Wav files were presented for analysis. Based upon the recorded microbat calls, nine (9) microbat species were positively identified as being definitely present at the study area (Table 1, Figure 1 - Figure 11). A further three (3) species, including two *Nyctophilus* species (e.g., *N. geoffroyi* (Lesser Long-eared Bat) and *N. gouldi* (Gould’s Wattled Bat) and *Saccolaimus*

flaviventris (Yellow-bellied Sheath-tailed Bat), whose recorded call profiles could not be resolved to a single species, were deemed to be potentially present at the study area (Table 1, Figure 1 - Figure 11).

Threatened species records

Two threatened species, *Miniopterus orianae oceanensis* (Large Bent-winged Bat) and *Myotis macropus* (Southern Myotis), which are listed as Vulnerable under the New South Wales *Biodiversity Conservation Act 2016* (BC Act) were positively identified as being present at the study area (Table 1). The Large Bent-winged Bat and the Southern Myotis are also listed Species Credit Species under the Biodiversity Assessment Methodology (Office of Heritage 2018).

Definite and potential Southern Myotis calls were recorded at Sites 1, 2 and 3. However, based upon the low number of detections (seven definite and 41 unresolved call profiles) recorded over the eight survey nights this species occurs at low densities within the study area.

One further threatened species, the Yellow-bellied Sheath-tailed Bat, which is also listed as Vulnerable under the BC Act, was deemed to be potentially present.

Roost and forage habitats

Large Bent-winged Bat and the Southern Myotis are known to roost in underground cave like roosts. This includes those dark and cave like structures often found in artificially made structures (Churchill 2008; Hoyer and Hall 2008). This includes those cave-like habitats often found in bridge and stormwater drains (e.g, scupper holes, lifting holes, expansion cracks as well as damaged or degraded sections). The Southern Myotis will also roost in tree hollows that are typically within a 100 radius of water source suitable in size and quality to enable this species to forage (Campbell 2009).

The study area and nearby areas are unlikely to support Large Bent-winged Bat breeding habitat. Therefore, the study area may support forage habitat for this species only.

The presence of HBTs, farm dams and open ponds means that the study area, and the surrounding areas do contain foraging, breeding and maternal habitat for Southern Myotis. If any HBTs (potential Southern Myotis breeding and material habitat) are to be impacted by the proposal, then a Test of Significance test under s7.3 of the BC Act could be required. Species Credits are likely to be required under the Biodiversity Offset Scheme (BOS) and BAM if there are to be impacts to this species breeding habitats.

Table 1. Microbat species that were recorded during the Walla Walla survey.

Species name	Common name	5 and 6 October 2021		7 and 8 October 2021	
		Site 1 Creek line	Site 2 Creek line	Site 3 Dam Outlet	Site 4 Flooded area
<i>Austronomus australis</i>	White-striped Free-tailed Bat	D	D	D	D
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	D	D	D	P
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	D	D	D	-
<i>Miniopterus orianae oceanensis</i> ¹	Large Bent-winged Bat	D	D	D	P
<i>Myotis macropus</i> ¹	Southern Myotis	D	P	D	-
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat	P	P	P	-
<i>Nyctophilus gouldii</i>	Gould's Long-eared Bat	P	P	P	-
<i>Ozimops planiceps</i>	Inland Broad-nosed Bat	D	D	D	D
<i>Ozimops ridei</i>	Little Broad-nosed Bat	D	D	D	D
<i>Saccolaimus flaviventris</i> ¹	Yellow-bellied Sheath-tailed Bat	P	-	P	-
<i>Vespadelus darlingtoni</i>	Large Forest Bat	D	D	D	D
<i>Vespadelus vulturnus</i>	Little Forest Bat	D	D	D	D

¹- listed as threatened under the BC Act.

D = definitely present at the Study area or P = potentially present at the Study area as based upon the recorded call profiles

Disclaimer

A microbat species was deemed as being positively present when the recorded call characteristics matched those described by Pennay *et al.* 2004 and Reinhold *et al.* 2001. In this survey, several species were recorded that can have overlapping call profiles, this included the following species complexes:

- White-striped Free-tailed Bat and Yellow-bellied Sheath-tailed Bat
- Large Bent-winged Bat, Large Forest Bat and Little Forest Bat
- Southern Myotis, *Nyctophilus geoffroyi* (Lesser Long-eared Bat) and *N. gouldii* (Gould's Long-eared Bat)

If an overlap occurred, the call profile was given to multi-species label and discounted from the assessment.

An example of each species and species complex call profile that was recorded during this survey is shown in Figure 1 - Figure 11.

Recorded species call profiles

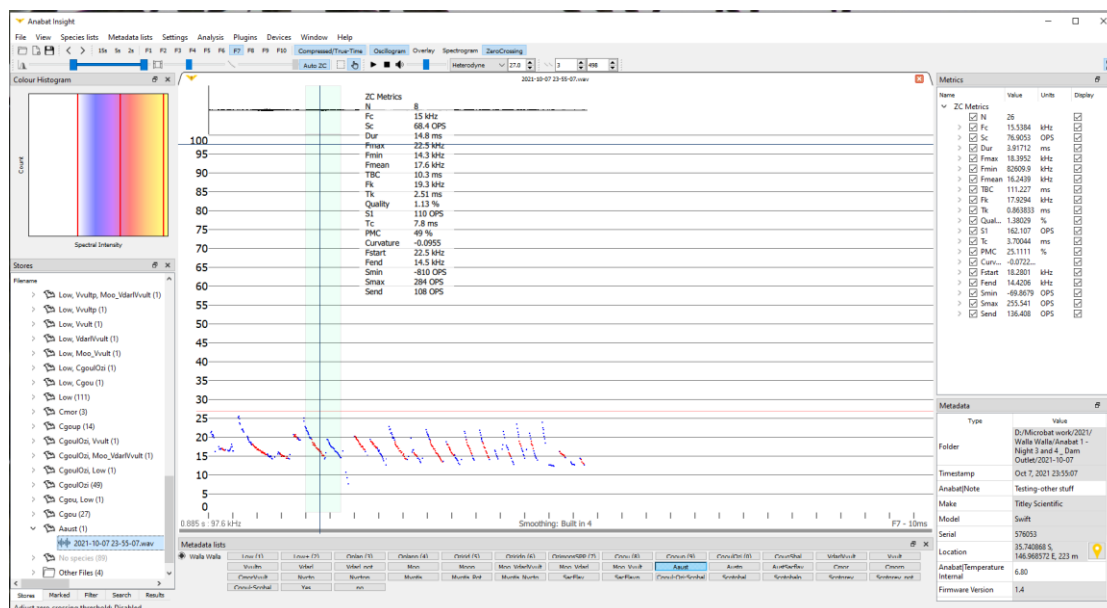


Figure 1. Call profile for *Austronomus australis* (White-striped Free-tailed Bat) recorded within the Walla Walla Solar Farm study area on the 7th October 2021.

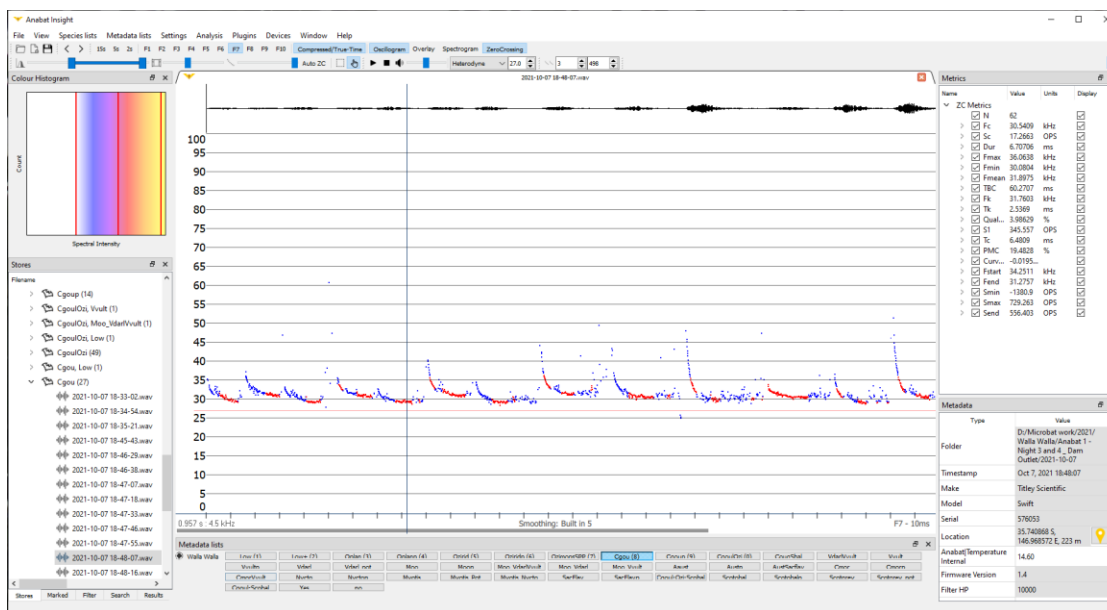


Figure 2. Potential call profile for *Chalinolobus gouldii* (Gould's Wattled Bat) recorded within the Walla Walla Solar Farm study area on the 7th October 2021.

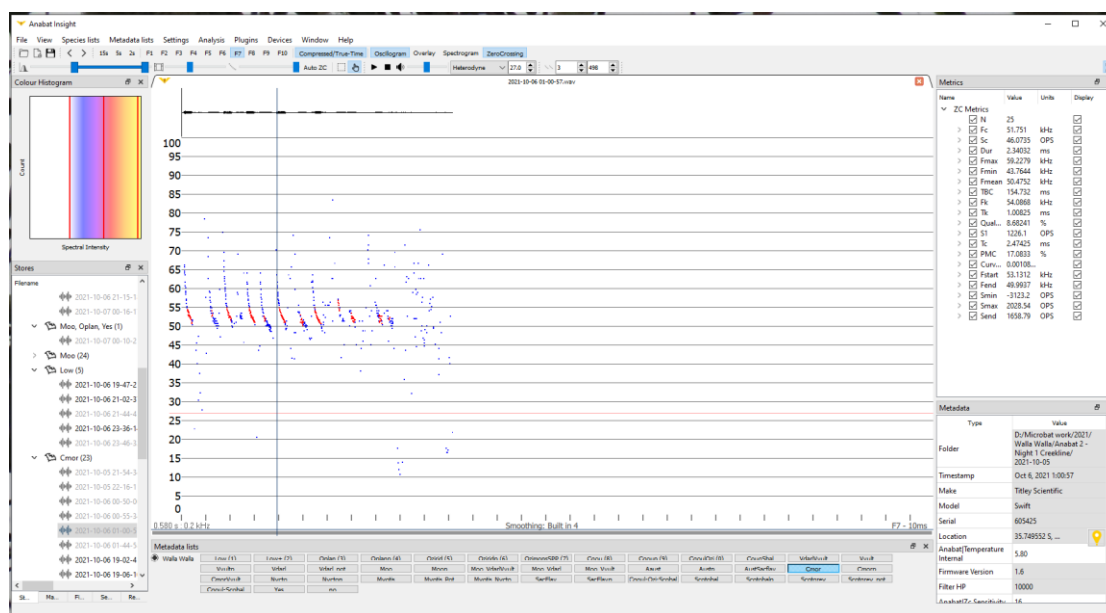


Figure 3. Call profile for *Chalinolobus morio* (Chocolate Wattled Bat) recorded within the Walla Walla Solar Farm study area on the 6th October 2021.

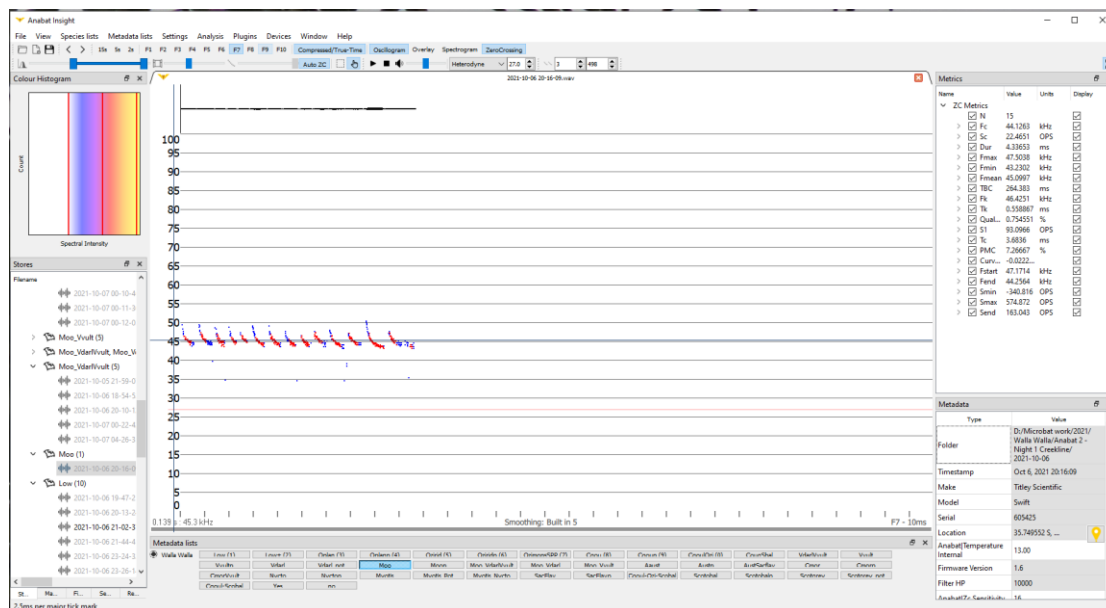


Figure 4. Call profile for *Miniopterus orianae oceanensis* (Large Bent-winged Bat) recorded within the Walla Walla Solar Farm study area on the 6th October 2021.

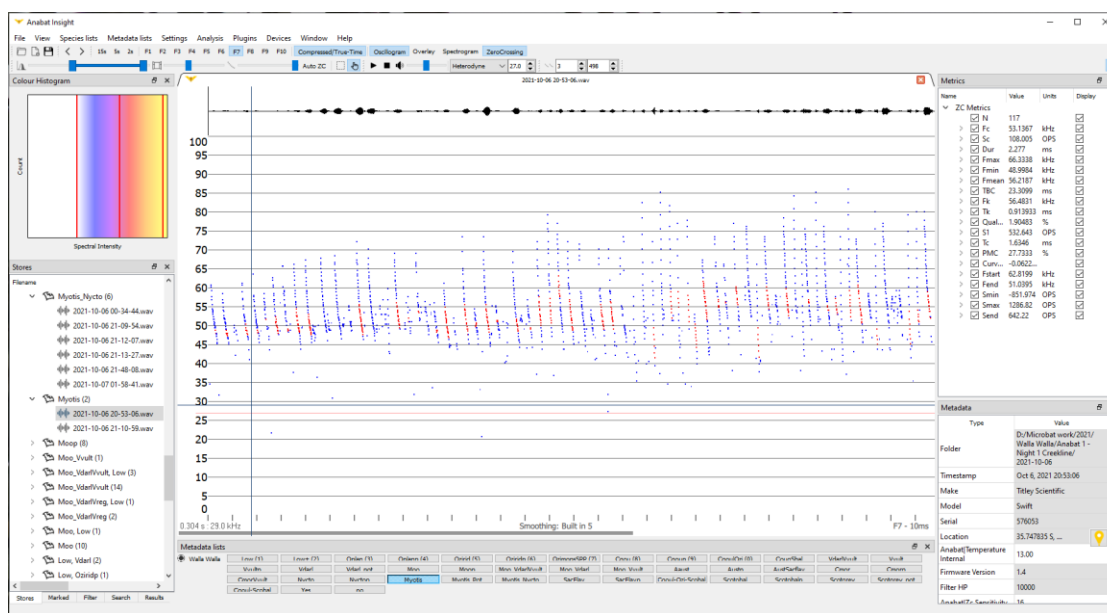


Figure 5. Call profile for *Myotis macropus* (Southern Myotis) recorded within the Walla Walla Solar Farm study area on the 6th October 2021.

