Birriwa Solar and Battery Project

Biodiversity Development Assessment Report

Prepared for ACEN Australia Pty Ltd

September 2022

Birriwa Solar and Battery Project

Biodiversity Development Assessment Report

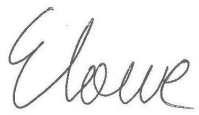
ACEN Australia Pty Ltd

J210553 Birriwa Solar and Battery Project - BDAR

September 2022

Version	Date	Prepared by	Approved by	Comments
V1_draft	22 July 2022	Bianca Seal	Erin Lowe	
V2	25 July 2022	Bianca Seal	Erin Lowe	
V3	12 September 2022	Bianca Seal	Erin Lowe	

Approved by



Erin Lowe
Associate Ecologist
12 September 2022

Level 3 175 Scott Street
Newcastle NSW 2300

Executive Summary

ES1 Project description

ACEN Australia Pty Ltd, operating as ACEN Australia (ACEN) proposes to develop the Birriwa Solar and Battery Project; a large scale solar photovoltaic (PV) generation facility along with battery storage and associated infrastructure (the project). The solar farm component of the project will have an indicative capacity of around 600 megawatts (MW) and include a centralised battery energy storage system of up to 600 MW and 2 hour duration. The project will be developed within a study area of approximately 1,300 hectares and will connect to the proposed Central-West Orana Renewable Energy Zone Merotherie Hub.

The project is on Wiradjuri Country, in the localities of Birriwa and Merotherie, approximately 15 kilometres (km) south-west of the township of Dunedoo, in the Central West of New South Wales (NSW). The project is within the Mid-Western Regional Council local government area (LGA) with part of its access (road corridor) within Warrumbungle Shire Council and is within the Central-West Orana (CWO) Renewable Energy Zone (REZ).

The project is State significant development (SSD) under the *State Environmental Planning Policy (State and Regional Development) 2011*. Therefore, a development application for the project is required to be submitted under Part 4, Division 4.1 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act). This Biodiversity Development Assessment Report (BDAR), prepared in accordance with the Biodiversity Assessment Method (BAM) (DPIE 2020), forms part of the Environmental Impact Statement (EIS).

ES2 Landscape features

The subject land is within the NSW South Western Slopes Interim Biogeographic Regionalisation for Australia (IBRA) bioregion and the Inland Slopes IBRA subregion. The Talbragar – Upper Macquarie Terrace Sands and Gravels NSW (Mitchell) Landscape dominates the assessment area with Cope Hill Granite mapped in the southern half of the assessment area. Smaller occurrences of additional NSW (Mitchell) Landscapes within the assessment area include:

- Gulgong Ranges;
- Liverpool Range Valleys and Footslopes; and
- Goonoo Slopes.

As the majority of the assessment area is located in the Talbragar – Upper Macquarie Terrace Sands and Gravels NSW (Mitchell) Landscape this was the landscape used in this assessment. The locality of the subject land is considered highly fragmented with native vegetation often occurring in isolated patches surrounded by a matrix of agricultural land. A vegetated road corridor provides connectivity along the western extent of the subject land.

Areas of geological significance include karsts, caves, crevices, cliffs, rocks and other geological features of significance as outlined in Section 3.1.3 of the BAM (DPIE 2020). A ridgeline occurs within the assessment area which is likely to have areas of geological significance such as crevices and geological habitat. This ridge line is associated with the higher slopes to the south of the subject land.

The percent of native vegetation within the assessment area is estimated at approximately 41%, based on the Central West Lachlan vegetation mapping and aerial imagery. The patch size is calculated to be greater than 100 ha due to contiguity (within 100 m) of vegetation within the subject land with nearby vegetation within the region.

ES3 Native vegetation

The subject land reflects regional vegetation mapping with areas dominated by exotic vegetation and native pasture. All vegetation within the subject land has been impacted by past land use, particularly with ongoing grazing, with the grasslands supporting little native species cover and a lack of native species diversity. Remnant vegetation is restricted to small patches, isolated paddock trees and a vegetated road corridor consisting primarily of Grey Box (*Eucalyptus microcarpa*), Blakely's Red Gum (*Eucalyptus blakelyi*) and Yellow Box (*Eucalyptus melliodora*).

Two plant community types (PCTs) occur within the subject land:

- PCT 80 – Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion; and
- PCT 281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion.

The PCTs within the subject land meet the criteria for inclusion as the following two *NSW Biodiversity Conservation Act 2016* (BC Act) listed Threatened Ecological Communities (TECs):

- PCT 80: Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (Endangered); and
- PCT 281: 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 (Critically Endangered).

In addition, PCT 281 is a candidate entity for Serious and Irreversible Impacts (SAII).

ES4 Threatened species

Habitat assessments within the subject land concluded that targeted surveys were required for seven flora species and 14 fauna species. No candidate flora species were recorded during the surveys. One candidate fauna species, the Koala, was recorded in the form of scats during dog detection surveys. The presence of the Koala is associated with the high condition vegetation zones of PCTs 80 and 281, which are also connected to the wider landscape. No other candidate fauna species were recorded during targeted surveys. Presence has been assumed for *Chalinolobus dwyeri* (Large-eared Pied Bat), *Ninox connivens* (Barking Owl), *Ninox strenua* (Powerful Owl) and *Tyto novaehollandiae* (Masked Owl), due to potential habitat within the subject land, and no targeted surveys being undertaken for these candidate fauna species.

ES5 Aquatic and riparian biodiversity

The waterways within the subject land and assessment area largely lack riparian vegetation which may support aquatic and terrestrial species. These waterways have been highly altered and degraded, with numerous online dams primarily providing water for livestock. These dams lack riparian vegetation and have high turbidity and sediment load due to stock access. Where waterways are connected within the subject land, a highly eroded gully occurs due to the apparent sandy substrate associated with the landscape. These gullies are very shallow and are disconnected by man-made weirs and roads.

Browns Creek and White Creek are mapped as Key Fish Habitat (KFH) (DPI 2021b). These creeks, in addition to Huxleys Creek, are also mapped within the freshwater threatened species distribution for the Purple-Spotted Gudgeon (*Mogurnda adspersa*) (DPI 2021a).

No nationally important or RAMSAR wetlands have been mapped within the subject land or are located within the locality.

ES6 Impact avoidance, minimisation and mitigation

The construction and operation of the project will result in direct and indirect impacts.

Measures to avoid and minimise impacts to vegetation were considered during the project refinement process, resulting in avoidance of significant biodiversity values.

As part of this refinement process, a total area of approximately 4.9 ha of derived native grassland (Endangered Ecological Community has been excluded from the subject land.

Public road crossings have been located within the subject land within areas of minimal vegetation, thereby avoiding the need to remove vegetation for these crossings.

Refinements to the project layout have also excluded as many higher order streams from the subject land, as possible. Three third order streams are excluded from the subject land, thereby avoiding impacts to any associate riparian vegetation, with the exception of that required for the provision of fencing, access and electrical reticulation (i.e., private internal access roads and electrical cables).

In addition, a key design principle within the project refinement process has been to maximise the placement of project infrastructure in cleared areas and, wherever possible, limit impacts to native vegetation of low quality only.

In relation to the road upgrade corridor within the subject land, the conceptual road upgrade design has sought to minimise the clearance of native vegetation as much as possible. The concept design was developed in consultation with EMM ecologists and with Mid-Western Regional Council and Warrumbungle Shire Council to develop a design that avoids as much of the native vegetation along the existing road verge as possible. Residual impacts to biodiversity values will be mitigated through pre-clearance surveys, planting locally native species characteristic of Box Gum woodland and Grey Box woodland in future landscaping, retention of logs and debris in the subject land post-construction, and weed hygiene measures.

ES7 Impact assessment

After avoidance and minimisation, the project will result in residual impact to:

- 76.80 ha of PCT 80, of which only 1.18 ha is of condition to require offsetting under the NSW Biodiversity Offset Scheme (BOS), and associated habitat for flora and fauna species; and
- 291.91 ha of PCT 281, of which only 7.45 ha is of condition to require offsetting under the NSW BOS, and associated habitat for flora and fauna species.

One BC Act listed TEC at risk of SAII occurs within the subject land and two BC Act listed fauna species at risk of SAII have the potential to occur within the subject land:

- 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;
- Large-eared Pied Bat; and
- *Anthochaera phrygia* (Regent Honeyeater).

The TEC and species have been assessed in accordance with Section 9.1 of the BAM (DPIE 2020).