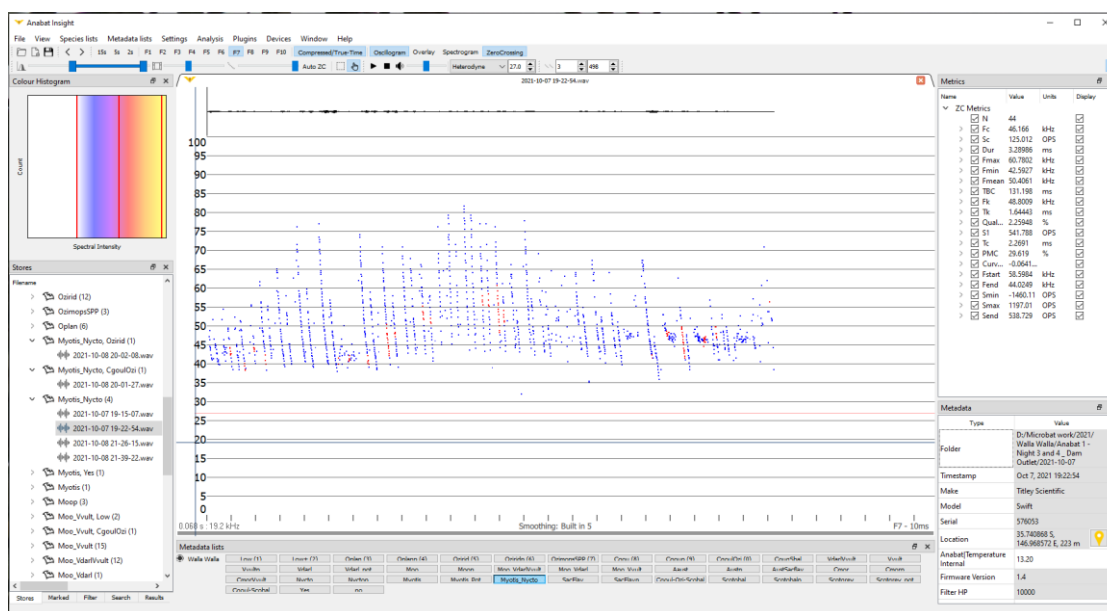
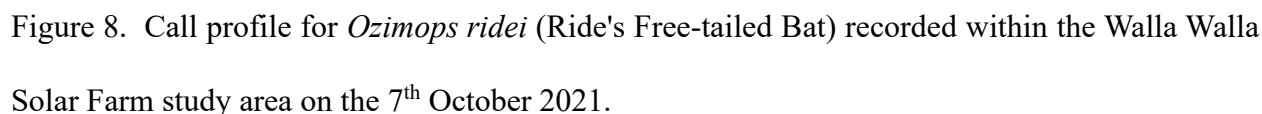
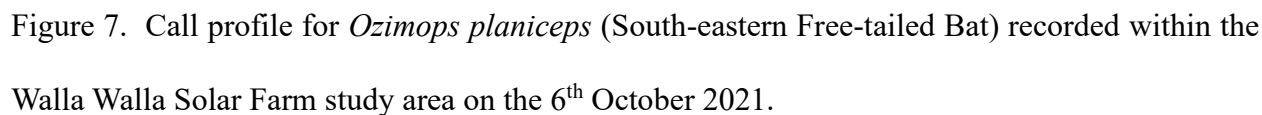


Figure 6. Unresolved call profile for *Myotis macropus* (Southern Myotis) / *Nyctophilus geoffroyi* (Lesser Long-eared Bat) / *Nyctophilus gouldi* (Gould's Long-eared Bat) recorded within the Walla Walla Solar Farm study area on the 7th October 2021.



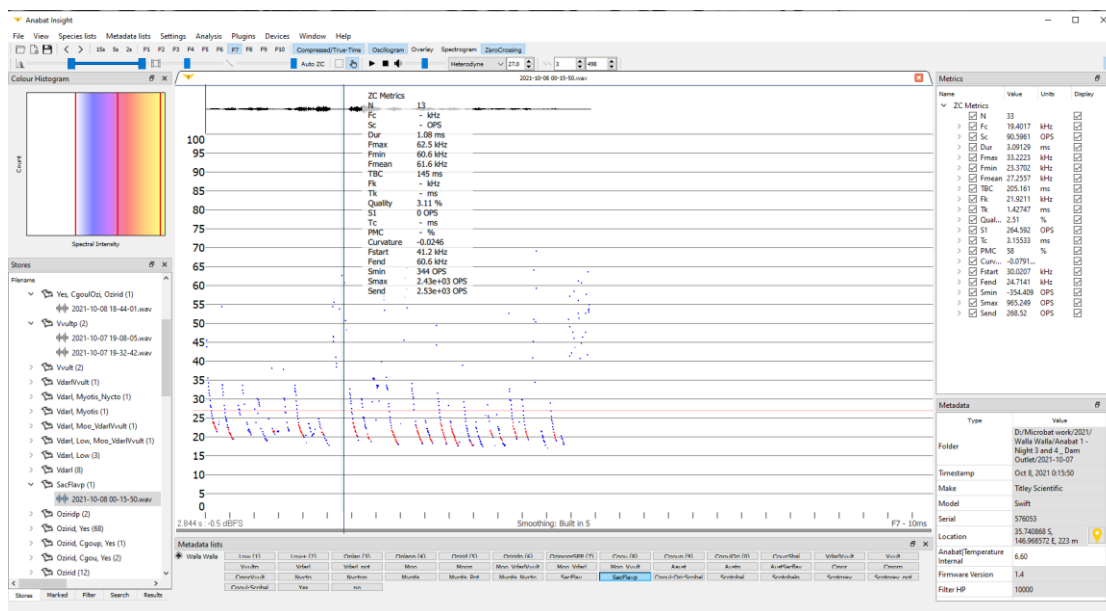


Figure 9. Potential call profile for *Saccolaimus flaviventris* (Yellow-bellied Sheath-tailed Bat) recorded within the Walla Walla Solar Farm study area on the 7th October 2021.

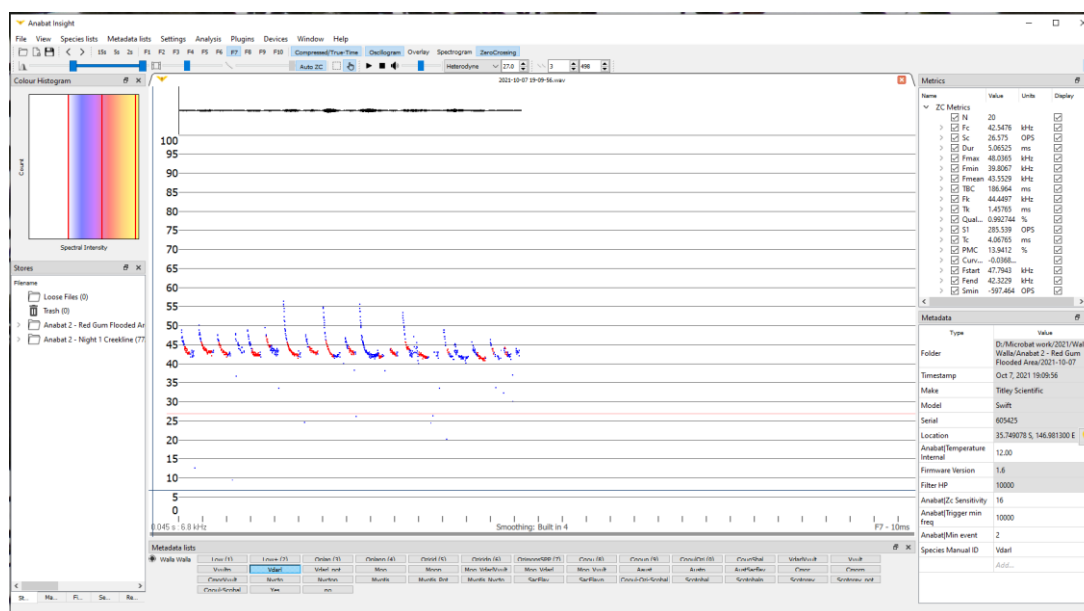
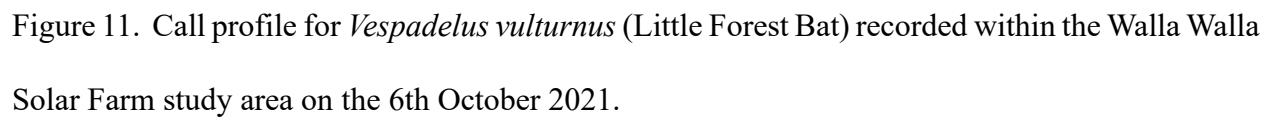


Figure 10. Call profile for *Vespadelus darlingtoni* (Large Forest Bat) recorded within the Walla Walla Solar Farm study area on the 7th October 2021.



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Appendix F Protected matters search results



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 18-Mar-2022

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	7
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	34
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	4
Commonwealth Heritage Places:	None
Listed Marine Species:	18
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	1
Regional Forest Agreements:	1
Nationally Important Wetlands:	1
EPBC Act Referrals:	4
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands)		[Resource Information]
Ramsar Site Name	Proximity	Buffer Status
Banrock station wetland complex	600 - 700km upstream from Ramsar site	In feature area
Barmah forest	100 - 150km upstream from Ramsar site	In buffer area only
Gunbower forest	200 - 300km upstream from Ramsar site	In buffer area only
Hattah-kulkyne lakes	400 - 500km upstream from Ramsar site	In feature area
Nsw central murray state forests	100 - 150km upstream from Ramsar site	In buffer area only
Riverland	500 - 600km upstream from Ramsar site	In feature area
The coorong, and lakes alexandrina and albert wetland	600 - 700km upstream from Ramsar site	In feature area

Listed Threatened Ecological Communities

[Resource Information]

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

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area	In feature area
Weeping Myall Woodlands	Endangered	Community may occur within area	In feature area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area	In feature area

Community Name	Threatened Category	Presence Text	Buffer Status
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Listed Threatened Species

[[Resource Information](#)]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
 Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
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BIRD

[Anthochaera phrygia](#)

Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
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[Botaurus poiciloptilus](#)

Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In feature area
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[Calidris ferruginea](#)

Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
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[Callocephalon fimbriatum](#)

Gang-gang Cockatoo [768]	Endangered	Species or species habitat may occur within area	In feature area
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[Falco hypoleucos](#)

Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
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[Grantiella picta](#)

Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area	In feature area
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[Hirundapus caudacutus](#)

White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area	In feature area
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[Lathamus discolor](#)

Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
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[Numenius madagascariensis](#)

Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
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[Polytelis swainsonii](#)

Superb Parrot [738]	Vulnerable	Species or species habitat known to occur within area	In feature area
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Scientific Name	Threatened Category	Presence Text	Buffer Status
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
FISH			
Galaxias rostratus Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Maccullochella macquariensis Trout Cod [26171]	Endangered	Species or species habitat may occur within area	In buffer area only
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area	In feature area
Nannoperca australis Murray-Darling Basin lineage Southern Pygmy Perch (Murray-Darling Basin lineage) [91711]	Vulnerable	Species or species habitat may occur within area	In buffer area only
FROG			
Crinia sloanei Sloane's Froglet [59151]	Endangered	Species or species habitat likely to occur within area	In feature area
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat may occur within area	In feature area
INSECT			
Synemon plana Golden Sun Moth [25234]	Vulnerable	Species or species habitat may occur within area	In buffer area only
MAMMAL			
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Nyctophilus corbeni			
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat likely to occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
PLANT			
Ammobium craspedioides			
Yass Daisy [20758]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Amphibromus fluitans			
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat may occur within area	In feature area
Brachyscome muelleroides			
Mueller Daisy [15572]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Caladenia arenaria			
Sand-hill Spider-orchid [9275]	Endangered	Species or species habitat may occur within area	In feature area
Lepidium monoplacoides			
Winged Pepper-cress [9190]	Endangered	Species or species habitat may occur within area	In feature area
Prasophyllum petilum			
Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within area	In feature area
Prasophyllum validum			
Sturdy Leek-orchid, Mount Remarkable Leek-orchid [10268]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Senecio macrocarpus			
Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Swainsona recta Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat may occur within area	In buffer area only
REPTILE			
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Delma impar Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Listed Migratory Species		[Resource Information]	
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area	In buffer area only
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]		
The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.		
Commonwealth Land Name	State	Buffer Status
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian Telecommunications Commission [15286]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [15285]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [14708]	NSW	In buffer area only
Commonwealth Land - Telstra Corporation Limited [14709]	NSW	In buffer area only

Listed Marine Species [Resource Information]			
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]		Species or species habitat likely to occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat may occur within area overfly marine area	In buffer area only
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Benambra	National Park	NSW	In buffer area only
Regional Forest Agreements			[Resource Information]
Note that all areas with completed RFAs have been included.			
RFA Name		State	Buffer Status
Southern RFA		New South Wales	In buffer area only
Nationally Important Wetlands			[Resource Information]

Wetland Name	State	Buffer Status
Walla Walla Swamp (Gum Swamp)	NSW	In buffer area only

EPBC Act Referrals [Resource Information]				
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Albury to Illabo Section of Inland Rail	2020/8670	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

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

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
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- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

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

Please feel free to provide feedback via the [Contact Us](#) page.

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Appendix G EPBC species habitat assessment

The tables in this appendix present the habitat evaluation for threatened species, ecological communities and endangered populations listed from the EPBC Act Protected Matters Report.

The likelihood of occurrence is based on presence of habitat, proximity of nearest records and mobility of the species (where relevant). The assessment of potential impact is based on the nature of the proposal, the ecology of the species and its likelihood of occurrence. The following classifications are used:

Presence of habitat:

- Present: Potential or known habitat is present within the study area
- Absent: No potential or known habitat is present within the study area

Likelihood of occurrence

- Unlikely: Species known or predicted within the locality but unlikely to occur in the study area
- Possible: Species could occur in the study area
- Present: Species was recorded during the field investigations

Possible to be impacted

- No: The proposal would not impact this species or its habitats. No further assessment would be necessary at this stage of the project.
- Yes: The proposal could impact this species or its habitats. Further investigation into the likelihood and consequence of the impact of the proposal on these species would be considered under the EPBC Act for the EIS.