ES8 Assessment of impacts under other relevant biodiversity legislation

ES8.1 Environment Protection and Biodiversity Conservation Act 1999

The high condition vegetation zones of PCTs 80 and 281 mapped within the subject land meet the criteria for inclusion as the following *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Listed TECs:

- PCT 80: Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia endangered ecological community (Endangered) (comprising 1.01 ha); and
- PCT 281: White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community (Critically Endangered) (comprising 0.35 ha).

One EPBC Act listed fauna species was recorded within the subject land; the Koala. A further five EPBC Act listed fauna species were assessed as potential impact, due to their likelihood of occurrence; namely:

- Regent Honeyeater;
- *Callocephalon fimbriatum* (Gang-gang Cockatoo);
- *Grantiella picta* (Painted Honeyeater);
- *Hirundapus caudacutus* (White-throated Needletail); and
- Large-eared Pied Bat.

Assessments in accordance with the *Matters of National Environmental Significance – Significant Impact Guidelines 1.1* (DoE 2013) concluded that the project is unlikely to result in a significant impact on the above listed Matters of National Environmental Significance (MNES). However, referral of the project to the Commonwealth Minister for the Environment is to be undertaken post-EIS submission.

ES8.2 Fisheries Management Act 1994

Browns Creek and White Creek are mapped as KFH. These creeks, in addition to Huxleys Creek, are also mapped within the freshwater threatened species distribution for the Purple-Spotted Gudgeon.

A likelihood of occurrence assessment for species listed under the FM Act was conducted based on database searches. The assessment concluded that no aquatic threatened ecological communities, endangered populations or species have a moderate to high likelihood of occurring within the subject land, therefore assessment under section 220ZZ and 220ZZA of the FM Act is not required.

ES8.3 Biosecurity Act 2015

Two priority weeds of the Central Tablelands were recorded in the subject land, namely Coolatai Grass (*Hyparrhenia hirta*) and St. Johns Wort (*Hypericum perforatum*).

ES9 Biodiversity offsets

To compensate for impacts on native vegetation and species habitat, the following credits are required:

- 51 ecosystem credits of PCT 80 – Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion;
- 230 ecosystem credits of PCT 281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion;
- 17 species credits for Large-eared Pied Bat;
- 33 species credits for Barking Owl (*Ninox connivens*);
- 33 species credits for Powerful Owl (*Ninox strenua*);
- 234 species credits for Koala (*Phascolarctos cinereus*); and
- 33 species credits for Masked Owl (*Tyto novaehollandiae*).

Two vegetation zones within the subject land (the pasture zone for both PCT 80 and PCT 281) do not require offsetting as the vegetation integrity (VI) score of these zones fall below the offset threshold under the BAM (DPIE 2020). Additional areas which do not require offsetting include existing cleared access tracks and watercourses, both of which occur within the subject land.

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1 Introduction

1.1 The project

ACEN Australia Pty Ltd, operating as ACEN Australia (ACEN) proposes to develop the Birriwa Solar and Battery Project; a large scale solar photovoltaic (PV) generation facility along with battery storage and associated infrastructure (the project). The solar project will have an indicative capacity of around 600 megawatts (MW) and will include a centralised battery energy storage system (BESS) of up to 600 MW for a 2 hour duration. The BESS will enable energy from solar to be stored and then released during times of demand.

The project is on Wiradjuri Country, in the localities of Birriwa and Merotherie, approximately 15 kilometres (km) south-west of the township of Dunedoo, in the Central West of New South Wales (NSW) (Figure 1.1). The project is within the Mid-Western Regional Council local government area (LGA) with parts of its access within Warrumbungle Shire Council and is within the Central-West Orana (CWO) Renewable Energy Zone (REZ).

The project is State significant development (SSD) under the *State Environmental Planning Policy (State and Regional Development) 2011*. Therefore, a development application for the project is required to be submitted under Part 4, Division 4.1 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act). This Biodiversity Development Assessment Report (BDAR) forms part of the Environmental Impact Statement (EIS).

EMM has conducted the necessary biodiversity assessments required under the Biodiversity Offset Scheme (BOS) and the Secretary's Environmental Assessment Requirements (SEARS) (see Section 1.4) to assess impacts of the project under the NSW *Biodiversity Conservation Act 2016* (BC Act), the NSW *Fisheries Management Act 1994* (FM Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

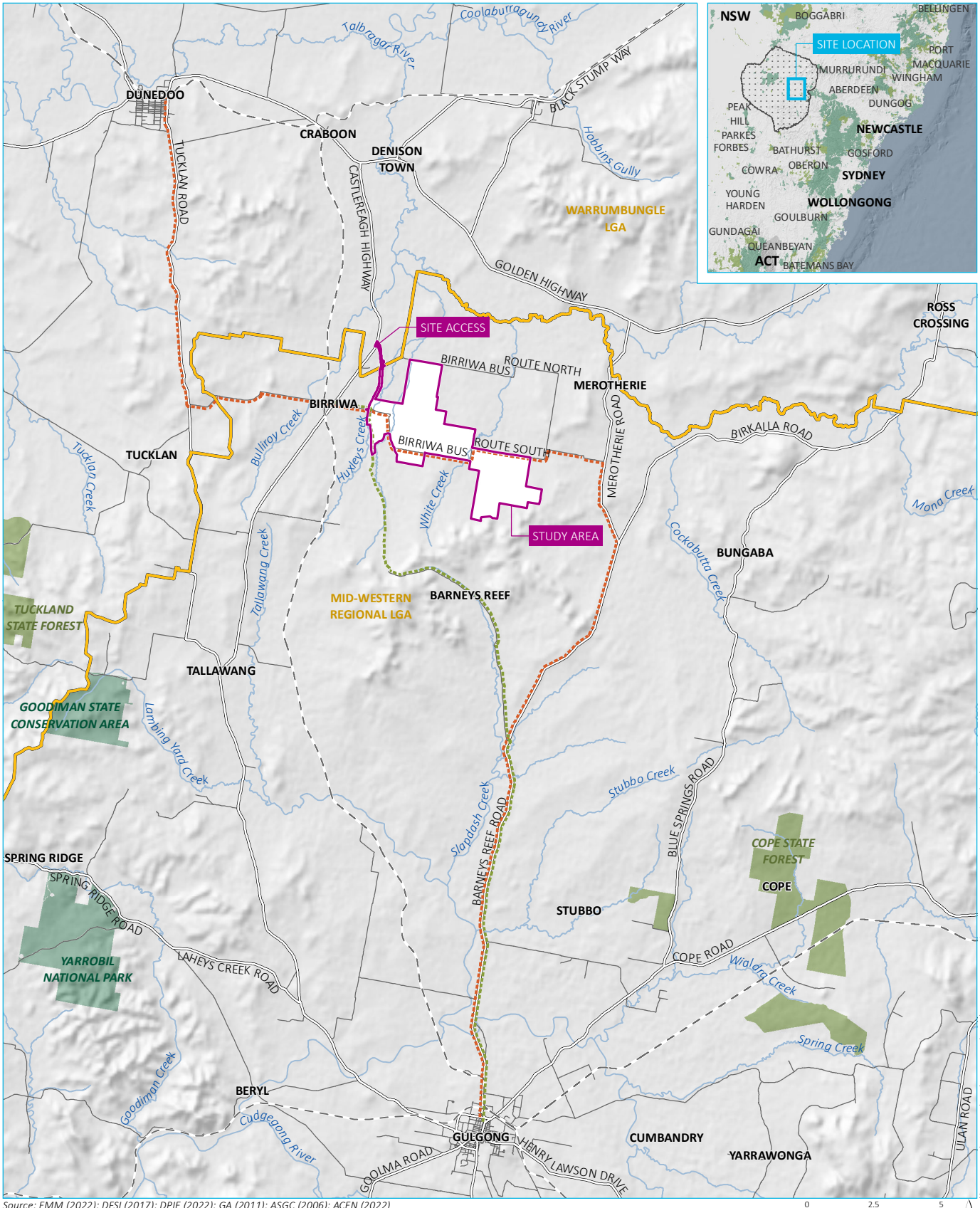
1.2 Site description

The project will be developed within a study area of approximately 1,300 hectares (ha) and is comprised of 18 freehold land parcels (Figure 1.2). The properties within the study area are currently primarily used for sheep and cattle grazing as well as low intensity dry land cropping.

The subject land is the land within the study area that will be used for the construction and operation of the project, which excludes certain areas of environmental value or social considerations (Figure 1.2). The subject land has been refined through an iterative design process throughout the preparation of the EIS and has been informed by the outcomes of community and stakeholder engagement and environmental, social and economic assessments.