G.1 Flora species

Species	Habitat requirements	Presence Of habitat	Likelihood Of occurrence	Potential Impact
Flora				
<i>Ammobium craspedioides</i> Yass Daisy BC – V EPBC – V IBRA Sub-region: Inland Slopes	Found in moist or dry forest communities, Box-Gum Woodland and secondary grassland derived from clearing of these communities. Grows in association with a large range of eucalypts (<i>Eucalyptus blakelyi</i>, <i>E. bridgesiana</i>, <i>E. dives</i>, <i>E. goniocalyx</i>, <i>E. macrorhyncha</i>, <i>E. mannifera</i>, <i>E. melliodora</i>, <i>E. polyanthemos</i>, <i>E. rubida</i>).	Present Woodland present but understory heavily grazed and degraded.	Unlikely Vegetation surveys indicate that this species is not present.	No No suitable habitat would be impacted by the proposal.
<i>Amphibromus fluitans</i> River Swamp Wallaby Grass EPBC – V BC - V IBRA Sub-region: Inland Slopes, Lower Slopes	<i>Amphibromus fluitans</i> grows mostly in permanent swamps. The species needs wetlands which are at least moderately fertile and which have some bare ground, conditions which are produced by seasonally-fluctuating water levels. Habitats in south-western NSW include swamp margins in mud, dam and tank beds in hard clay and in semi-dry mud of lagoons with <i>Potamogeton</i> and <i>Chamaeraphis</i> species. Flowering time is from spring to autumn or November to March. Disturbance regimes are not known, although the species requires periodic flooding of its habitat to maintain wet conditions. Wetlands inhabited by this species that are converted to deep, permanent dams are unsuitable for continued habitation by this species. The species has shown a level of resistance to salinization of habitat in experimental tests. Has been observed covering several hectares in area. The species is also recorded as occasional too common in populations.	Absent No permanent swamps or waterbodies with vegetation in study area.	Unlikely Vegetation surveys indicate that this species is not present.	No No suitable habitat would be impacted by the proposal.

Species	Habitat requirements	Presence Of habitat	Likelihood Of occurrence	Potential Impact
<i>Brachyscome muelleroides</i> Mueller Daisy	Grows in damp areas on the margins of claypans in moist grassland with <i>Pycnosorus globosus</i> , <i>Agrostis avenacea</i> and <i>Austrodanthonia duttoniana</i> . Also recorded from the margins of lagoons in mud or water, and in association with <i>Calotis anthemoides</i> . Victorian collections have generally come from open positions on the Murray River floodplain, swampy River Red Gum (<i>Eucalyptus camaldulensis</i>) Forest and damp depressions Occurs in the Wagga Wagga, Narranderra, Tocumwal and Walbundrie areas. Also occurs in north-central Victoria (only along the Murray from Tocumwal to the Ovens River).	Absent Damp areas present within development site but heavily grazed and degraded.	Unlikely Not detected during site surveys	No No suitable habitat would be impacted by the proposal.
<i>Caladenia arenaria</i> Sand-hill Spider Orchid EPBC – E BC – E IBRA Sub-region: Inland Slopes, Lower Slopes	Found mostly on the south west plains and western south west slopes. The Sand-hill Spider Orchid is currently only known to occur in the Riverina between Urana and Narranderra. Occurs in woodland with sandy soil, especially that's dominated by White Cypress Pine (<i>Callitris glaucophylla</i>). Many of the associated species in the understorey are different at each of the populations or are species that are widespread and occur in a range of habitats. It is apparent that <i>C. arenaria</i> has fairly broad habitat tolerances, occurring in <i>Callitris glaucophylla</i> - <i>Eucalyptus melliodora</i> (Yellow Box) woodlands, <i>Callitris glaucophylla</i> – <i>Allocasuarina luehmannii</i> woodlands and woodlands dominated by a mixture of <i>Callitris glaucophylla</i> , <i>E. dwyeri</i> (Dwyer's Redgum) and <i>Acacia doratoxylon</i> (Currawang). Soils vary from skeletal soils over sandstone to clay loams.	Absent Woodland present but understorey heavily grazed and degraded.	Unlikely Vegetation surveys indicate that this species is not present.	No No suitable habitat would be impacted by the proposal.
<i>Lepidium monoplacoides</i> Winged Pepper- cress	Occurs on seasonally moist to waterlogged sites, on heavy fertile soils, with a mean annual rainfall of around 300-500 mm. Predominant vegetation is usually an open woodland dominated by <i>Allocasuarina luehmannii</i> (Bulloak) and/or eucalypts, particularly <i>Eucalyptus largiflorens</i> (Black Box) or <i>Eucalyptus populnea</i> (Poplar Box). The field layer of the surrounding woodland is dominated by tussock grasses. Recorded in a wetland-grassland community comprising <i>Eragrostis australasicus</i> , <i>Agrostis avenacea</i> , <i>Austrodanthonia duttoniana</i> , <i>Homopholis proluta</i> , <i>Myriophyllum crispatum</i> , <i>Utricularia dichotoma</i> and <i>Pycnosorus globosus</i> , on waterlogged grey-brown clay. Also recorded from a <i>Maireana</i>	Absent Woodland present but understorey heavily grazed and degraded.	Unlikely Not detected during site surveys	No No suitable habitat would be impacted by the proposal.

Species	Habitat requirements	Presence Of habitat	Likelihood Of occurrence	Potential Impact
	<i>pyramidata</i> shrubland. Widespread in the semi-arid western plains' regions of NSW.			
<i>Swainsona recta</i> Small Purple-pea EPBC – E BC – E IBRA Sub-region: Inland Slopes, Lower Slopes	Occurs in grassland and open woodland, often on stony hillsides, dominated by one or more of the following: <i>Callitris endichleri</i> , <i>C. glaucophylla</i> , <i>Eucalyptus blakelyi</i> , <i>E. bridgesiana</i> , <i>E. dives</i> , <i>E. melliodora</i> , <i>E. microcarpa</i> , <i>E. nortonii</i> and <i>E. polyanthemos</i> . Requires a forb-rich grassy ground layer dominated by <i>Themeda triandra</i> , <i>Poa sieberiana</i> var. <i>sieberiana</i> or <i>Austrostipa</i> spp. Resprouts in autumn and winter from a woody root. It flowers in spring, peaking over two to three weeks in October.	Absent Woodland present but understory heavily grazed and degraded.	Unlikely Vegetation surveys indicate that this species is not present.	No No suitable habitat would be impacted by the proposal.
<i>Prasophyllum petilum</i> Tarengo Leek Orchid EPBC – E BC – E IBRA Sub-region: Inland Slopes	The flower-spike emerges in mid spring to early summer from a hole near the base of the leaf. Natural populations are known from a total of four sites in NSW: Boorowa, Captains Flat, Ilford and Delegate. Also occurs at Hall in the Australian Capital Territory. Grows in patchy woodland in fertile soils. Grows in open sites within Natural Temperate Grassland at the Boorowa and Delegate sites. Also grows in grassy woodland in association with River Tussock <i>Poa labillardierei</i> Black Gum <i>Eucalyptus aggregata</i> and tea-trees <i>Leptospermum</i> spp. at Captains Flat and within the grassy ground layer dominated by Kangaroo Grass under Box-Gum Woodland at Ilford (and Hall, ACT). Apparently highly susceptible to grazing, being retained only at little-grazed travelling stock reserves (Boorowa & Delegate) and in cemeteries (Captains Flat, Ilford and Hall). Co-occurring species include <i>Pentapogon quadrifidus</i> , <i>Schoenus apogon</i> , <i>Drosera peltata</i> , <i>Sebaea ovata</i> and <i>Haloragis heterophylla</i> .	Absent Woodland present but understory heavily grazed and degraded.	Unlikely Vegetation surveys indicate that this species is not present.	No No suitable habitat would be impacted by the proposal.
<i>Prasophyllum</i>	The Sturdy Leek-orchid tends to grow in drier woodland habitats, generally with a low sparse understorey. In Victoria, it occurs in box and box-	Absent	Unlikely Vegetation surveys	No No suitable habitat

Species	Habitat requirements	Presence Of habitat	Likelihood Of occurrence	Potential Impact
<i>validum</i> Sturdy Leek-orchid EPBC – V IBRA Sub-region: Inland Slopes	ironbark woodland with overstorey trees including Eucalyptus polyanthemos, Eucalyptus albens, Eucalyptus macrorhyncha, Eucalyptus viminalis and Callitris glaucophylla, and an open grassy to sparsely shrubby understorey including Themeda triandra, Joycea pallida, Arthropodium strictum, Acacia verniciflua, Bursaria spinosa, Grevillea alpine and Grevillea dryophylla. Soils vary from heavy clays to sandy loams.	Woodland present but understorey heavily grazed and degraded.	indicate that this species is not present.	would be impacted by the proposal.
<i>Senecio macrocarpus</i> Large-fruit Fireweed EPBC -V	An erect or sprawling shrub with stems to approximately 70 cm tall arising from a perennial rootstock that is usually greyish-cobwebbed all over. The leaves are stalkless, linear in shape and between 4-12 cm long and 2-5 mm wide. The leaf margins are entire or sometimes slightly notched. The upper leaf surface is sometimes covered with bristly hairs as well as being cobwebbed, the lower surface is usually more densely cobwebbed than the upper. The yellow flowers are in a flattish arrangement with the central or end flowers blooming earliest. There are between 2-10 flowers in each flowerhead. The fruit is small, dry, leathery and cylindrical in shape but taper towards the tip. They are approximately 4.5-6 mm long and densely hairy in rows. The pappus (ring of scales of bristles on top of the fruit) consists of slender hairs between 8-10 mm long.	Absent Woodland present but understorey heavily grazed and degraded.	Unlikely Vegetation surveys indicate that this species is not present.	No No suitable habitat would be impacted by the proposal.
EEC				
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Characterised by the presence or prior occurrence of White Box, Yellow Box and/or Blakely's Red Gum. The trees may occur as pure stands, mixtures of the three species or in mixtures with other trees, including wattles.	Present Characteristic. tree species present in development site	Likely Development site within known distribution	Yes Assessment against EPBC Vegetation threshold required

Species	Habitat requirements	Presence Of habitat	Likelihood Of occurrence	Potential Impact
BC – E EPBC – CE IBRA Sub-region: Inland Slopes, Lower Slopes				
Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia EPBC- E IBRA Sub-region: Inland Slopes	Generally, occurs in landscapes of low-relief such as flat to undulating plains, low slopes and rises and, to a lesser extent, drainage depressions and flats. The tree canopy is dominated ($\geq 50\%$ canopy crown cover) by <i>Eucalyptus microcarpa</i> (Grey Box). Widespread associated tree species that may be present include: <i>Allocasuarina luehmannii</i> (Buloke), <i>Brachychiton populneus</i> (Kurrajong), <i>Callitris glaucophylla</i> (White Cypress Pine), <i>Eucalyptus albens</i> (White Box), <i>E. camaldulensis</i> (River Red Gum), <i>E. conica</i> (Fuzzy Box), <i>E. leucoxylon</i> (Yellow Gum, SA Blue Gum), <i>E. melliodora</i> (Yellow Box) and <i>E. populnea</i> (Bimble Box, Poplar Box). The ground layer also is highly variable in development and composition, ranging from almost absent to mostly grassy to forb-rich. Derived grasslands are a special state of the ecological community, whereby the canopy and mid layers have been mostly removed to $<10\%$ crown cover but the native ground layer remains largely intact, with 50% or more of the total vegetation cover being native.	Present Characteristic. tree species present in development site	Likely Site is highly disturbed	Yes Assessment against EPBC vegetation threshold required
Weeping Myall Woodlands EPBC – E	The Weeping Myall Woodlands occurs on the inland alluvial plains west of the Great Dividing Range in NSW and Queensland, with one small outlying patch in northern Victoria. Occurs in a range from open woodlands to woodlands, generally 4-12 m high, in which Weeping Myall (<i>Acacia pendula</i>) trees are the sole or dominant overstorey species. Weeping Myall trees often occur in monotypic stands, however other	Absent No Weeping Myall (<i>Acacia pendula</i>) in study area.	Unlikely No suitable habitat present.	No No suitable habitat would be impacted by the proposal.

Species	Habitat requirements	Presence Of habitat	Likelihood Of occurrence	Potential Impact
	vegetation may also occur in the ecological community, though not as dominant species. These include Western Rosewood (<i>Alectryon oleifolius subsp. elongatus</i>); Poplar Box (<i>Eucalyptus populnea</i>); or Black Box (<i>Eucalyptus largiflorens</i>). Grey Mistletoe (<i>Amyema quandang</i>) commonly occurs on the branches of Weeping Myall trees throughout the ecological community's range.			

G.2 Fauna species

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
Fauna				
Aves				
<i>Anthochaera phrygia</i> Regent Honeyeater BC - CE EPBC – CE IBRA Sub-region: Inland Slopes, Lower Slopes	A semi-nomadic species occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests (NPWS, 1999 177 /id) (Pizzey, 1997). A semi-nomadic species occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests (NPWS, 1999 177 /id) (Pizzey, 1997).	Present River Red Gum Forests and Box-Gum Woodland present in development site	Possible Study area within known distribution of species	Yes AoS Required
<i>Botaurus poiciloptilus</i> Australasian Bittern EPBC – E BC - E IBRA Sub-region: Inland Slopes, Lower Slopes	In NSW, this species occurs along the coast and is frequently recorded in the Murray-Darling Basin, notably in floodplain wetlands of the Murrumbidgee, Lachlan, Macquarie and Gwydir Rivers. Occurs in permanent freshwater wetlands with tall, dense vegetation. Favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and/or reeds (e.g., <i>Phragmites</i> , <i>Cyperus</i> , <i>Eleocharis</i> , <i>Juncus</i> , <i>Typha</i> , <i>Baumea</i> , <i>Bolboschoenus</i>) or cutting grass (<i>Gahnia</i>) growing over muddy or peaty substrate. Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails.	Absent No permanent wetlands in study area.	Unlikely No suitable habitat present.	No No suitable habitat would be impacted by the proposal.

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
<i>Calidris ferruginea</i> Curlew Sandpiper EPBC – CE BC - E IBRA Sub-region: Inland Slopes, Lower Slopes	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Curlew Sandpipers generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh. This species does not breed in Australia. This species forages mainly on invertebrates, including worms, molluscs, crustaceans, and insects, as well as seeds.	Marginal Ephemeral creekline and dams in study area. No bare mud or sand edges	Possible Study area within known distribution of species.	No Marginal habitat and unlikely to occur.
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo BC – V EPBC - E	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. May also occur in sub-alpine Snow Gum (<i>Eucalyptus pauciflora</i>) woodland and occasionally in temperate rainforests. In NSW, it is distributed from the south-east coast to the Hunter region, inland to the Central Tablelands and south-west slopes, and regularly in the ACT. It is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee.	Present Box-gum Woodlands present in development site	Unlikely Not detected during targeted surveys	No No suitable habitat would be impacted by the proposal.
<i>Falco hypoleucos</i> Grey Falcon BC- E EPBC - V	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast, and near wetlands where surface water attracts prey. Preys primarily on birds, especially parrots and pigeons, using high-speed chases and stoops; reptiles and mammals are also taken. Utilises old nests of other birds of prey and ravens, usually high in a living eucalypt near water or a watercourse; peak laying season is in late winter and early spring. Sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Believed to be extinct in	Present Box-gum Woodlands present in development site	Unlikely Not detected during targeted surveys	No No suitable habitat would be impacted by the proposal.