The road upgrade corridor within the subject land is the area of direct impact for public road upgrade works along the access route, which comprises part of Barneys Reef Road and Birriwa Bus Route South (connecting the access point to the project with the Castlereagh Highway). It also includes three public road crossings along Birriwa Bus Route South, two of them being outside the road upgrade corridor. Public road crossings will allow construction and operation traffic to access different areas of the project with limited impacts on Birriwa Bus Route South.

The study area will be accessed via the Castlereagh Highway, Barneys Reef Road and Birriwa Bus Route (Figure 1.2). From the project access point, private internal roads will be used to traverse the subject land. The different areas of the subject land can be accessed via public road crossings located along Birriwa Bus Route South. A section of each of Barneys Reef Road and Birriwa Bus Route within the road upgrade corridor component of the subject land will require upgrade to provide safe access to the solar farm during construction of the project.



Source: EMM (2022); DFSI (2017); DPIE (2022); GA (2011); ASGC (2006); ACEN (2022)

0 2.5 5 km

GDA 1994 MGA Zone 55

N

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KEY

- Study area

Existing environment

- Rail line
- Major road
- Minor road
- Named watercourse
- Local government area
- Central West Orana Renewable Energy Zone (see inset)
- NPWS reserve
- State forest

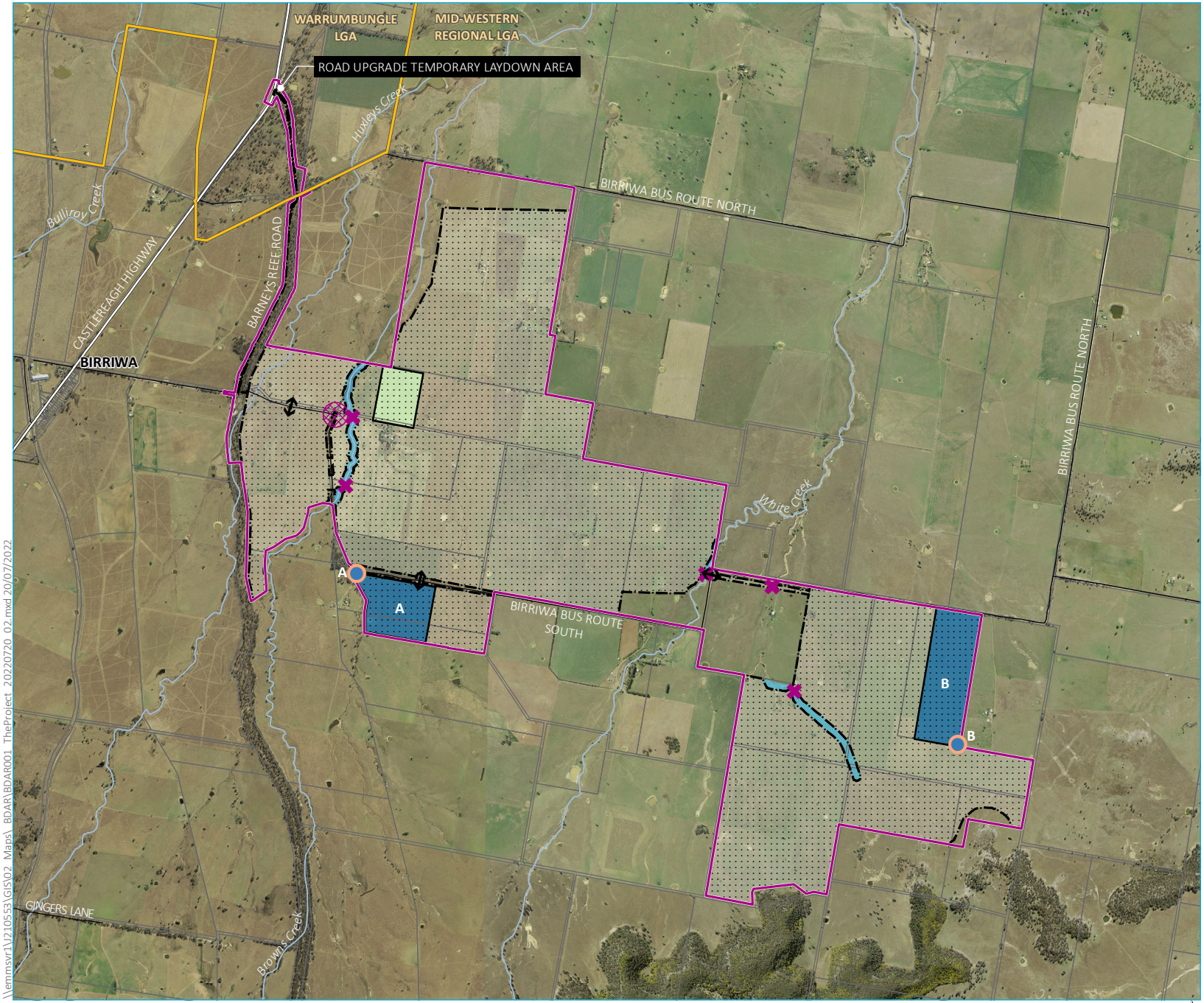
Central West Cycle (CWC) Trail

- CWC main route - Gulgong to Dunedoo
- CWC alternate route - Slap Dash Creek side trail

Regional context

Birriwa Solar and Battery Project
Biodiversity Development Assessment Report
Figure 1.1

EMM
creating opportunities



KEY

- Study area
- Subject land

Project layout

- Potential crossing point
- Potential public road crossing location
- Proposed access point to the project
- Connection point (option A or B)
- Proposed operational infrastructure area including substation, operational facility and BESS (option A or B)
- Temporary laydown area
- Restricted development area

Existing environment

- Major road
- Minor road
- Named watercourse
- Cadastral boundary
- Local government area boundary

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Source: EMM (2022); DFSI (2017, 2022); GA (2011); ACEN (2022)

0 1 2 km

GDA 1994 MGA Zone 55

N

The project

Birriwa Solar and Battery Project
Biodiversity Development Assessment Report
Figure 1.2

EMM
creating opportunities

1.3 Terms and definitions

Project elements referred to in this BDAR are described in Table 1.1.

Table 1.1 Project elements referred to in this BDAR

Project elements	Definition
Assessment area	1,500 m buffer of the subject land (site-based developments only).
Study area	Area that was surveyed for ecological values.
Subject land	Area subject to all proposed direct impacts in accordance with the 'subject land' described in the BAM (DPIE 2020). This equates to the 'impact footprint' described in the EIS and includes the final development footprint and construction footprint, which includes temporary laydown areas and ancillary structures. It also includes the road upgrade corridor. For the purposes of this BDAR, the calculations have been managed as a staged approach, with the subject land split as per staged development. These include the: • road upgrade corridor; and • the development footprint of the solar farm. Both of these stages encompass the subject land; however. these areas have been split to assess offset requirements for a staged development. The staged development is to allow for the access road to be developed first, to allow for construction access into the solar project.

1.4 Assessment requirements

ACEN submitted a request for Secretary's environmental assessment requirements (SEARs) to the Department of Planning and Environment (DPE) along with supporting documentation describing the project, stakeholder engagement, key matters to be addressed in the EIS and the proposed assessment methods. The SEARs were issued on 5 November 2021. The relevant requirements of the SEARs, and where they are addressed in this BDAR, are listed in Table 1.2.

Table 1.2 Secretary's Environmental Assessment Requirements

Requirement	Section addressed
Biodiversity An assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the *Biodiversity Conservation Act 2016* (NSW), the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR), unless BCS and DPIE determine the proposed development is not likely to have any significant impacts on biodiversity values.	All sections of this BDAR.
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.	Section 6
An assessment of the likely impacts on listed aquatic threatened species, populations or ecological communities, scheduled under the *Fisheries Management Act 1994*, and a description of the measures to minimise and rehabilitate impacts.	Sections 3.1.2 and 7.2
If an offset is required, details of the measures proposed to address the offset obligation.	Sections 6.6 and 6.7

1.5 Purpose of this report

The specific objectives of this assessment are to:

- describe biodiversity values of the subject land;
- assess the likelihood that threatened species and communities (threatened biodiversity) listed under relevant the NSW *Biodiversity Conservation Act 2016* (BC Act), Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the NSW *Fisheries Management Act 1994* (FM Act) could occur in the subject land;
- document the strategies implemented to avoid and/or minimise impacts of the project on threatened biodiversity;
- assess residual threatened biodiversity impacts, after avoidance and minimisation strategies have been implemented; and
- provide environmental safeguards to mitigate threatened biodiversity impacts during construction and operation.