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
	areas with more than 500mm rainfall in NSW.			
<i>Hirundapus caudacutus</i> White throated Needletail EPBC – V, M	Arrive in Australia from their breeding grounds in the northern hemisphere in about October each year and leave somewhere between May and August. Are non-breeding migrants in Australia. Breeding takes place in northern Asia.	Present Aerial habitats and woodland present	Possible	Yes AoS undertaken
<i>Polytelis swainsonii</i> Superb Parrot EPBC - V BC – V IBRA Sub-region: Inland Slopes, Lower Slopes	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. Inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest.	Present Box-Gum Woodland, River Red Gum Forests and Grey Box Woodland present in study area.	Possible Known records within 10km of development site.	Yes AoS required
<i>Rostratula australis</i> Australian Painted Snipe BC - E EPBC – E IBRA Sub-region: Inland Slopes, Lower Slopes	Little is known of the ecology, habitat requirements and reproductive biology of Australian Painted Snipe. They feed in shallow water or at the waters' edge and on mudflats, taking seeds and invertebrates such as insects, worms, molluscs and crustaceans. Females, which are larger and more brightly coloured than males, are thought to sometimes be polyandrous, mating with several males and leaving each one to incubate and raise chicks. Inhabits inland and coastal shallow freshwater wetlands. The species occurs in both ephemeral and permanent wetlands, particularly where there is a cover of vegetation, including grasses, Lignum and Samphire. Individuals have also been known to use artificial habitats, such as sewage ponds, dams and waterlogged grassland. Nests on the ground amongst tall vegetation, such as grass tussocks or reeds. Forages nocturnally on mud flats and in shallow water. Breeding is often in response to local conditions; generally, occurs	Absent No mudflats in study area.	Unlikely No suitable habitat present.	No No suitable habitat would be impacted by the proposal.

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
	from September to December.			
<i>Grantiella picta</i> Painted Honeyeater BC – V EPBC – V IBRA Sub-region: Inland Slopes, Lower Slopes	The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus <i>Amyema</i> . Insects and nectar from mistletoe or eucalypts are occasionally eaten. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches.	Present Associated Vegetation types of Grey Box Woodland and Box-Gum Woodland present in development sites	Possible Development site within known distribution	Yes AoS required
<i>Lathamus discolor</i> Swift Parrot EPBC – CE IBRA Sub-region: Inland Slopes, Lower Slopes	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> . Commonly used lerp infested trees include Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> and Yellow Box <i>E. melliodora</i> . Return to home foraging sites on a cyclic basis depending on food availability.	Present Feed trees of Grey Box and Yellow Box present in development site	Possible Development site within known distribution. May forage in development site on occasion.	Yes AoS required
<i>Numenius madagascariensis</i> Eastern Curlew, Far Eastern Curlew	The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. The Eastern Curlew mainly forages on soft sheltered intertidal sandflats or mudflats, open and without vegetation or covered with seagrass, often near mangroves, on	Absent Study area is not within coastal landforms.	Unlikely No suitable habitat present.	No No suitable habitat would be impacted by the proposal.

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
EPBC – CE	salt flats and in saltmarsh, rockpools and among rubble on coral reefs, and on ocean beaches near the tideline. The Eastern Curlew roosts on sandy spits and islets, especially on dry beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. It occasionally roosts on reef-flats, in the shallow water of lagoons and other near-coastal wetlands.			
Mammals				
<i>Dasyurus maculatus maculatus</i> (SE mainland population) Spotted-tailed Quoll BC - V EPBC – E IBRA Sub-region: Inland Slopes, Lower Slopes	Tiger Quolls are found in a range of forest habitats, from rainforest to open forest, coastal heath and inland riparian forest. They require forest with suitable den sites such as rock crevices, small caves, rocky-cliff faces, hollow logs, burrows and tree hollows. The Tiger Quoll has a large home range and can cover considerable distances (more than 6km) overnight. It is largely nocturnal and solitary.	Absent No forests, rock crevices, caves, cliff faces in study area. Very few hollow logs.	Unlikely No suitable habitat present.	No No suitable habitat would be impacted by the proposal.
<i>Nyctophilus corbeni</i> Corben's Long-eared Bat, South-eastern Long-eared Bat EPBC – V	Corben's Long-eared Bat occurs from the south eastern side of the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. The Species inhabits a variety of vegetation types, including mallee, buloke <i>Allocasuarina leuhmanni</i> and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. The species roosts in tree hollows, crevices, and under loose	Present Hollow-bearing trees in study area.	Possible Study area within known distribution of species.	Yes AoS Undertaken

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
BC - V IBRA Sub-region: Inland Slopes, Lower Slopes	bark, and breeds in autumn with one or two young born in late spring to early summer.			
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox EPBC – V IBRA Sub-region: Inland Slopes, lower slopes	Grey-headed Flying-foxes are found within 200km of the eastern coast of Australia, from Bundaberg in Queensland to Melbourne in Victoria. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20km of a regular food source, often in stands of riparian rainforest, Paperbark or Casuarina Forest, and are commonly found in gullies, close to water, or in vegetation with a dense canopy. Forage on the nectar and pollen of native trees, in particular <i>Eucalyptus</i> , <i>Melaleuca</i> and <i>Banksia</i> , and fruits of rainforest trees and vines. Travel up to 50km to forage. Annual mating commences in January with single young born each October or November. Site fidelity to camps is high with some camps being used for over a century.	Absent No riparian rainforest, gullies or vegetation with dense canopies, in study area.	Unlikely No breeding camps in development site. suitable habitat present.	No No suitable habitat would be impacted by the proposal.
<i>Phascolarctos cinereus</i> Koala BC - V EPBC - E IBRA Sub-region: Inland Slopes, Lower Slopes	Occurs in eastern Australia, from north-eastern Queensland to south-eastern South Australia and to the west of the Great Dividing Range. In NSW it mainly occurs on the central and north coasts with some populations in the western region. It was historically abundant on the south coast of NSW, but now occurs in sparse and possibly disjunct populations. The koala inhabits a range of eucalypt forest and woodland communities, including coastal forests, the woodlands of the tablelands and western slopes, and the riparian communities of the western plains.	Present Eucalypt Woodlands in study area.	Unlikely Not detected during targeted surveys. No nearby records.	No No suitable habitat would be impacted by the proposal.

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
Amphibians				
<i>Litoria raniformis</i> Southern Bell Frog EPBC –V BC – E IBRA Sub-region: Inland Slopes, Lower Slopes	Currently, the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. Usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat. Breeding occurs during the warmer months and is triggered by flooding or a significant rise in water levels. During the breeding season animals are found floating amongst aquatic vegetation (especially cumbungi or Common Reeds) within or at the edge of slow-moving streams, marshes, lagoons, lakes, farm dams and rice crops. Outside the breeding season animals disperse away from the water and take shelter beneath ground debris such as fallen timber and bark, rocks, grass clumps and in deep soil cracks.	Absent No aquatic vegetation in farm dams.	Unlikely No suitable habitat	No No suitable habitat would be impacted by the proposal.
<i>Crinia sloanei</i> Sloane's Froglet BC – V EPBC - E	It is typically associated with periodically inundated areas in grassland, woodland and disturbed habitats. Recorded from widely scattered sites in the floodplains of the Murray-Darling Basin, with the majority of records in the Darling Riverine Plains, NSW South Western Slopes and Riverina bioregions in New South Wales. At a number of sites where records are verified by museum specimens, the species has not been subsequently detected during more recent frog surveys in the vicinity (e.g., Holbrook, Nyngan, Wagga Wagga and Tocumwal).	Present Farm Dams present in development site	Unlikely Not detected from site surveys	No No suitable habitat would be impacted by the proposal
Insects				
<i>Synemon plana</i> Golden Sun Moth BC- E	NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. Historical distribution extended from Bathurst (central NSW) through the NSW Southern Tablelands, through to central and western Victoria, to Bordertown in eastern South Australia. Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which ground layer is dominated by wallaby grasses <i>Rytidosperma</i> spp. Grasslands	Absent No native tussock grasses in understory	Unlikely No suitable habitat	No No suitable habitat would be impacted by the proposal.

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
EPBC - CE	dominated by wallaby grasses are typically low and open - the bare ground between the tussocks is thought to be an important microhabitat feature, as it is typically these areas on which the females are observed displaying to attract males. Habitat may contain several wallaby grass species, which are typically associated with other grasses particularly spear-grasses <i>Austrostipa</i> spp. or Kangaroo Grass <i>Themeda triandra</i> . Larvae feed on the roots of the wallaby grass plant.			
Reptiles				
<i>Aprasia parapulchella</i> Pink-tailed Worm-lizard, Pink-tailed Legless Lizard EPBC – V BC – V IBRA Sub-region: Inland Slopes, Lower Slopes	Only known from the Central and Southern Tablelands, and the South Western Slopes. There is a concentration of populations in the Canberra/Queanbeyan Region. Other populations have been recorded near Cooma, Yass, Bathurst, Albury and West Wyalong. This species is also found in the Australian Capital Territory. Inhabits sloping, open woodland areas with predominantly native grassy ground layers, particularly those dominated by Kangaroo Grass (<i>Themeda australis</i>). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks; the burrows have been constructed by and are often still inhabited by small black ants and termites. Feeds on the larvae and eggs of the ants with which it shares its burrows. It is thought that this species lays 2 eggs inside the ant nests during summer; the young first appear in March. Best detected from September to February.	Absent No predominantly native grassy ground layer or rocky outcrops in study area.	Unlikely No suitable habitat present.	No No suitable habitat would be impacted by the proposal.
<i>Delma impar</i> Striped Legless Lizard EPBC - V BC – V	The Striped Legless Lizard occurs in the Southern Tablelands, the South West Slopes and possibly on the Riverina. Populations are known in the Goulburn, Yass, Queanbeyan, Cooma and Tumut areas. Also occurs in the ACT, Victoria and south-eastern South Australia. Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component. Also found in secondary grassland near Natural	Absent No tussock grasslands or surface rocks in study area.	Unlikely No suitable habitat present.	No No suitable habitat would be impacted by the proposal.

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
IBRA Sub-region: Inland Slopes	Temperate Grassland and occasionally in open Box-Gum Woodland. Habitat is where grassland is dominated by perennial, tussock-forming grasses such as Kangaroo and Wallaby. Sometimes found in grasslands with significant amounts of surface rocks, which are used for shelter. Actively hunts for spiders, crickets, moth larvae and cockroaches. Animals have been recorded moving at least 20m in one day, and up to 50m over several weeks.			
Fish				
<i>Maccullochella peelii</i> Murray Cod EPBC – V IBRA Sub-region: Inland Slopes	Grow up to a maximum size of 1200mm. Found extensively throughout the Murray Darling Basin in the south-eastern region of Australia. Murray cod are able to live in a wide range of habitats from clear, rocky streams in the upper western slopes' regions of New South Wales to the slow flowing, turbid rivers and billabongs of the western plains. Generally, they are found in waters up to 5m deep and in sheltered areas with cover from rocks, timber or overhanging banks. The most common components of adult cod's diet include crustaceans such as yabbies, shrimp and crayfish, and fish such as the introduced common carp, goldfish and redfin perch, and the native fish bony herring, catfish, golden perch, western carp gudgeon and even other cod. It appears that Murray cod prefer protected spawning sites, and typically spawn large (3.0-3.5mm diameter) adhesive eggs onto firm substrates such as hollow logs, rocks, pipes and clay banks, from spring to early summer.	Absent No deep streams with shelter	Unlikely- No suitable habitat present.	No- No suitable habitat would be impacted by the proposal.
<i>Macquaria australasica</i> Macquarie Perch EPBC – E IBRA Sub-region:	Macquarie perch grow to a maximum size of 400mm. They are found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury and Shoalhaven catchments. The conservation status of the different populations is not well known, but there have been long-term declines in their abundance. Macquarie perch are found in both river and lake habitats, especially the upper reaches of rivers and their	Absent No deep rocky holes with plenty of cover	Unlikely No suitable habitat in study area.	No No suitable habitat would be impacted by the proposal.

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
Inland Slopes	tributaries. They are quiet, furtive fish that feed on aquatic insects, crustaceans and molluscs. Sexual maturity occurs at two years for males and three years for females. Macquarie perch spawn in spring or summer in shallow upland streams or flowing parts of rivers. Females produce around 50,000-100,000 eggs which settle among stones and gravel of the stream or riverbed.			
Flathead Galaxias <i>Galaxius rostratus</i> CE EPBC CE FM IBRA Sub-region: Inland Slopes	Below 150 m in altitude. Billabongs, lakes, swamps, and rivers, with preference for still or slow-flowing waters.	Absent Above 150 m in altitude.	Unlikely No suitable habitat in study area.	No No suitable habitat would be impacted by the proposal.
Migratory Species				
<i>Apus pacificus</i> Fork-tailed Swift EPBC – M	This migratory marine species is a non-breeding visitor to Australia and has been recorded in all regions of NSW. Found across a range of habitats from inland open plains to wooded areas. They are mainly exclusively aerial flying from < 1m to 300 m above ground.	Present Aerial species wo	Possible Study area within known distribution of species.	No Exclusively aerial species and not dependent on habitat in development site
<i>Motacilla flava</i> Yellow Wagtail EPBC - M	This migratory terrestrial species migrates from Africa to Australia in summer and breeds in Europe. Foraging habitat in Australia comprises mostly well-watered open grasslands and the fringes of Wetlands. Roosts in Mangroves and other dense vegetation.	Absent	Unlikely Study area within known distribution of species.	No No suitable habitat would be impacted by the proposal.

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
<i>Myiagra cyanoleuca</i> Satin Flycatcher EPBC - M	The Satin Flycatcher is found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. It is also found in New Guinea. The Satin Flycatcher is not a commonly seen species, especially in the far south of its range, where it is a summer breeding migrant. The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests. The Satin Flycatcher is a migratory species, moving northwards in winter to northern Queensland and Papua New Guinea, returning south to breed in spring.	Absent No forests or gullies in study area.	Unlikely No suitable habitat in study area.	No No suitable habitat would be impacted by the proposal.
<i>Rhipidura rufifrons</i> Rufous Fantail EPBC - M	The Rufous Fantail is found in northern and eastern coastal Australia, being more common in the north. The Rufous Fantail is found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground. During migration, it may be found in more open habitats or urban areas. Strongly migratory in the south of its range, it moves northwards in winter, and virtually disappears from Victoria and New South Wales at this time.	Absent No wet forests, woodlands, mangroves or swamps in study area.	Unlikely No suitable habitat in study area.	No No suitable habitat would be impacted by the proposal.
<i>Actitis hypoleucos</i> Common Sandpiper EPBC - CE	This migratory wetland species is found along all Australian coastlines and many inland areas. They are active birds that will pursue invertebrates over rocks. Breeding habitat is mainly in Europe.	Absent No wetlands, mangroves or coastal landforms in study area.	Unlikely No suitable habitat in study area.	No No suitable habitat would be impacted by the proposal.
<i>Calidris acuminata</i> Sharp-tailed Sandpiper EPBC - M	This migratory wetland species wades mud in estuarine habitats feeding on invertebrates. They are widespread throughout much of NSW but are sparse in the south-central and lower western regions. Breeding habitat is in Northern Siberia.	Absent No mangroves or coastal landforms in study area.	Unlikely No suitable habitat in study area.	No No suitable habitat would be impacted by the proposal.

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
<i>Calidris ferruginea</i> Curlew Sandpiper EPBC - M	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Curlew Sandpipers generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh. This species does not breed in Australia. This species forages mainly on invertebrates, including worms, molluscs, crustaceans, and insects, as well as seeds.	Marginal Farm dams and ephemeral creekline in the study area.	Possible Study area within known distribution of species.	No Marginal habitat and unlikely to occur.
<i>Calidris melanotos</i> Pectoral Sandpiper EPBC - M	This species breeds in high-arctic tundra from the Yamal Peninsula eastwards to the Bearing Strait in Siberia and in arctic Alaska and Canada. It is known to migrate mostly through the USA and Mexico and spends most of its non-breeding months in South America. A small number of these birds are known to reach Australia and are believed to be concentrated in south-eastern Australia. This species prefers freshwater mudflats.	Absent No freshwater mudflats in study area.	Unlikely No suitable habitat in study area.	No No suitable habitat would be impacted by the proposal.
<i>Gallinago hardwickii</i> Latham's Snipe, Japanese Snipe EPBC - M	In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g., swamps, flooded grasslands or heathlands, around bogs and other water bodies). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity. Latham's Snipe does not breed within Australia.	Present Modified or artificial wetlands occur in the form of farm dams in study area.	Possible Study area within known distribution of species.	No No suitable habitat would be impacted by the proposal.
<i>Hirundapus</i>	This migratory terrestrial species occurs in Australia from late spring to early autumn. Found across a range of habitats more often over woodland areas,	Present	Possible	No No suitable habitat

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
<i>caudacutus</i> White-throated Needletail EPBC - M	where it is almost exclusively aerial. Large tracts of native vegetation may be a key habitat requirement for this species. Found to roost in tree hollows in tall trees on ridge-tops, on bark or rock faces	Some trees are present along creekline in the study area.	Study area within known distribution of species.	would be impacted by the proposal.
<i>Numenius madagascariensis</i> Eastern Curlew, Far Eastern Curlew EPBC – M	The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. The Eastern Curlew mainly forages on soft sheltered intertidal sandflats or mudflats, open and without vegetation or covered with seagrass, often near mangroves, on salt flats and in saltmarsh, rockpools and among rubble on coral reefs, and on ocean beaches near the tideline. The Eastern Curlew roosts on sandy spits and islets, especially on dry beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. It occasionally roosts on reef-flats, in the shallow water of lagoons and other near-coastal wetlands.	Absent No coastal landforms, mangroves or wetlands in the study area.	Unlikely No suitable habitat in study area.	No No suitable habitat would be impacted by the proposal.
CE BC = listed as Critically Endangered under Schedule 1 of the NSW <i>Biodiversity Conservation Act 2016</i> CE EPBC = listed as Critically Endangered under the Commonwealth <i>Environment Protection & Biodiversity Conservation Act 1999</i> . E BC = listed as Endangered under Schedule 1 of the NSW <i>Biodiversity Conservation Act 2016</i> E EPBC = listed as Endangered under the Commonwealth <i>Environment Protection & Biodiversity Conservation Act 1999</i> . V BC = listed as Vulnerable under Schedule 1 of the NSW <i>Biodiversity Conservation Act 2016</i> V EPBC = listed as Vulnerable under the Commonwealth <i>Environment Protection & Biodiversity Conservation Act 1999</i> .		CAMBA = Chinese-Australia Migratory Bird Agreement JAMBA = Japan-Australia Migratory Bird Agreement		

Species	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential impact
M EPBC = listed as Migratory under the Commonwealth <i>Environment Protection & Biodiversity Conservation Act 1999</i>. CE FM = listed as Critically Endangered under Schedule 4A of the NSW <i>Fisheries Management Act 1994</i>. E FM = listed as Endangered under Schedule 4 of the NSW <i>Fisheries Management Act 1994</i>. V FM = listed as Vulnerable under Schedule 5 of the NSW <i>Fisheries Management Act 1994</i>.				

Appendix H EPBC assessment of significant impact

The Environment Protection and Biodiversity Conservation Act 1999 specifies factors to be considered in deciding whether a development is likely to significantly affect EECs, threatened species and migratory species, listed at the Commonwealth level. The following assessments assesses the significance of the likely impacts associated with the proposed works on:

CRITICALLY ENDANGERED SPECIES (Table 12-1)

Swift Parrot – (*Lathamus discolor*) – CE.

Regent Honeyeater (*Anthochaera phrygia*) – CE.

VULNERABLE SPECIES (Table 12 2)

Superb Parrot (*Polytelis swainsonii*) – V.

Painted Honeyeater (*Grantiella picta*) – V.

Corben's Long-eared Bat (*Nyctophilus corbeni*) – V.

White-throated Needletail (*Hirundapus caudacutus*) – V.

MIGRATORY SPECIES

Fork-tailed Swift (*Apus pacificus*) – M.

White-throated Needletail (*Hirundapus caudacutus*) – M.

Table 12-1 Assessment of significance for critically endangered EPBC species

Critically Endangered Species (Swift Parrot and Regent Honeyeater)	
a) Will the action lead to a long-term decrease in the size of a population of a species?	
Swift Parrot	Swift Parrots can forage in lerp infested Grey Box and Yellow Box trees. Potential foraging habitat for Swift Parrots occurs within the development site and would be removed by the proposal. Surveys did not detect these species and no known records occur within the development site. The development site is not considered known habitat but provides potential foraging habitat. The proposal would involve the removal of around 10.75ha of Grey Box woodland and 2.4ha of River Red gum Woodland. There would also be some disturbance associated with construction, including noise, vibration, light. The quality of potential habitat for these species is low, being largely cleared and highly disturbed by agriculture. Given the relatively small amount of habitat to be removed, and with the recommended mitigation measures, the likelihood of the proposal leading to a long-term decrease in the size of a population of this species is minimal.
Regent Honeyeater	The Regent Honeyeater is considered to occur as a single population throughout its range. No known records occur with the development site, and they were not detected during the site surveys. The development site is not considered known habitat but provides potential foraging habitat. The proposal would involve the removal of around 10.75ha of Grey Box woodland and 2.4ha of River Red

Critically Endangered Species (Swift Parrot and Regent Honeyeater)

gum Woodland. There would also be some disturbance associated with construction, including noise, vibration, light. The quality of potential habitat for these species is low, being largely cleared and highly disturbed by agriculture. Given the relatively small amount of habitat to be removed, and with the recommended mitigation measures, the likelihood of the proposal leading to a long-term decrease in the size of a population of this species is minimal.

b) Will the action reduce the area of occupancy of the species?

Swift Parrot

The proposal would involve the removal of around 13ha of potential foraging habitat. There would also be some disturbance associated with construction. The development site is not considered known habitat.

The quality of habitat in the development site is low, being highly fragmented and partially cleared from agriculture and the area of habitat to be removed is relatively small in the context of the Swift Parrots range across South Eastern Australia. In this context, while removal of this habitat could reduce the area of occupancy, it would not be enough to have a significant impact on these species.

Regent Honeyeater

The proposal would involve the removal of around 13ha of potential foraging habitat. There would also be some disturbance associated with construction. The development site is not considered known habitat.

The quality of habitat in the development site is low, being highly fragmented and partially cleared from agriculture and the area of habitat to be removed is relatively small in the context of the Regent Honeyeaters range across South Eastern Australia. In this context, while removal of this habitat could reduce the area of occupancy, it would not be enough to have a significant impact on these species.

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

Swift Parrot

The Swift Parrot occurs as a single migratory population (Saunders & Tzaros, 2011) The proposal would involve the removal of around 13ha of potential habitat. There would also be some disturbance associated with construction. The development site is not considered known habitat.

The area of habitat to be removed is relatively small in the context of the Swift Parrots range across South-Eastern Australia and would not disrupt habitat connectivity for the migratory Swift Parrot. 62ha of remnant vegetation would still remain within or adjacent to the development site and migratory movement would not be impacted. The proposal would not fragment an existing population of this species into two or more populations.

Regent Honeyeater

The Regent honeyeater population comprises a single population that moves throughout its range of South Eastern Australia. The proposal would involve the removal of around 13ha of potential habitat. There would also be some disturbance associated with construction.

The area of habitat to be removed is relatively small in the context of the Regent Honeyeaters range across South-Eastern Australia and would not disrupt habitat connectivity for the Regent Honeyeater. 62ha of remnant vegetation would remain within or adjacent to the development site and movement would not be impacted. The proposal would not fragment an existing population of this species into two or more populations.

Critically Endangered Species (Swift Parrot and Regent Honeyeater)

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

Swift Parrot

Habitat critical to the survival of the Swift Parrot includes those areas of priority habitat for which the Swift Parrot has a level of site fidelity or are identified by the recovery team. The development site is not known habitat nor within a mapped important area identified by OEH and is unlikely to be habitat critical to the survival of the species.

Regent Honeyeater

Critical habitat for the survival of the Regent Honeyeater listed in the national recovery plan includes

- any breeding or foraging habitat where the species is likely to occur (as defined by the distribution map)
- Any newly discovered breeding or foraging locations

The development site falls within the mapped areas of where this species is likely to occur but not within a key breeding area. 13ha of habitat would be removed; however, this vegetation is of low habitat quality comprised of smaller isolated patches within a cleared and disturbed agricultural landscape.

e) Will the action disrupt the breeding cycle of the species?

Swift Parrot

Swift Parrots breed only in Tasmania, migrating to the mainland in autumn and winter. The likelihood of the action disrupting the breeding cycle of a population of these species is minimal.

Regent Honeyeater

Four key breeding areas occur in the known range of the Regent Honeyeater. The development site is not within a known breeding area for the Regent Honeyeater; thus, the proposal is unlikely to disrupt the breeding cycle of the species.

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

Swift Parrot

The proposal would involve the removal of around 13ha of foraging habitat. There would also be some disturbance associated with construction, which could decrease the quality of some habitat in the short-term. The development site is not considered known habitat and is considered potential foraging habitat only.

The area of habitat to be removed is relatively small in the context of the Swift Parrots range across South-Eastern Australia and would not disrupt habitat connectivity. Approximately 63ha of similar or better-quality habitat would remain within or adjacent to the development site. With the implementation of the recommended mitigation measures, the likelihood of the action modifying, destroying, removing, isolating,

Critically Endangered Species (Swift Parrot and Regent Honeyeater)	
or decreasing the availability or quality of habitat to the extent that these species would be likely to decline is minimal.	
Regent Honeyeater	
The proposal would involve the removal of around 13ha of foraging habitat, comprised of smaller isolated patches. This habitat is considered low quality having been partially cleared and degraded from intense agricultural activities. There would also be some disturbance associated with construction, which could decrease the quality of some habitat in the short-term. The development site is not considered known habitat and is considered potential foraging habitat only. While the proposal may reduce the availability of habitat, this habitat is considered low quality. 63ha of similar or better-quality habitat would remain within or adjacent to the development site that could provide foraging habitat for the Regent Honeyeater. The likelihood of the action modifying, destroying, removing, isolating, or decreasing the availability or quality of habitat to the extent that these species would be likely to decline is minimal.	
g) Will the action result in invasive species that are harmful to a critically endangered species becoming established in the critically endangered species' habitat?	
Swift Parrot and Regent Honeyeater	
The proposal will modify the current land use, potentially creating additional shelter habitat for predatory invasive species such as foxes and cats, which are considered likely to be locally prevalent regardless of the proposal. Management protocols will be prepared and implemented as part of the Flora and Fauna Management Plan for the proposal which will monitor and manage these species within the development site. These species are already widespread in a rural environment and the proposal is not anticipated to increase the numbers of feral pest animals. There is a risk that invasive weed could be introduced to the proposal area via machinery, vehicles, and materials during construction. With the implementation of the recommended mitigation measures, including restricting vehicle movements to sealed tracks, the likelihood of the action resulting in harmful invasive species becoming established in the vulnerable species' habitat is minimal.	
h) Will the action introduce disease that may cause the species to decline?	
Swift Parrot	
Beak and Feather Disease could impact the Swift Parrot; however, the proposal is not considered likely to act as a vector for the disease. With the implementation of the recommended mitigation measures, the likelihood of the action resulting in the introduction of diseases that may cause the species to decline is minimal.	
Regent Honeyeater	
The proposal is not considered to act as a vector for any diseases to the Regent Honeyeater.	
i) Will the action interfere substantially with the recovery of the species?	

Critically Endangered Species (Swift Parrot and Regent Honeyeater)

Swift Parrot

The National Recovery Plan for the Swift Parrot lists the following objectives:

1. To identify and prioritise habitats and sites used by the species across its range, on all land tenures.
2. To implement management strategies to protect and improve habitats and sites on all land tenures.
3. To monitor and manage the incidence of collisions, competition and Beak and Feather Disease (BFD).
4. To monitor population trends and distribution throughout the range.

The proposal would not interfere with any of these objectives.

Regent Honeyeater

The National Recovery Plan for the Regent Honeyeater lists the following objectives;

2. Reverse the long-term population trend to decline and increase the number of regent honeyeaters to a level where there is a viable, wild breeding population even in poor breeding years.
3. Enhance the condition of habitat across the regent honeyeater ranges to maximise survival and reproductive success and provide refugia during periods of extreme environmental fluctuation.

The proposal would not substantially interfere with any of these objectives.

Conclusion

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

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

A referral to the Federal Department of Environment is not considered necessary.