1.6 Information sources

1.6.1 Publications and databases

To provide context for the project, information about flora and fauna species, populations, communities and habitats from the locality (generally within 20 km) was obtained from the following databases:

- BioNet Atlas of NSW Wildlife for previous threatened species records (BCS 2021a);
- Commonwealth Department of Agriculture, Water and the Environment (DAWE) (now the Department of Climate Change, Energy, the Environment and Water, DCCEEW) Protected Matters Search Tool (PMST) (DAWE 2022d) for Matters of National Environmental Significance (MNES) likely to occur within the subject lands; and
- the NSW Plant Community Types (PCTs), as held within the BioNet Vegetation Classification database.

1.6.2 Spatial data

Spatial data encompassing the subject land, was obtained from ACEN. Base map data was obtained from Department of Finance, Services and Innovation (DFSI) NSW databases, with cadastral data obtained from DFSI digital cadastral database. Mapping for stream orders was obtained from NSW Department of Primary Industries (DPI).

The following spatial datasets were utilised during the development of this report:

- *State Vegetation Type Map: Central West/Lachlan Region version 1.4. VIS_ID 4468* (DPIE 2015);
- *Mitchell Landscapes Version V3.1* (OEH 2017);
- *Interim Biogeographic Regionalisation of Australia (IBRA) Version 7* (DoEE 2018);
- Strahler Stream Order (DPI 2015);
- Freshwater threatened species distribution maps (DPI 2021a);
- Key fish habitat map – Murray Darling Basin North (DPI 2021b);
- Fisheries NSW Spatial Data Portal (DPI 2022a);
- Fish stocking (DPI 2022b);
- Local Government Area (DFSI 2017);
- Road Segment (DFSI 2017);
- NPWS Reserve (DFSI 2017);
- State Forest (DFSI 2017); and
- BAM – Important Areas viewer maps (BCS 2022b).

Mapping undertaken during the site assessment was conducted using a hand-held Global Positioning System (GPS) unit, mobile tablet computers running Collector for ArcGIS™ and Survey123 for ArcGIS™ and aerial photo interpretation. Accuracy is subject to accuracy of GPS devices, generally ± 5 m. Mapping has been produced using a Geographic Information System (GIS; ArcGIS 10.5).

Spatial data relevant to this BDAR was provided to the DPE following lodgement of the BDAR.

1.7 Declarations

1.7.1 Certification under clause 6.15 Biodiversity Conservation Act 2016

I certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method (DPIE 2020) and Clause 6.15 of the BC Act.

1.7.2 Conflict of interest

As per the Accredited BAM Assessor Code of Conduct, BAM Accredited Assessors must not act in circumstances where there is actual, perceived, or potential conflict of interest. I declare that I have considered the circumstances and there is no actual, perceived, or potential conflict of interest. This declaration has been made in the interests of full disclosure to the decision-maker. Full disclosure has also been provided to the client.

Signature: 

Date: 12 September 2022

BAM Assessor Accreditation no: BAAS18135

1.7.3 Contributors

The qualifications and experience of the personnel involved in the preparation of this BDAR are listed within Table 1.3.

Table 1.3 Personnel involved in preparing this BDAR

Name	Qualifications	Experience	Tasks performed
Cecilia Phu	BScience (Hons) Accredited BAM assessor: BAAS17058	15 years	• Technical advice
Erin Lowe	BScience (Sustainable Resource Management) BNatHistIllus Accredited BAM assessor: BAAS18135	12 years	• Report review • BAMC review
Eugene Dodd	BScience (Hons) Master Research (Ecology and Environmental Management) Accredited BAM assessor: BAAS17009	12 years	• Candidate species habitat assessment • Vegetation mapping • BAM plot surveys • Targeted threatened flora surveys • Targeted threatened fauna species
Bianca Seal	BScience PGDipGIS	4 years	• BAM plot surveys • Vegetation mapping • Report preparation
Erica-Danae Johnstone	BScience (Zoology)	8 years	• Targeted flora and fauna surveys • Report preparation
Peter Tolley	BEnvScience MGIS	4 years	• Report figures • GIS support

2 Legislative context

This chapter provides a brief outline of the key biodiversity legislation and government policy considered in this assessment.

2.1 Commonwealth

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, heritage places and water resources which are defined as Matters of National Environmental Significance (MNES) under the EPBC Act. These are:

- world heritage properties;
- places listed on the National Heritage Register;
- Ramsar wetlands of international significance;
- threatened flora and fauna species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park;
- nuclear actions (including uranium mining); and
- water resources, in relation to coal seam gas or large coal mining development.

Under the EPBC Act, an action that may have a significant impact on a MNES is deemed to be a 'controlled action' and can only proceed with the approval of the Commonwealth Minister for the Environment. An action that may potentially have a significant impact on a MNES is to be referred to DCCEEW for determination as to whether it is a controlled action. If deemed a controlled action the project is assessed under the EPBC Act, and a decision made as to whether or not to grant approval.

Consultation, in the form of a pre-referral meeting, was undertaken with DCCEEW on 2 June 2022, to advise DCCEEW of the intention to refer the project. AECN provided DCEEW with a summary of proposed impacts, and measure taken to avoid significant impacts upon MNES.

The project will be referred to the Commonwealth Minister for the Environment and Water post submission of this BDAR.

An assessment of the project against the EPBC Act is provided in Section 7.1.

2.2 State

2.2.1 Environmental Planning and Assessment Act 1979

The NSW EP&A Act was enacted to encourage the consideration and management of impacts of proposed development or land-use changes on the environment and the community. The EP&A Act is administered by the NSW Department of Planning and Environment (DPE).

The EP&A Act provides the overarching structure for planning in NSW; however, is supported by other statutory environmental planning instruments (EPIs) including State Environmental Planning Policies (SEPPs). EPIs relevant to the natural environment are outlined further below.

i State Environmental Planning Policy (Biodiversity and Conservation) 2021

The *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (Biodiversity and Conservation SEPP) was ratified on the 1 March 2022 and consolidates, transfers and repeals provisions of numerous SEPPs, which includes the former *State Environmental Planning Policy (Koala Habitat Protection) 2020* (Koala SEPP 2020) and *State Environmental Planning Policy (Koala Habitat Protection) 2021* (Koala SEPP 2021). No policy changes have been made to the Koala SEPPs.

The former Koala SEPP 2020 and 2021 together aimed to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline. In nine metropolitan Sydney local government areas (Blue Mountains, Campbelltown, Hawkesbury, Ku-Ring-Gai, Liverpool, Northern Beaches, Hornsby, Wollondilly) and the Central Coast LGA Koala SEPP 2021 applies to all land use zones. Outside of these areas Koala SEPP 2020 continues to apply to all land zoned RU1, RU2, and RU3.

As SSD, the project does not require approval from Council, and thus consideration of the provisions of former Koala SEPP 2020 and Koala SEPP 2021 are not triggered. Nonetheless, consideration has been given to the potential occurrence and impacts upon the Koala (*Phascolarctos cinereus*) within this report, as required by the BC Act and EPBC Act.

2.3 Biodiversity Conservation Act 2016

The NSW BC Act is the legislation responsible for the conservation of biodiversity in NSW through the protection of threatened flora and fauna species, populations and ecological communities. The BC Act, together with the Biodiversity Conservation Regulation 2017 (BC Regulation), established the Biodiversity Offsets Scheme (BOS).

The BOS includes establishment of the Biodiversity Assessment Method (the BAM, DPIE 2020) for use by accredited persons in biodiversity assessment under the scheme. The purpose of the BAM (DPIE 2020) is to assess the impact of actions on threatened species and threatened ecological communities, and their habitats and determine offset requirements. For major projects, use of the BAM (DPIE 2020) is mandatory, unless a BDAR waiver is granted.

The BAM (DPIE 2020) sets out the requirements for a repeatable and transparent assessment of terrestrial biodiversity values on land to:

- identify the biodiversity values on land subject to a proposed development;
- determine the impacts of a proposed development, following all measures to avoid, minimise and mitigate impacts; and
- quantify and describe the biodiversity credits required to offset the residual impacts of proposed development on biodiversity values.

This BDAR has been undertaken in accordance with the requirements of the BAM (DPIE 2020).

2.4 Fisheries Management Act 1994

The NSW FM Act contains provisions for the conservation of fish stocks, key fish habitat, biodiversity, threatened species, populations and ecological communities. It regulates the conservation of fish, vegetation and some aquatic macroinvertebrates and the development and sharing of the fishery resources of NSW for present and future generations. The FM Act lists threatened species, populations and ecological communities, key threatening processes (KTPs) and declared critical habitat. Assessment guidelines to determine whether a significant impact is expected are detailed in section 220ZZ and 220ZZA of the FM Act.