Table 12-2 Assessment of significance for vulnerable species

Vulnerable Species (Superb Parrot & Painted Honeyeater)	
a) Will the action lead to a long-term decrease in the size of an important population of a species?	
Superb Parrot	
No records of the Superb Parrot occur within the development site and no known population of Superb Parrot occurs within the development site. The development site is not considered known habitat but provides potential foraging habitat. The breeding population of Superb Parrots <i>Polytelis swainsonii</i> is approximately 6500. The species is somewhat mobile, and typically utilises foraging habitat within 10km of breeding habitat (SPRAT, 2017). The development site is not part of a core breeding area for the Superb Parrot (Baker Gabb, 2011). Thus, an important population is not considered to occur in the development site and no impacts are anticipated to an important population of Superb Parrot.	
Painted Honeyeater	
No records of the Painted Honeyeater occur within the development site and no known population occurs within the development site. The presence of mistletoe provides potential foraging and breeding habitat. The development site is not part of a key management site listed by OEH; thus, an important population is not considered to occur in the development site and no impacts are anticipated to an important population of Painted Honeyeater.	
Corben's Long-eared Bat	
No records of the Corben's Long-eared Bat occur within the development site and no known population of Corben's Long-eared Bat occurs within the development site. The presence of Box-Gum Woodland and hollow bearing trees provides potential foraging and roosting habitat for this species. The development site is not part of a key management site listed by OEH; thus, an important population is not considered to occur in the development site and no impacts are anticipated to an important population of Corben's Long-eared Bat.	
White-throated Needletail	
No records of the White-throated Needletail occur within the development site and no known population of White-throated Needletail occurs within the development site. The development site is not considered known habitat but provides potential foraging habitat. The subspecies <i>caudacutus</i> is the key breeding population that affects the Needletails that occur in Australia (SPRAT, 2019). However, this subspecies <i>caudacutus</i> only breeds outside of Australia, thus an important population is not considered to occur in the development site and no impacts are anticipated to an important population of White-throated Needletail.	
b) Will the action reduce the area of occupancy of an important population of the species?	
Superb Parrot	
As an important population is not considered to occur within the development site, the action is not considered to reduce the area of occupancy of an important population. The broader proposal area will continue to contain suitable areas of breeding and foraging habitat of a sufficient size and quality to maintain individuals of the species within the proposal area and the wider locality.	

Vulnerable Species (Superb Parrot & Painted Honeyeater)	
Painted Honeyeater	
As an important population is not considered to occur within the development site, the action is not considered to reduce the area of occupancy of an important population. The broader proposal area will continue to contain suitable areas of breeding and foraging habitat of a sufficient size and quality to maintain individuals of the species within the proposal area and the wider locality.	
Corben's Long-eared Bat	
As an important population is not considered to occur within the development site, the action is not considered to reduce the area of occupancy of an important population. The broader proposal area will continue to contain suitable areas of roosting and foraging habitat of a sufficient size and quality to maintain individuals of the species within the proposal area and the wider locality.	
White-throated Needletail	
As an important population is not considered to occur within the development site, the action is not considered to reduce the area of occupancy of an important population. The broader proposal area will continue to contain suitable areas of foraging habitat of a sufficient size and quality to maintain individuals of the species within the proposal area and the wider locality.	
c) Will the action fragment an existing important population into two or more populations?	
Superb Parrot	
As the individuals of the species are not considered to form an important population, the action is not considered to fragment an existing important population. Native vegetation will be planted along the perimeter of the development area to screen solar farm infrastructure, adding to the habitat potential of the site. As the species is highly mobile, the proposal will not impact on its movement within or across the development site.	
Painted Honeyeater	
As the individuals of the species are not considered to form an important population, the action is not considered to fragment an existing important population. Native vegetation will be planted along the perimeter of the development area to screen solar farm infrastructure, adding to the habitat potential of the site. As the species is highly mobile, the proposal will not impact on its movement within or across the development site.	
Corben's Long-eared Bat	
As the individuals of the species are not considered to form an important population, the action is not considered to fragment an existing important population. Native vegetation will be planted along the perimeter of the development area to screen solar farm infrastructure, adding to the habitat potential of the site. As the species is highly mobile, the proposal will not impact on its movement within or across the development site.	
White-throated Needletail	
As the individuals of the species are not considered to form an important population, the action is not considered to fragment an existing important population. Native vegetation will be planted along the perimeter of the development area to screen solar farm infrastructure, adding to the habitat potential of the	

Vulnerable Species (Superb Parrot & Painted Honeyeater)	
site. As the species is highly mobile and predominately aerial, the proposal will not impact on its movement within or across the development site.	
d) Will the action adversely affect habitat critical to the survival of a species?	
Superb Parrot, Painted Honeyeater, Corben's Long-eared Bat and White-throated Needletail	
The Register of Critical Habitat established under the EPBC Act does not list any critical habitat for these protected species. The proposed development is not located near any critical habitat for and species listed on the register.	
e) Will the action disrupt the breeding cycle of an important population of the species?	
Superb Parrot	
No known important population occurs within the proposal area. Three main breeding areas for the superb parrot occur in NSW. The nearest known breeding area to the proposal area occurs in the South West Slopes near Wagga Wagga, around 100km north of Walla Walla (Baker Gabb, 2011). Within the South West Slopes, the Superb Parrot breeds in hollows in River Red Gum, Blakely's Red Gum, Apple Box, Grey Box, White Box and Red Box species. The nests are usually located near water and the same nest hollows are used in successive years. The action would not disrupt the breeding cycle of an important population.	
Painted Honeyeater	
No known important populations occur within the proposal area.	
Corben's Long-eared Bat	
No known important population occurs within the proposal area.	
White-throated Needletail	
This species does not breed in Australia.	
f) Will the action modify, destroy, remove, isolate or decrease the availability of quality habitat to the extent that the species is likely to decline?	
Superb Parrot	
The proposal will remove approximately 13ha of woodland vegetation in the development site. Approximately 63ha of similar or better-quality habitat would remain in or adjacent to the development site. This modification and removal of habitat is not considered likely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline, as extensive habitat will remain in the locality.	
Painted Honeyeater	
The proposal will remove approximately 13ha of woodland vegetation in the development site. Approximately 63ha of similar or better-quality habitat would remain in or adjacent to the development site. This modification and removal of habitat is not considered likely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline, as extensive habitat will remain in the locality.	

Vulnerable Species (Superb Parrot & Painted Honeyeater)	
Corben's Long-eared Bat	
The proposal will remove approximately 13ha of woodland vegetation in the development site, which includes 73 hollow bearing trees. Approximately 63ha of similar or better-quality habitat would remain in or adjacent to the development site. This modification and removal of habitat is not considered likely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline, as extensive habitat will remain in the locality.	
White-throated Needletail	
The proposal will remove approximately 13ha of woodland vegetation in the development site. Approximately 63ha of similar or better-quality habitat would remain in or adjacent to the development site. This modification and removal of habitat is not considered likely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline, as extensive habitat will remain in the locality.	
g) Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	
Superb Parrot, Painted Honeyeater, Corben's Long-eared Bat and White-throated Needletail	
The proposal is not considered likely to result in invasive species becoming established within the Superb Parrot's habitat. Competition with Noisy Miners for breeding and foraging habitat and resources is a major threat to the species and cause for the decline in population numbers. Noisy Miners are already present at the development site. The proposal is unlikely to result in invasive species such as these that are harmful to the habitat of the Superb Parrot. The proposal will modify the current land use, potentially creating additional shelter habitat for predatory invasive species such as foxes and cats, which are considered likely to be locally prevalent regardless of the proposal. Management protocols will be prepared and implemented as part of the Flora and Fauna Management Plan for the proposal which will monitor and manage these species within the development site.	
h) Will the action introduce disease that may cause the species to decline?	
Superb Parrot	
Beak and Feather Disease has been proven to impact the Superb Parrot (DoE, 2017); however, the proposal is not considered likely to act as a vector for the disease.	
Painted Honeyeater	
The proposal is not considered to act as a vector for any diseases to the Painted Honeyeater.	
Corben's Long-eared Bat	
The proposal is not considered to act as a vector for any diseases to the Corben's Long-eared Bat.	
White-throated Needletail	
The proposal is not considered to act as a vector for any diseases to the White-throated Needletail.	

Vulnerable Species (Superb Parrot & Painted Honeyeater)	
i) Will the action interfere substantially with the recovery of the species?	
Superb Parrot	
Core breeding areas and surrounding habitat are considered important to the recovery of the species. The nearest known breeding area to the proposal area occurs in the South West Slopes near Wagga Wagga, approximately 100km north of the development site. Habitats across the broader proposal area will remain available to the species and given its mobility, the proposal would not restrict the movements of the species across the development site. The proposal is unlikely to interfere with the recovery of the Superb Parrot.	
Painted Honeyeater	
No recovery plan has been developed for the Painted Honeyeater.	
Corben's Long-eared Bat	
No recovery plan has been developed for the Corben's Long-eared Bat.	
White-throated Needletail	
No recovery plan has been developed for the White-throated Needletail	
Conclusion	
A significant impact to this species is considered unlikely, on the basis that the proposal would not: • Lead to a reduction of the size or area of occupancy of an important population, or fragment or disrupt the breeding cycle of a population. • Affect habitat critical to the survival of these species. • Affect habitat or introduce disease such that these species would decline. • Introduce invasive species harmful to the species. • Interfere with the recovery of these species. A referral to the Federal Department of Environment is not considered necessary.	
Migratory Species (Fork-tailed Swift and White-throated needletail)	
An assessment of significance for migratory species must establish whether the habitat on the proposed site is considered "important habitat" as defined in the EPBC Act. "Important habitat" for migratory species is described as: 1. <i>Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or</i> 2. <i>Habitat that is of critical importance to the species at particular lifecycle stages; and/or</i> 3. <i>Habitat utilised by a migratory species which is at the limit of the species range; and/or</i> 4. <i>Habitat within an area where the species is declining.</i> The habitat within the proposal site is not considered important habitat for the Fork-tailed Swift or the White-throated Needletail.	
a) Will the action substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles, or altering hydrological cycles), destroy, or isolate an area of important	

Vulnerable Species (Superb Parrot & Painted Honeyeater)	
habitat for a migratory species?	
Fork-tailed Swift & White-throated Needletail	
The Fork-tailed Swift and the White-throated Needletail are almost exclusively aerial and are considered unlikely to rely on the habitats present within the proposal site. The habitats within the proposal site are not considered important habitat. Therefore, the action is unlikely to substantially modify, destroy or isolate an area of important habitat for either species.	
b) Will the action result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species?	
Fork-tailed Swift & White-throated Needletail	
The Fork-tailed Swift and the White-throated Needletail are almost exclusively aerial and are considered unlikely to rely on the habitats present within the proposal site. The habitats within the proposal site are not considered important habitat. Therefore, the action is unlikely to substantially modify, destroy or isolate an area of important habitat for either species.	
c) Will the action seriously disrupt the lifecycle (breeding, feeding, migration, or resting behaviour) of an ecologically significant proportion of the population of a migratory species?	
Fork-tailed Swift & White-throated Needletail	
The Fork-tailed Swift and the White-throated Needletail are almost exclusively aerial and are considered unlikely to rely on the habitats present within the proposal site. The area is not considered to support an ecologically significant proportion of the population of the species. Therefore, the action is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the population of either species.	
Conclusion	
The project site area contains habitat that could potentially be used by the Fork-tailed Swift or the White-throated Needletail. Of the four criteria for significant impact for a migratory species, the project is unlikely to cause a significant impact to any criteria. The proposal is therefore considered unlikely to significantly impact the Fork-tailed Swift or the White-throated Needletail.	

Appendix I BAM credit calculations

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00029035/BAAS18074/21/00029036	Walla Walla Modification	24/11/2021
Assessor Name	Report Created	BAM Data version *
Julie Gooding	19/03/2022	50
Assessor Number	BAM Case Status	Date Finalised
BAAS18074	Finalised	19/03/2022
Assessment Revision	Assessment Type	
1	Major Projects	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAI	Ecosystem credits

BAM Credit Summary Report

Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion												
1	277_grazed	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	12.1	12.1	0.18	PCT Cleared - 94%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	0
											Subtotal	0

BAM Credit Summary Report

Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South Western Slopes Bioregion												
4	278_good	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	43.1	43.1	0.11	PCT Cleared - 80%	High Sensitivity to Potential Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	TRUE	3
											Subtotal	3
River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.												
3	5_wetland	Not a TEC	41.9	41.9	1.1	PCT Cleared - 40%	High Sensitivity to Potential Gain			1.50		18
7	5_Grazed	Not a TEC	11.4	11.4	0.16	PCT Cleared - 40%	High Sensitivity to Potential Gain			1.50		0

BAM Credit Summary Report

9	5_Low	Not a TEC	5.6	5.6	0.65	PCT Cleared - 40%	High Sensitivity to Potential Gain			1.50		0
10	5_Creekline	Not a TEC	45.5	45.5	0.6	PCT Cleared - 40%	High Sensitivity to Potential Gain			1.50		10
										Subtotal		28
Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions												
2	76_grazed	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	20.2	20.2	10.8	PCT Cleared - 92%	High Sensitivity to Potential Gain	Endangered Ecological Community	Endangered	2.00		109
5	76_wetland	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	20	20.0	3.3	PCT Cleared - 92%	High Sensitivity to Potential Gain	Endangered Ecological Community	Endangered	2.00		33

BAM Credit Summary Report

6	76_Derived_Grassland	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	16.2	16.2	11.5	PCT Cleared - 92%	High Sensitivity to Potential Gain	Endangered Ecological Community	Endangered	2.00		93
8	76_Roadside	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	40.5	40.5	1.6	PCT Cleared - 92%	High Sensitivity to Potential Gain	Endangered Ecological Community	Endangered	2.00		32
											Subtotal	267
											Total	298

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAIL	Species credits
<i>Myotis macropus</i> / Southern Myotis (Fauna)									
76_grazed		20.2	20.2	2.6		Vulnerable	Not Listed	False	26

BAM Credit Summary Report

5_wetland	41.9	41.9	0.37		Vulnerable	Not Listed	False	8
278_good	43.1	43.1	0.11		Vulnerable	Not Listed	False	2
76_wetland	20.0	20.0	3.3		Vulnerable	Not Listed	False	33
5_Grazed	11.4	11.4	0.06		Vulnerable	Not Listed	False	1
76_Roadside	40.5	40.5	0.78		Vulnerable	Not Listed	False	16
5_Creekline	45.5	45.5	0.6		Vulnerable	Not Listed	False	14
							Subtotal	100
<i>Petaurus norfolcensis / Squirrel Glider (Fauna)</i>								
76_grazed	20.2	20.2	10.8		Vulnerable	Not Listed	False	109
5_wetland	41.9	41.9	1.1		Vulnerable	Not Listed	False	24
278_good	43.1	43.1	0.11		Vulnerable	Not Listed	False	2
5_Grazed	11.4	11.4	0.16		Vulnerable	Not Listed	False	1
76_Roadside	40.5	40.5	1.6		Vulnerable	Not Listed	False	32
5_Low	5.6	5.6	0.65		Vulnerable	Not Listed	False	2
5_Creekline	45.5	45.5	0.6		Vulnerable	Not Listed	False	14
							Subtotal	184

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00029035/BAAS18074/21/00029036	Walla Walla Modification	24/11/2021
Assessor Name	Assessor Number	BAM Data version *
Julie Gooding	BAAS18074	50
Proponent Names	Report Created	BAM Case Status
	19/03/2022	Finalised
Assessment Revision	Assessment Type	Date Finalised
1	Major Projects	19/03/2022

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	Critically Endangered Ecological Community	277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion



BAM Biodiversity Credit Report (Like for like)

White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	Critically Endangered Ecological Community	278-Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South Western Slopes Bioregion
Species		
Nil		

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami / Glossy Black-Cockatoo
Climacteris picumnus victoriae / Brown Treecreeper (eastern subspecies)