Another objective of the FM Act is to conserve key fish habitat (KFH). These are defined as aquatic habitats that are important to the sustainability of recreational and commercial fishing industries, the maintenance of fish populations generally and the survival and recovery of threatened aquatic species. KFH is defined in Section 3.2.1 and 3.2.2 of the *Policy and Guidelines for Fish Conservation and Management* (DPI 2013).

The impact of the project on threatened aquatic species, populations, communities, habitats and KFH have been assessed in Sections 3.1.2, 6 and 7.2.

2.5 Biosecurity Act 2015

The primary objective of the NSW *Biosecurity Act 2015* (Biosecurity Act) is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

The Biosecurity Act stipulates management arrangements for weed biosecurity risks in NSW, with the aim to prevent, eliminate and minimise risks. Management arrangements include:

- any land managers and users of land have a responsibility for managing weed biosecurity risks that they know about or could reasonably be expected to know about;
- applies to all land within NSW and all waters within the limits of the State; and
- local strategic weed management plans will provide guidance on the outcomes expected to discharge duty for the weeds in that plan.

NSW WeedWise (DPI 2022c) identifies relevant weed species by region. The relevant region for the project is the Central Tablelands. 104 priority weed species are listed for the Central Tablelands region (DPI 2022c).

The *Central Tablelands Regional Strategic Weed Management Plan 2017 – 2022* (LLS 2017) supports regional implementation of the Biosecurity Act by articulating community expectations in relation to effective weed management and facilitating a coordinated approach to weed management in the region. The plan identifies weed management in the region, weed risk assessment and prioritisation, actions, details regarding how to apply the actions, and measures proposed to increase the chance of success and for continuous improvement. Appendix 1 of the plan provides a list of priority weeds for the Central West LLS region and Appendix 2 identifies other weeds of regional concern. Should any of these species be recorded on the subject land the management actions provided in the plan will need to be implemented.

The provisions of the Biosecurity Act are discussed further in Section 7.3.

2.6 Water Management Act 2000

Division 6 of the NSW *Water Management Act 2000* (WM Act) requires consideration of controlled activities on waterfront land (ie activities within 40 m of top of bank) and aquifer interference activities. The NSW Aquifer Interference Policy (DPI 2012) also requires an assessment of potential impacts on groundwater users, including groundwater dependent ecosystems.

The project will be constructed within 40 m of waterfront land; however, a water use approval under Section 89, a water management work approval under Section 90 or an activity approval (other than an aquifer interference approval) under Section 91 of the WM Act will not be required pursuant to Section 4.41 of the EP&A Act. Section 91 of the WM Act states that a controlled activity approval confers a right on its holder to carry out a specified controlled activity at a specified location in, on or under waterfront land. Under Section 4.41 of the EP&A Act states that SSD does not require a controlled activity approval. The WM Act is further discussed in Section 4.4 of the EIS.

Groundwater will not be intercepted for the project and therefore it does not represent an aquifer interference activity.

Stage 1 – Biodiversity assessment

3 Landscape features

3.1 Landscape features

The landscape features described in the following sections are shown on Figure 3.1 and Figure 3.2.

3.1.1 Bioregions and landscapes

The subject land is within the NSW South Western Slopes Interim Biogeographic Regionalisation for Australia (IBRA) bioregion and the Inland Slopes IBRA subregion. The Talbragar – Upper Macquarie Terrace Sands and Gravels NSW (Mitchell) Landscape dominates the assessment area with Cope Hill Granite mapped in the southern half of the assessment area. Smaller occurrences of additional NSW (Mitchell) Landscapes within the assessment area include:

- Gulgong Ranges;
- Liverpool Range Valleys and Footslopes; and
- Goonoo Slopes.

As the majority of the subject land and assessment area is located in the Talbragar – Upper Macquarie Terrace Sands and Gravels NSW (Mitchell) Landscape, this was the landscape used in this assessment.

3.1.2 Rivers, streams, estuaries and wetlands

The subject land is located within the Macquarie-Bogan catchment. The Macquarie-Bogan catchment covers 74,800 square kilometres of central-west NSW (DPIE n.d). The catchment originates from the Great Dividing Range to the east and flows north-westerly until it joins the Barwon River.

A number of named creeks occur within the subject land, in addition to multiple unnamed first and second order streams. The named creeks include (Figure 3.2):

- Huxleys Creek;
- Browns Creek; and
- White Creek.

These creeks flow in a northerly direction into Talbragar River, approximately 2.4 km from the subject land.

In total, the subject land and assessment area contain:

- 55 first-order water courses;
- 17 second-order water courses;
- 10 third-order water courses; and
- four fourth-order water courses.

The waterways within the subject land and assessment area largely lack wooded riparian vegetation which may support aquatic and terrestrial species, however there are some riparian remnants which occur downstream immediately outside of the subject land which provide canopy cover and shading for the creek lines (Photograph 3.1). These creeks have a sandy substrate, which is common to all waterways within the subject land and is characteristic of a highly erodible landform. Browns Creek and White Creek have highly eroded gullies as a result, which lack bank vegetation (Photograph 3.2).

The aquatic habitat within these creeks occurs as slow-flowing creeks with no rocky habitat or substrate to provide refuge for aquatic species. Intermittent pools do occur within these creeks, which provide aquatic vegetation in the form of sedges, rushes and a limited diversity of macrophytes (Photograph 3.3). Whilst the creeks provide limited aquatic habitat to aquatic species, these creek lines have been highly altered and degraded and are disconnected by man-made culverts and roads (Photograph 3.4). One of these culverts provides rocky habitat and snags within Browns Creek, however this waterway shows evidence of livestock runoff and pollution as a result of current livestock practices (Photograph 3.5). Cows were observed within Browns Creek during surveys.

The subject land also has a large number of online dams primarily providing water for livestock. These dams lack riparian vegetation and have high turbidity and sediment load due to stock access.

Browns Creek and White Creek are mapped as KFH (DPI 2021b). These creeks, in addition to Huxleys Creek, are also mapped within the freshwater threatened species distribution for the Purple-Spotted Gudgeon (*Mogurnda adspersa*) (DPI 2021a). Talbragar River is also mapped within the freshwater threatened species distribution of the Eel-tailed Catfish (*Tandanus tandanus*).

No nationally important or RAMSAR wetlands have been mapped within the subject land or are located within the locality.

Photograph 3.1 Browns Creek immediately north of the subject land

Photograph 3.2 **Unnamed tributary which flows into White Creek**

Photograph 3.3 **Aquatic habitat associated with White Creek**

Photograph 3.4 Large culverts underneath the tributary connected to White Creek

Photograph 3.5 Culvert associated with Brown Creek underneath road crossing

3.1.3 Connectivity

The locality of the subject land is considered highly fragmented with native vegetation often occurring in isolated patches surrounded by a matrix of agricultural land. A vegetated road corridor provides connectivity along the western extent of the subject land. This allows for connectivity of vegetation to the south of the subject land, primarily associated with intact native vegetation located on the higher slopes and ridgelines to the south.

Several waterways occur within the subject land (see above). These waterways lack the wooded riparian vegetation which is likely to provide connectivity to terrestrial species within the landscape.

3.1.4 Areas of geological significance

Areas of geological significance include karsts, caves, crevices, cliffs, rocks and other geological features of significance as outlined in Section 3.1.3 of the BAM (DPIE 2020). A ridgeline occurs within the assessment area which is likely to have areas of geological significance such as crevices and geological habitat. This ridge line is associated with the higher slopes to the south of the subject land.

3.1.5 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value, as declared by the NSW Minister for Energy and Environment, within the subject land or assessment area.

3.2 Native vegetation cover

Native vegetation cover on the has been assessed in accordance with Section 3.2 of the BAM (DPIE 2020) and is outlined within the following section.

3.2.1 Native vegetation extent

Vegetation mapping across the subject land and locality (DPIE 2015) identifies a small number of vegetation communities. To calculate native vegetation cover, these vegetation types were classified as native or non-native (Table 3.1) The native vegetation extent was then assessed against aerial imagery to adjust for inconsistencies between the regional vegetation mapping and aerial imagery. Areas such as cropped farmland were excluded, whilst treed waterways and planted vegetation screens were included. The area of native vegetation within the assessment area and the percent native vegetation was then calculated, consistent with the requirements of the BAM (DPIE 2020). The extent of native vegetation cover based on this data source is shown in Figure 3.1.