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	0.2	0	0	0
76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	27.1	174	93	267
5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.	Not a TEC	2.6	28	0	28
278-Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South Western Slopes Bioregion	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	0.1	0	3	3

BAM Biodiversity Credit Report (Like for like)

5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Inland Riverine Forests This includes PCT's: 2, 5, 7, 8, 9, 10, 11, 36, 78, 112, 233, 234, 249, 356, 362	Inland Riverine Forests <50%	5_wetland	Yes	18	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Inland Riverine Forests This includes PCT's: 2, 5, 7, 8, 9, 10, 11, 36, 78, 112, 233, 234, 249, 356, 362	Inland Riverine Forests <50%	5_Grazed	Yes	0	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Inland Riverine Forests This includes PCT's: 2, 5, 7, 8, 9, 10, 11, 36, 78, 112, 233, 234, 249, 356, 362	Inland Riverine Forests <50%	5_Low	No	0	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

	Inland Riverine Forests This includes PCT's: 2, 5, 7, 8, 9, 10, 11, 36, 78, 112, 233, 234, 249, 356, 362	Inland Riverine Forests <50%	5_Creekline	Yes	10	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions This includes PCT's: 76, 80, 81, 101, 110, 237, 248	-	76_grazed	Yes	109	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions This includes PCT's: 76, 80, 81, 101, 110, 237, 248	-	76_wetland	Yes	33	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions This includes PCT's: 76, 80, 81, 101, 110, 237, 248	-	76_Derived_Grassland	No	93	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions This includes PCT's: 76, 80, 81, 101, 110, 237, 248	-	76_Roadside	Yes	32	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	-	277_grazed	Yes	0	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

	This includes PCT's: 74, 75, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 352, 356, 367, 381, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 496, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1304, 1307, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1693, 1698					
278-Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South Western Slopes Bioregion	Like-for-like credit retirement options					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native	-	278_good	No	3	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or

BAM Biodiversity Credit Report (Like for like)

	Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla This includes PCT's: 74, 75, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 352, 356, 367, 381, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 496, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1304, 1307, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1693, 1698					Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
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Species Credit Summary

BAM Biodiversity Credit Report (Like for like)

Species	Vegetation Zone/s	Area / Count	Credits
Myotis macropus / Southern Myotis	76_grazed, 5_wetland, 278_good, 76_wetland, 5_Grazed, 76_Roadside, 5_Creekline	7.8	100.00
Petaurus norfolcensis / Squirrel Glider	76_grazed, 5_wetland, 278_good, 5_Grazed, 76_Roadside, 5_Low, 5_Creekline	15.0	184.00

Credit Retirement Options

Like-for-like credit retirement options

Myotis macropus / Southern Myotis	Spp	IBRA subregion
	Myotis macropus / Southern Myotis	Any in NSW
Petaurus norfolcensis / Squirrel Glider	Spp	IBRA subregion
	Petaurus norfolcensis / Squirrel Glider	Any in NSW

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00029035/BAAS18074/22/00031078	21-200 Walla Walla modification	24/11/2021
Assessor Name	Report Created	BAM Data version *
Julie Gooding	29/03/2022	50
Assessor Number	BAM Case Status	Date Finalised
BAAS18074	Finalised	29/03/2022
Assessment Revision	Assessment Type	BOS entry trigger
0	Scattered Trees	Major Project

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Scattered Trees Credit Requirement

Class	Contains hollows	Number of trees	Ecosystem credits
277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion			
3	True	7.0	7
3	False	2.0	2
3	True	2.0	2
3	False	1.0	1
3	True	1.0	1
			13
5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.			
3	True	1.0	1
2	False	1.0	1
			2
76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions			
3	True	23.0	23
3	False	6.0	5
3	False	1.0	1



BAM Credit Summary Report

3	True	1.0	1
			30
			45

Species credits for threatened species

Nil

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00029035/BAAS18074/22/00031078	21-200 Walla Walla modification	24/11/2021
Assessor Name	Assessor Number	BAM Data version *
Julie Gooding	BAAS18074	50
Proponent Names	Report Created	Date Finalised
	29/03/2022	29/03/2022
Assessment Revision	Assessment Type	BAM Case Status
0	Scattered Trees	Finalised
BOS entry trigger	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
Major Project		

Potential Serious and Irreversible Impacts

Nil

Additional Information for Approval

PCTs With Customized Benchmarks
No Changes

Ecosystem Credit Summary

Assessment Id	Proposal Name
00029035/BAAS18074/22/00031078	21-200 Walla Walla modification

BAM Biodiversity Credit Report (Like for like)

PCT	TEC	HBT Cr	No HBT Cr	Credits
76-Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions	24	6	30
277-Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	10	3	13
5-River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.	Not a TEC	1	1	2

Credit classes for 5	Like-for-like options				
	Class	Trading group	HBT	Credits	IBRA region
	Inland Riverine Forests	Inland Riverine Forests <50%	Yes	1	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

	Inland Riverine Forests	Inland Riverine Forests <50%	No	1	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Credit classes for 76	Like-for-like options				
	TEC	Trading group	HBT	Credits	IBRA region
	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions	-	Yes	24	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions	-	No	6	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Credit classes for 277	Like-for-like options				
	TEC	Trading group	HBT	Credits	IBRA region

BAM Biodiversity Credit Report (Like for like)

	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	-	Yes	10	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	-	No	3	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Appendix J Biodiversity enhancement plan



NOTES REGARDING WALLA WALLA PV PLANT

TO : FRV SOLAR

Report prepared by Kylie Durant

20/09/2019

Final Updated 30/09/19

DISCLAIMER: The following comments are made in context of the information and discussion points supplied by Mark Love of FRV during a joint site visit on 12/09/2019 in the context of preparing a voluntary biodiversity plan that is separate from the consent and EIS process

Costings are a guide only

This document relates to the proposed Walla Walla Solar Farm a large 300MW ac Utility scale Solar project being developed by FRV. The site area covers approx. 605 Hectares of existing mixed-use agricultural land and is located off Benambra Road, Walla Walla NSW

PURPOSE:

To highlight opportunities for conservation management and restoration and provide technical input to a biodiversity plan

Landscape values

The FRV Walla Walla Solar Farm site is intersected by a well vegetated section of Back Creek with several ephemeral wetland areas on the property in various conditions, both to the north and south of the creek.

In terms of landscape connectivity, the creek forms the most important continuous link in this local landscape. There are significant ephemeral swamps and wetlands to the north and a significant “patch” of degraded open woodland to the south, as well as some planted tree lines.

The eastern end of the Benambra Rd roadside is significant vegetation (*Hume Shire Roadside Plan 1998*). A significant tree line also runs along the eastern boundary in an old Crown Road Reserve, and along the end of Weeamara Rd south of Benambra Rd to the creek.

In the broader landscape the Gum Swamp Reserve to the west and the Benambra National Park/Tabletop range in the east are the most significant features.

The creek, existing wetland remnants Excl 2, 3, 4, 5, 7 and the Weeamara Rd corridor are the most valuable biodiversity assets on the property that would benefit from fencing and the control of stock access.

In terms of locally significant species, the site is within 5km of sites that have been used by Brolgas and Bush Stone Curlews in the past. The creek is very likely to have Squirrel Gliders. The suite of NSW threatened woodland birds are also commonly found in this area.

Dam rehabilitation for biodiversity

The decision to retain and rehabilitate dam sites on the property should be considered in the context of the management of the site in general and although there would be localised benefits for various frog and birds species of retaining permanent water, the

natural ephemeral wetland sites would be a “natural” setting in which to concentrate rehabilitation efforts.

Another consideration is the requirement for stock water points and other on-farm requirements (dust control on tracks, washing panels?). Although there is a trough system, I would recommend an analysis of the final paddock layout and grazing regime to be employed before decommissioning any dams, and this use would need to be considered if looking at any active rehabilitation.

Retaining multiple water sources can also encourage high kangaroo numbers and overgrazing by Kangaroos can impact the recovery of restoration areas.

The dams on the property east of Schneider’s Rd are mostly within existing exclusion areas already so will benefit from the passive rehabilitation through exclusion of stock, and revegetation surrounding them. Most dams were observed to be very low at the time of inspection, and it would be typical of dams in this landscape to have rapidly fluctuating water levels, and it is difficult to maintain fringing and aquatic vegetation under those circumstances.

The dam areas if retained would benefit from placement of coarse woody debris both in and around the dams and this could be achieved by relocating any material from and clearing being undertaken.

More active rehabilitation could be considered if FRV wanted to. For example, using earthworks to create a range of deep and shallow area in a dam can enhance the habitat values for various species. Creation of vegetated islands, or standing dead timber in the water can benefit water birds, although most of the dams here are small and would make that logistically difficult.

Connectivity

As a general concept, landscape connectivity can be enhanced for a wide range of species by reducing the gaps in vegetation to less than 100m, in a landscape that has larger remnants in it.

The creek is by far the most important connectivity asset. There is opportunity to enhance a link along the Weeamara Laneway to the creek by revegetating a small section to the creek.

Excl 3, 4, 5 and 7 are all retained patches that are within 1km of the creek and could potentially benefit from connecting vegetation if that was within the scope of the farm design.

Revegetation methodology - Background

Tubestock revegetation is suitable for former pasture and crop areas. Preparation requires spraying to control exotic cover and then ripping or cultivation when the site has a dry profile. The intention of ripping is to break the compaction of the soil, allow moisture penetration and retention in preparation for planting and create a weed-free “bed” for fast planting. Deep ripping refers to 30-40cm – some of these soil types may only require regular cultivation. Spraying with a knockdown chemical should occur the Spring before planting is to go ahead and then again after the Autumn break and just before planting. Planting in this district generally occurs from June to September (see attachment 1 Site Preparation).

Direct Seeding is a suitable method where there is low fertility and usually some native groundcover left. The seeder is towed on the back of a ute so needs to be able to manoeuvre in the site. If there is exotic weed cover (annual species) a 1m wide strip is sprayed with a knockdown at the same time as seeding.

All site recommendations would come from the Southwest Slopes Revegetation Guide – Walla Walla Site Profile. Specific site species recommendations are not included in this document.

Revegetation of the 5 m buffer zones on the boundary

This area is suitable for tubestock planting only. I would recommend a configuration that has at least 3 rows of plants. Due to the narrowness of this buffer, you may consider cultivation of the area rather than putting in multiple riplines with a single tyne. There is scope to adapt to the machinery that is on site – a multi-tyned cultivation instrument, a multi-tyned ripper, a rotary hoe attachment or disc equipment could be used.

Revegetation design should match the objective - screening, connectivity or biodiversity and ecosystem benefit. Method also has to be suited to the history of the site – is it developed perennial pasture/crop or unfertilised area with remnant native cover.

For a Grassy Woodland ecosystem restoration site the recommended spacings are 600 per ha (4mX 4m) with 80% understorey species and 20% trees.

In some parts of the buffer where screening is required, you may choose very close spacings (eg. 2-3m) and increase the % of understorey species.

Where there are existing trees you can expect that tree regeneration will occur after site preparation.

Tree guards are recommended if there are rabbits and hares and no control is undertaken, but they are not a standard practice for on-farm revegetation in the area.

Revegetation areas

For the 50m buffers, a more standard approach to revegetation is appropriate. The sites should be ripped parallel to the fencing at 4m spacings and planted 600 per ha (a 4x4m grid) with 80% shrubs, 20% trees.

Complementary roadside planting

There would be opportunity for supplementing the roadside vegetation along Schneider's Rd and the section of the Benambra Rd west of the creek with the agreement of Greater Hume Council. Addition of understorey plants such as wattles and other shrubs at intervals along the road could be done. Tubestock would be the most appropriate method here.

Nest boxes

The purpose of nest boxes needs to be articulated so recommendations can be made.

If there is a hollow-dependent species identified as using the site and hollows are limited, then there is ecological benefit in investing in specifically designed nest boxes.

If it just for community engagement, then a range of boxes suited to locally-occurring hollow-dependent species may be installed.

A long term management plan is required for maintenance of the boxes.

Stock Management

Our recommendation is that all areas with revegetation should have stock excluded for at least 5 years. If stock grazing is necessary for weed or fire management then short crash grazing can be undertaken. In our management agreement, that is not to exceed 10 days per calendar year.

In the exclusion areas, crash grazing should NOT occur between November and February to allow native species to reproduce and set seed. In the wetland sites, grazing is not recommended in the Winter months either.

Fencing

We recommend only wildlife friendly fencing with no barb wire to ensure there is lower risk of entanglement to gliding possums and owls.

Potential to link to Gum Swamp

The most significant natural feature in proximity to the site is the Gum Swamp. This is largely public land under the governance of a community committee, and they are often in need of funds for fencing, maintenance and wish to develop interpretive signage and visitor facilities.



FRV Walla Walla PV Farm

Imagery courtesy of NSW Land and Property Information. Base data sourced from the Office of Environment & Heritage. Holbrook Landcare does not guarantee this data is free from error.
Produced - 30/9/2019

FRV Walla Walla PV Plant Site recommendations				
Map ref	Description	Notes	approx costs	approx num/k m
Back Creek	Potential to fence and manage stock access and direct seed selected understorey species	Most of this creek is fenced off already and if stock are going to be grazing the site I would recommend fencing it off to stock and undertaking some sort of understorey planting. The creek would be suitable for direct seeding where the ute could get around amongst the regrowth. If the existing fences were to remain, then direct seeding by machine is an option in some most of the creek. If the fencing was to be moved in closer to the creek then tubestock and/or hand direct seeding would be more appropriate	fence - \$8-10K per km erected Seed and Machine direct seeding \$500/km	2.66km 5km
Dam 1, 2, 3, 6, 8, 9	Dam - exclude stock and revegetate	These are already included within exclusion areas and within the boundary buffer zone - recommend planting with tubestock as part of the buffer planting Allow passive regeneration of fringing vegetation	General revegetation costs	
Dam 4	not inspected	Could be fenced and revegetated		
Dam5	Dam - stock access point and fence and revegetate	Could either be left in the paddock or included in the boundary buffer with a stock access point.		