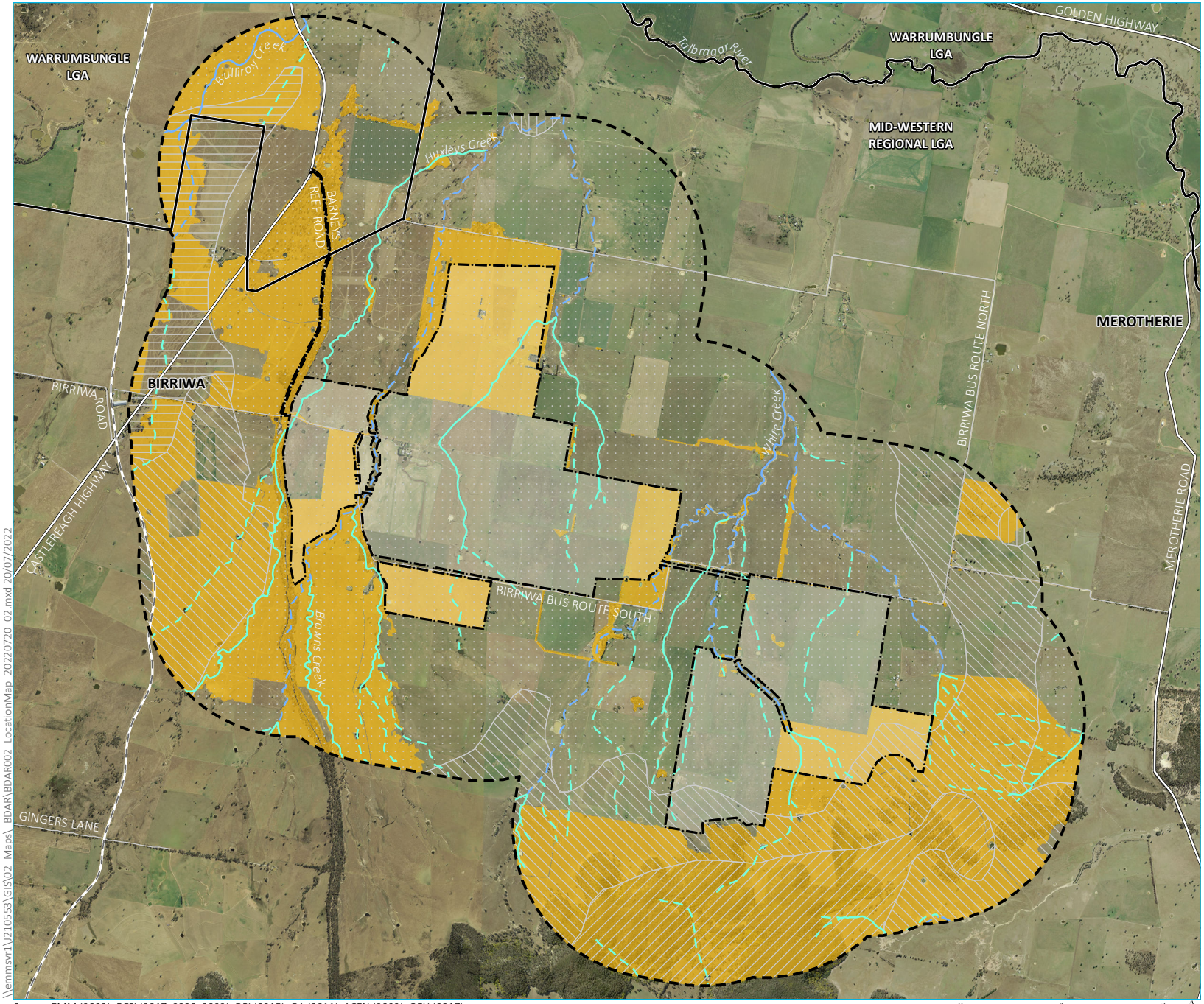
Table 3.1 Native vegetation assessment

PCT (DPIE 2015)	Classification
76 – Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Native
81 – Western Grey Box – cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion	Native
272 – White Box – Black Cypress Pine – red gum +/- Mugga Ironbark shrubby woodland in hills of the NSW central western slopes	Native
281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Native
330 – Mugga Ironbark – Black Cypress Pine – Red Stringybark – Blakelys Red Gum – Red Ironbark woodland on hillslopes and in valleys on ranges in the NSW central western slopes	Native
437 – Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	Native
440 – Red Stringybark – Narrow-leaved Ironbark – Black Cypress Pine – hill red gum sandstone woodland of southern NSW Brigalow Belt South Bioregion	Native
461 – Tumbledown Gum woodland on hills in the northern NSW South Western Slopes Bioregion and southern Brigalow Belt South Bioregion	Native
467 – Blue-leaved Ironbark – Black Cypress Pine shrubby sandstone open forest in the southern Brigalow Belt South Bioregion (including Goonoo)	Native
468 – Narrow-leaved Ironbark – Black Cypress Pine +/- Blakelys Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo)	Native
477 – Inland Scribbly Gum – Red Stringybark – Black Cypress Pine – Red Ironbark open forest on sandstone hills in the southern Brigalow Belt South Bioregion and northern NSW South Western Slopes Bioregion	Native
478 – Red Ironbark – Black Cypress Pine – stringybark +/- Narrow-leaved Wattle shrubby open forest on sandstone in the Gulgong – Mendooran region, southern Brigalow Belt South Bioregion	Native
479 – Narrow-leaved Ironbark – Black Cypress Pine – stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion	Native
511 – Queensland Bluegrass – Redleg Grass – Rats Tail Grass – spear grass – panic grass derived grassland of the Nandewar Bioregion and Brigalow Belt South Bioregion	Native
599 – Blakelys Red Gum – Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion	Native
796 – Derived grassland of the NSW South Western Slopes	Native
Not native	Not native

Vegetation proximal to the subject land is highly fragmented, with native vegetation often occurring in isolated patches surrounded by a matrix of agricultural land (Figure 3.2). A large extent of native woodland occurs south of the assessment area associated with the higher slopes and ranges (Figure 3.1). Native vegetation cover for the assessment area is provided in Table 3.2.

Table 3.2 Percentage native vegetation cover

IBRA subregion	Native vegetation in assessment area (ha)	Assessment area (ha)	Approximate percentage of native vegetation in assessment area (%)	Cover class (%)
Inland Slopes	2,323.65	5,705.12	41	30–70



KEY

- Assessment area
- Subject land

Existing environment

- Rail line
- Major road
- Minor road
- Local government area boundary
- Native vegetation cover

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order

Mitchell landscape (v3.1)

- Cope Hills Granite
- Goonoo Slopes
- Gulgong Ranges
- Liverpool Range Valleys and Footslopes
- Talbragar - Upper Macquarie Terrace Sands and Gravels

Note: entire view extent is within the:
- NSW South Western Slopes IBRA7 region
- Inland Slopes IBRA7 subregion

Source: EMM (2022); DFSI (2017, 2020, 2022); DPI (2015); GA (2011); ACEN (2022); OEH (2017)