Dam 7 , 11, 12, 13, 14	Dams included in Exclusion areas	This is included in marked exclusion areas		
Dam 10	Dam - exclude stock and revegetate	This is adjacent to the creek and if the dam is to remain I would recommend fencing it in to the creek site		
Dam 15	Dam - maintain existing fencing	Manage stock access		
Excl1	Severely degraded gilgai formation. Exclude from grazing	Recommend maintaining existing internal fencing so this becomes part of the creekscape area to reduce further degradation by stock access. The site has been sown with exotic pasture species so has limited chance of natural recovery. Recommend addition of coarse woody debri and could attempt active regeneration by weed control and hand direct seeding - need to assess further.	Needs to be explored further	
Excl2	Degraded gilgai formation but potential for recovery	High priority for stock exclusion and recommend addition of some coarse woody debri.	Included in creek fencing above	
Excl3&4	Intact ephemeral Redgum swamps	High priority for stock exclusion	fence - \$8-10K per km erected	800m

Excl5	Intact ephemeral Redgum swamp - potential to fence and exclude grazing	High priority for stock exclusion	fence - \$8-10K per km erected	500m
Excl7	Intact Redgum Wetland	Maintain existing fencing and exclude regular stock grazing		
Reveg1	50m reveg corridor buffer	This site is exotic pasture and/or crop. Recommend tubestock planting at 4X4m spacing 80% understorey, 20% trees	fence - \$8-10K per km erected Tubestock planted \$2.50 each	1.2km 3600 plants
Reveg2	50 m corridor screen and biodiversity link	This site is exotic pasture and/or crop. Recommend tubestock planting at 2X4m spacing 80% understorey, 20% trees	fence - \$8-10K per km erected Tubestock planted \$2.50 each	700m 4200 plants

Reveg3	50 m corridor screen and biodiversity link tubestock	This site is exotic pasture and/or crop. Recommend tubestock planting at 2X4m spacing 80% understorey, 20% trees	fence - \$8-10K per km erected Tubestock planted \$2.50 each	350m 2200 plants
WLane	Remnant Grey Box and add understorey	Recommend retaining this corridor for linkage to other remnant vegetation in the areas Undertake weed control in whole corridor - would expect some regeneration of Grey Box trees Fence, rip and plant the 300m to create a corridor to creek (10m corridor proposed, 3 rows)	fence - \$8-10K per km erected Tubestock planted \$2.50 each	300m 240 plants
5m buffer plantings	Grey Box/Redgum/Yellow Box	Recommend to space 3 lines 1.5m apart and plant at 4m spacings alternating across the rows Where particular screening is required can make spacings 3m in those sections	Tubestock planted \$2.50 each	12000 plants (for whole boundary)
Roadside planting	Addition of understorey species along the section of Benambra Rd and Schneiders Rd	2.2km of roadside with some plants added.	Tubestock planted \$2.50 - \$3 each	550 plants

Proposed Seed Production area (SPA)	Potential to establish a SPA in partnership with Murray Local Land Services (MLLS)	Would have to be negotiated with MLLS		
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Site preparation for tube stock

SPRING

Spray out exotic perennial pasture

- If you are planting in perennial pasture dominated site, spraying the site the Spring prior to planting is the ideal preparation, and you may then only require one spray in Autumn

SUMMER

Order plants

- Order plants early to guarantee supply of desired species
- Consult with your local nursery and the "Southwest Slopes Revegetation Guide" ([online at www.holbrooklandcare.org.au](http://www.holbrooklandcare.org.au)) for appropriate plants for your area



Control rabbits and hares at site and surrounds

- Coordinate with neighbours if necessary, deal with burrows and surface dwelling rabbits
- Avoid the need for labour intensive and expensive tree guards

AUTUMN

Ripping—where appropriate

- Rip before the Autumn break, while the ground is hard and dry to get deep shattering of the soil
- Rip lines should be spaced a minimum of 4 metres apart and at least 40cm deep
- Do not rip under the drip-line of existing trees., through wet areas or where there is erosion hazard

Crash graze/slash grass and spray rip lines before frosts, but about 10 days after rain

- Seek appropriate agronomic advice on sprays and rates of chemical
- Spray rip lines only —broad scale spraying of site not recommended
- If no rip lines, spot herbicide application 1 square metre per plant

Re-spray one month prior to planting if required

- Only non-residual herbicides are recommended for use
- If no chemicals to be used, consider slashing/grazing again

WINTER

Plant seedlings mid July to September

- For 400 plants per ha, plant every 6 m for rip lines that are 4m apart
- For 600 plants per ha, plant every 4 metres for rip lines 4m apart

Check for vermin or stock damage first week after planting

- Inspect for vermin such as rabbits, hares and **act** on any specific problems
- Check that there is no stock entry to plantation

Check plants regularly post-planting

- Watch and act on weed regrowth through Spring and early summer.
- Monitor insects such as grasshoppers, Rutherglen bugs etc. Spot spraying may be undertaken if necessary
- Damage can be caused by frost, birds, kangaroos and wombats
- Remember to shut the gate on the way out!!



SPRING

Ripping

Before ripping, landowners should contact Dial-Before-You-Dig to check the location of utilities.

- Ripping should be done when the profile is dry to **shatter** the soil (not slice) and reduce the risk of air pockets forming, especially in clay soils.
- Rip lines should be spaced 4 metres apart, and at least 40cm deep.
- If the rip has resulted in air spaces, running a tractor wheel or cultivating over the rip line may be appropriate.



- On undulating or hilly land, rip lines should be along the contour to minimise soil erosion.
- Mounding may be recommended in specific soil types, especially sites prone to waterlogging, but it is the exception rather than the rule.

When is ripping **NOT** appropriate?

Native grass sites—If planting is appropriate at all, then native grass areas should be direct seeded to prevent disturbance and the invasion of weeds.

Steep Land— slopes must be safe to work on and the appropriate equipment used. If accessible, rip on the contour. Choose appropriate equipment (eg. bulldozer rather than tractor).

Erodible lands— sites with existing active erosion, erodible soil types (including subsoil) or at risk of sheet erosion. Rip lines can catch and redirect water if not designed properly. Seek advice before ripping in erosion prone areas.

Spraying

- The area covered by herbicide spraying should be no wider than 50cm along either side of the rip line.
- If weed regrowth is excessive, over spraying with some chemicals is possible at certain times of the year when the plants are dormant. Consult with your nursery or professional for advice.

What if I don't want to use chemicals?

Site preparation is about reducing the competition for moisture, light and nutrients for the seedling, and this can be achieved in other ways.

- **Reduce the biomass**—slashing or using grazing to knock down the grass load.
- **Scalping** (taking the top 1-2cm of soil off) the planting site may be appropriate in sites with low erosion risk. As you are scraping off the nutrients present in the top layer, there is usually some residual effect before regrowth occurs. Scalping over large areas is not recommended, except under VERY specific circumstances (eg sheep camp restoration).



Tree Guards?

Advantages

- Can provide protection from rabbits and hares where control difficult
- Can provide protection from frost

Disadvantages

- Significant cost per unit
- Significant labour cost to install
- Require maintenance and eventual removal



Watering?

Good site preparation and the timing of planting in late Winter/early Spring is recommended to eliminate the need for watering over the first Summer.

Assessing losses— Vegetation growth in the first Spring can often make it difficult to see the plants. Assess the site properly before making a decision. We recommend to wait until the end of the second or third Spring to assess for replanting **UNLESS** there has been a specific grazing incursion or insect attack.

For more information please contact Holbrook Landcare Network

Phone: (02) 6036 3181 Mobile: 0418 198 522
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<http://www.holbrooklandcare.org.au/bushlinks>

Appendix K Assessment of infrastructure impacts to grassland



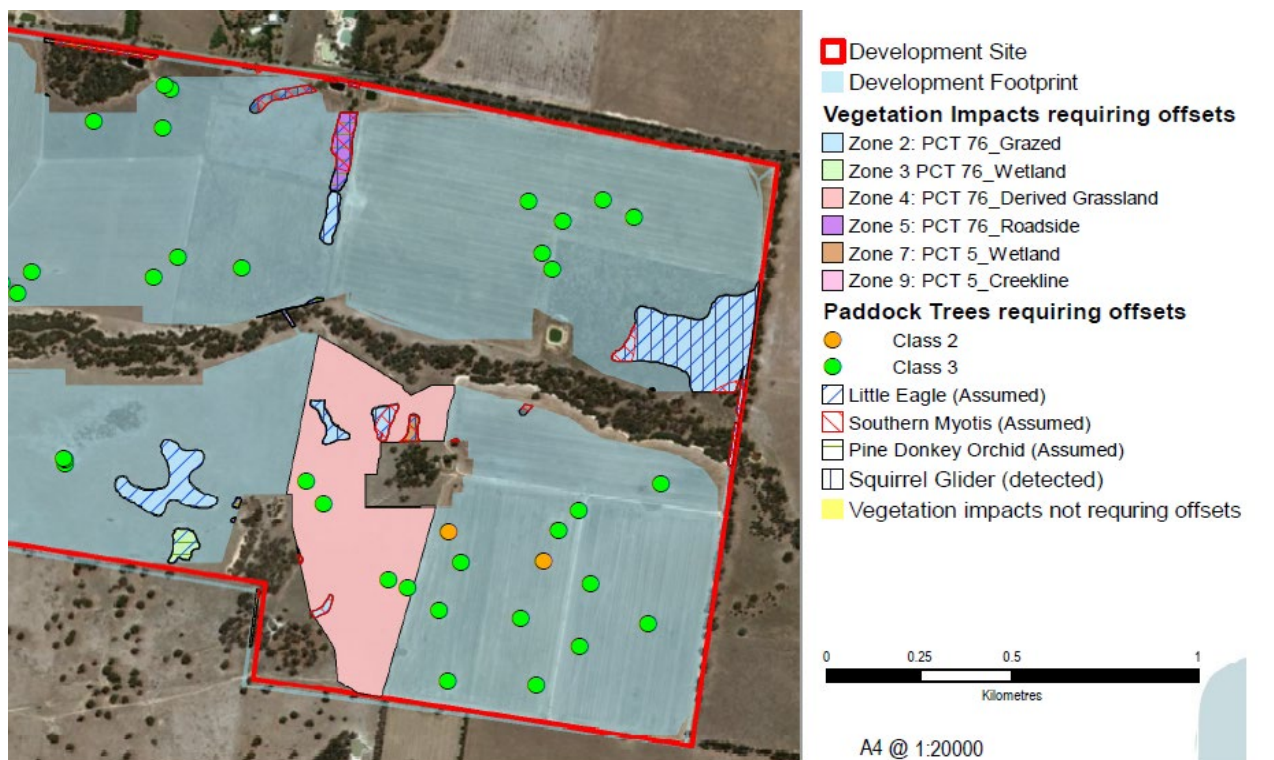
Powering a Sustainable Future

Walla Walla Solar Farm

Zone 4: PCT76 Derived Grassland Analysis

The Walla Walla Solar Farm is a proposed 300MW ac Tracker mounted utility scale Solar Farm located on lands off Benambra Road, Walla Walla, NSW, 2659

During an ecological assessment carried out by Julie Gooding Environmental Consultant - Accredited NSW BAM Assessor (BAAS18074) of NGH, an area of Grey Box derived grasslands (PCT 76_derived grassland) was identified which is shown in pink below.

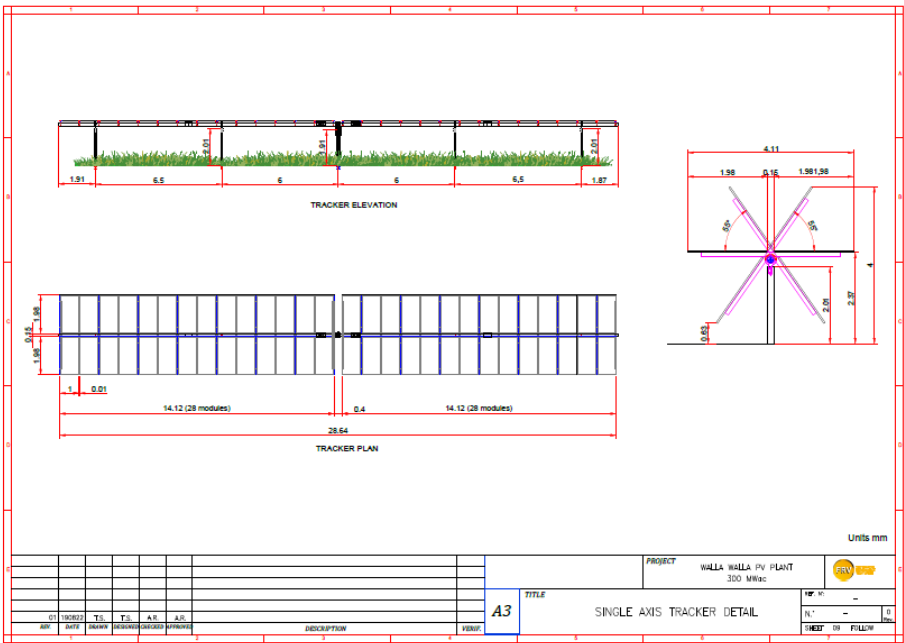


Given the perceived expectation that a solar farm would significantly impact on this area of grassland it was initially regarded as requiring biodiversity offsets for impacts to the entire area of derived grassland.

However, FRV have completed detailed analysis of the actual / real impact of a solar farm based on current construction methods, a realistic and workable design coupled with significant experience in developing, constructing and managing operational assets across Australia.

During the Operational phase of assets within Australia and, whilst reviewing assets globally, it has become evident that grasses and other vegetation are able to continue growing underneath the panels and tracker systems. This is in part due to the rotational characteristics of the technology which allows diffused light and

moisture to penetrate the ground but also potentially that additional shading assists in moisture retention underneath the panel / tracker area.



Rotational nature of tracker infrastructure



Evidence of Grass Growth under Operational asset in QLD, Australia – Lilyvale Solar Farm 100MW ac

Based on this evidence FRV undertook an internal modelling exercise which examined the actual impact of Solar Farm infrastructure within the Zone 4: PCT76_Derived Grassland area based on the following:

1. A number of uprights (posts) that support the Tracker / panels – each post was measured for its steel thickness with a conservative 20CM X 20cmSq impact area – regardless of the fact that the actual post will be Based on an I section profile (A).
2. 720 Tracker units that could be installed within the 29.3 ha area (A)
3. Inverter bases within the area – Based on SMA Modular technology (B)
4. Two 4m wide access tracks that cross the area (C)

The table of calculation can be found here:

Walla Walla Solar Farm - Land Usage Impact Analysis			23.9 Hectare Native Vegetation - Grasses
Site	Walla Walla		
Capacity (DC)	362000000	W	14258075.15
AC Capacity	300000000	W	11816084.38
Solar Farm Land Area	6068000	m^2	0.039386948
Tracker	30x4m		
Module	330	W	
Road Width	4	m	
Tracker			
Modules / Row	60	N/A	
# Posts / Tracker	9	#	
Area of Each Post	0.04	m^2	
# Trackers (Approx.)	18283	#	720.10
Assumed non grazable area under modules/Tracker	25	m^2	
Post Area Land Impact	6582	m^2	259.24
Land Impact of total tracker + posts	463653	m^2	18261.86
Inverter Blocks			
Block Capacity	5000000	W	
Block Width	2.44	m	
Block Length	12.19	m	
Block QTY	72	#	2.84
Area of Total Inverter Blocks	2141.5392	m^2	84.35
Other Areas			
Access Roads (assume 4m width)	72800	m^2	2867.37
O&M Compound	2400	m^2	0
Total Other Areas	75200	m^2	2867.37
Total Grazing Land Loss			21213.58
% Loss			8.88%
% Ground Contact (Ignores Screening Areas, Module Shading)			1.34%
Total impacted grass area within the 23.9 Hectares due to tracks / infrastructure = A+B+C =			21,213Msq
Total impact on Vegetation within the 23.9 Hectares area as a % =			8.88%

This analysis demonstrates that within the 23.9 Hectare area only 21,213 sq meters of land is impacted by the solar farm infrastructure equating to 8.88% of its area.