0 1 2 km

GDA 1994 MGA Zone 55

N

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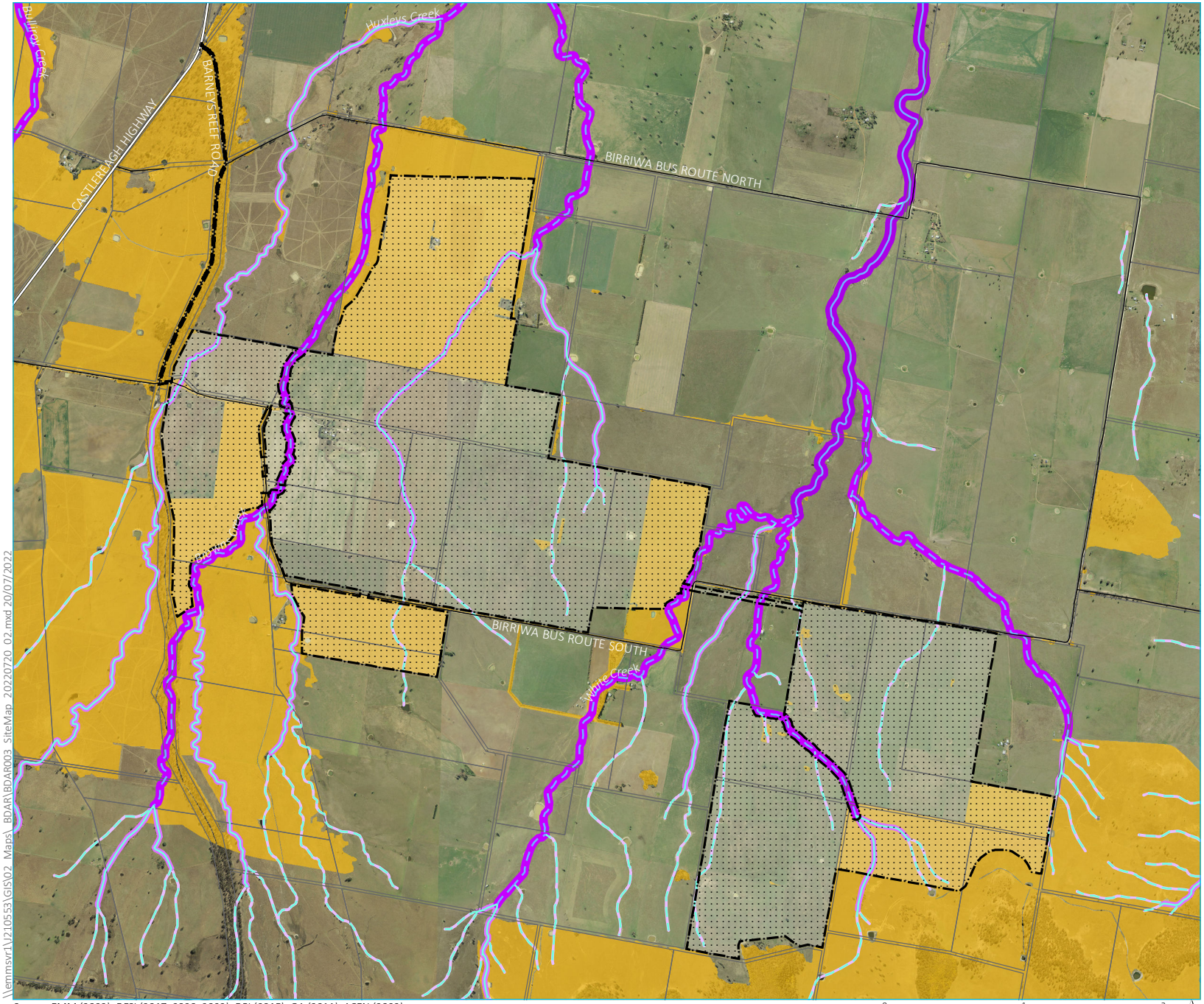
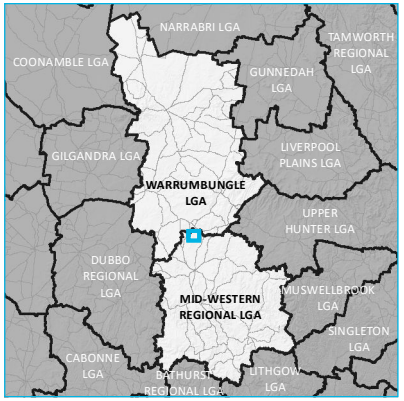
Location map

Birriwa Solar and Battery Project
Biodiversity Development Assessment Report
Figure 3.1

EMM
creating opportunities





KEY

- Subject land

Existing environment

- Major road
- Minor road
- Cadastral boundary
- Native vegetation cover

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order

Riparian buffer

- 10 m
- 20 m
- 30 m
- 40 m

\\emmsvr1\J210553\GIS\02 Maps\ BDAR\BDAR003 SiteMap 20220720 02.mxd 20/07/2022

Source: EMM (2022); DFSI (2017, 2020, 2022); DPI (2015); GA (2011); ACEN (2022)

0 1 2 km

GDA 1994 MGA Zone 55

N

Site map

Birriwa Solar and Battery Project
Biodiversity Development Assessment Report
Figure 3.2

EMM
creating opportunities

4 Native vegetation

The assessment of native vegetation within the subject land was determined using Section 4 of the BAM (DPIE 2020), as summarised within this chapter.

4.1 Background review

Review of the State Vegetation Type Mapping (SVTM), Central West/Lachlan Region (DPIE 2015) indicates that most of the subject land is listed as non-native and considered cleared. This is supported by recent and historical aerial imagery with widespread evidence of agriculture including plough lines, farm dams and cropping. The SVTM also indicates that there are small patches of native vegetation, with seven Plant Community Types (PCTs) mapped (Table 4.1).

Table 4.1 Plant Community Types and Threatened Ecological Communities mapped within the study area (STVM)

Plant Community Type	BC Act	EPBC Act
81 – Western Grey Box – cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion	Grey Box woodland and grassland [1.]	Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia Endangered Ecological Community (EEC) (Grey Box woodland and grassland)
281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Box Gum Woodland and derived native grassland[2.]	Box Gum Woodland and derived native grassland[3.]
330 – Mugga Ironbark – Black Cypress Pine – Red Stringybark – Blakely's Red Gum - Red Ironbark woodland on hillslopes and in valleys on ranges in the NSW central western slopes	-	-
437 – Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion	Box Gum Woodland and derived native grassland[2.]	Box Gum Woodland and derived native grassland[3.]
468 – Narrow-leaved Ironbark – Black Cypress Pine/Blakely's Red Gum shrubby open forest on sandstone low hills in the southern Brigalow Belt South Bioregion (including Goonoo)	-	-
511 – Queensland Bluegrass – Redleg Grass – Rats Tail Grass – spear grass – panic grass derived grassland of the Nandewar Bioregion and Brigalow Belt South Bioregion	Box Gum Woodland and derived native grassland[2.]	Box Gum Woodland and derived native grassland[3.]
796 – Derived grassland of the NSW South Western Slopes	Box Gum Woodland and derived native grassland[2.]	Box Gum Woodland and derived native grassland[3.]

1. Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (BC Act – Endangered Ecological Community).
2. 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 (BC Act – Critically Endangered Ecological Community).
3. White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (EPBC Act – Critically Endangered Ecological Community).

As shown in Table 4.1, five of the regionally mapped PCTs are aligned with two different BC Act listed Threatened Ecological Communities (TECs):

- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (Endangered) (referred to as Grey Box woodland and grassland); and
- 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 (Critically Endangered) (referred to as Box Gum Woodland and derived native grassland).

In addition, the Box Gum Woodland and derived native grassland is a candidate entity for Serious and Irreversible Impacts (SAII) under the BAM (DPIE 2020).

As shown in Table 4.1, both BC Act listed TECs are also listed under the EPBC Act, albeit with different names:

- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia endangered ecological community (Endangered); and
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community (Critically Endangered).

The EPBC Act also listings have different determinations, with specific condition requirements for woodland and derived native grassland (DNG) to meet the EPBC Act listings. In contrast, the BC Act listings have few condition requirements.

4.2 Methods

The following sections outline the methods employed to map vegetation, and to assess the vegetation integrity of native vegetation within the subject land in accordance with Section 4.3 of the BAM (DPIE 2020).

4.2.1 Detailed vegetation mapping and habitat assessment

An assessment of the subject land was undertaken on 17–20 August 2021. This assessment included detailed vegetation mapping and habitat assessments. The study area was traversed in a vehicle and on foot, with vegetation mapped and aligned with NSW PCTs. PCTs were stratified into vegetation zones based on broad condition state using the definitions in Table 4.2.

Table 4.2 Definitions used in delineation of vegetation zones

Condition class	Description
High	Largely intact with all strata present and minimal disturbance.
Medium	Tree stratum and mid stratum present, with various levels of native and exotic understorey growth.
Poor	Tree stratum present, but mid stratum primarily absent. Understorey vegetation degraded due to weeds or other major disturbance such as regular maintenance or grazing.
Pasture	Tree stratum and mid stratum missing. Grassland areas with various levels of improvement and seeding. Native vegetation is restricted to low diversity grasslands with high native cover.
Derived Native Grassland (DNG)	Tree stratum and mid stratum missing. Grassland areas with various levels of improvement and seeding. Grassland is considered to conform to an EPBC Act listing.
Planted	Treed vegetation which occurs in patches and appears to be planted based on the uniform age, spacing and landscaped shape of the canopy species.

Where there was some uncertainty about correct PCT alignment, or to justify PCT alignment, a series of rapid vegetation assessments (RVAs) were undertaken, with the three dominant species in the overstorey, midstorey and groundcover recorded. Vegetation was mapped in the field using GPS-enabled tablet computers using Collector for ArcGIS™.

4.2.2 Vegetation integrity assessment

Following the stratification of vegetation zones within the subject land, native vegetation integrity was assessed using data obtained via a series of plots, as per the methodology outlined in Section 4.2.1, 4.3.3 and 4.3.4 of the BAM (DPIE 2020). Plot data was collected from the subject land on 26–28 October 2021, 14–17 December 2021, 11–14 January 2022 and 11–14 April 2022. At each plot location the following was undertaken:

- one 20 x 20 m plot, for assessment of composition and structure; and
- one 20 x 50 m plot, for assessment of function, including a series of five 1 x 1 m plots to assess average leaf litter cover.

The assessment of composition and structure, based on a 20 x 20 m plot, recorded species name, stratum, growth form, cover and abundance rating for each species present within the plot. Cover (foliage cover) was estimated for all species rooted in or overhanging the plot, and recorded using decimals (if less than 1%, rounded to whole number (1%–5%) or estimated to the nearest 5% (5%–100%). Abundance was counted (up to 20) and estimated above 20, and recorded using the following intervals: 1, 2, 3, 4, 5, 10, 20, 50, 100, 500, 1,000, 1,500, 2,000, etc.

The assessment of function recorded the number of large trees, the presence of tree stem size class, tree regeneration, number of trees with hollows and length of fallen logs, as well as leaf litter cover within the 20 x 50 m plot and five 1 x 1 m subplots. The minimum number of plots and transects per vegetation zone was determined using Table 3 of the BAM (DPIE 2020). A total of 26 plots were undertaken within the study area.

The plot surveys were conducted prior to the final design of the project. For this reason, some plots are located outside of the subject land but are still situated within proximity of the subject land. Despite falling outside of the final design of the subject land, these are representative and occur in contiguous vegetation zones and have been used to inform the stratification of management zones within the subject land (Table 4.2).

Datasheets are provided in Appendix 1 while compiled plot data is provided in Appendix 2.

4.3 Results

4.3.1 Vegetation description and high threat weeds

The subject land reflects regional vegetation mapping (DPIE, 2015) with areas of exotic vegetation and native pasture dominating the subject land. All vegetation within the subject land has been impacted by past land use, particularly with ongoing grazing, with the grasslands supporting little native species cover and a lack of species diversity. Remnant vegetation is restricted to small patches and isolated paddock trees consisting primarily of Grey Box (*Eucalyptus microcarpa*), Blakely's Red Gum (*Eucalyptus blakelyi*) and Yellow Box (*Eucalyptus melliodora*). The road upgrade corridor occurs along a highly vegetated road corridor which also include these species. Whilst the remnant patches and paddock trees generally lack any native mid-stratum and contain a disturbed native understorey, the vegetated road corridor contains intact shrub and understorey strata due to less disturbance when compared to the remnant patches and paddocks. The road corridor has been classed as a high condition vegetation zone for this reason.

A total of 226 species (132 native and 94 exotic) were recorded within the study area. Most of these species were native and exotic groundcovers, with a small number of native shrub species present and a total of seven tree species. Of the 94 exotic species, 12 are high threat weeds and primarily include herbaceous groundcover and grasses (Appendix 1).

4.3.2 Plant community types and vegetation zones

The vegetation within the subject land has been classified as two PCTs (Table 4.3).

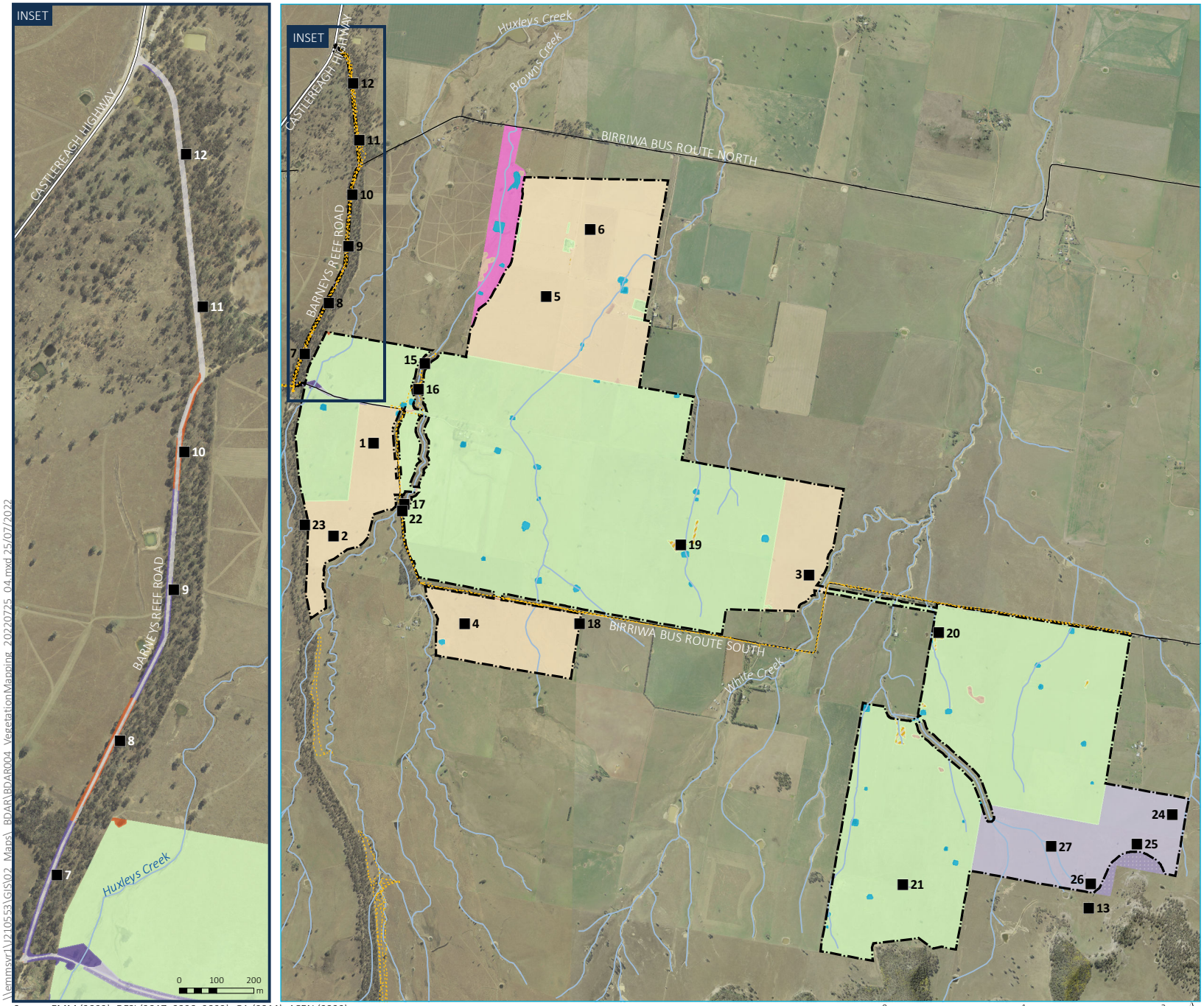
Table 4.3 Vegetation within the subject land

Vegetation type	Vegetation class	Vegetation formation	Percent cleared	Area (ha)
PCT 80 – Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Floodplain Transition Woodlands	Grassy Woodlands	83	76.80
PCT 281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Western Slopes Grassy Woodlands	Grassy Woodlands	67	291.91
Exotic grassland	-	-	-	776.66
Exotic trees	-	-	-	4.73
Dam	-	-	-	5.02
Cleared	-	-	-	4.08
Total area in hectares (to 2 decimal place)				**1,159.19**

Each PCT recorded within the subject land is represented by multiple vegetation zones. Details for each vegetation zone are summarised in Table 4.4. Descriptions of the PCTs are presented in Table 4.5 and Table 4.6.

Table 4.4 Vegetation zones identified within the subject land along with broad condition state as identified by EMM

Vegetation zone	PCT ID	PCT name	Condition	Extent in subject land (ha)	Vegetation integrity score
1	80	Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	High	1.01	95.3
2			Pasture	75.62	4.8
3			Poor	0.17	41.1
4	281	Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	High	0.35	99.2
5			Medium	0.55	59.3
6			Pasture	284.46	2.7
7			Planted	2.59	55.5
8			Poor	3.95	39.5
Total area in hectares (to 2 decimal place)				**368.70**	**-**



KEY

- Subject land
- Plot location
- Threatened species transect

Existing environment

- Major road
- Minor road
- Watercourse/drainage line
- Cleared
- Dam
- Exotic (trees, grassland)

Plant community type

PCT 80 | Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

- High
- Poor
- Derived native grassland (DNG)
- Pasture

PCT 281 | Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

- High
- Medium
- Poor
- Pasture
- Planted
- Tussock

Threatened ecological communities:

- **PCT 281**: 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 (Critically Endangered) (BC Act and EPBC Act)
- **PCT 80**: Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (Endangered) (BC Act)
- **PCT 80 (High; DNG)**: Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (Endangered) (EPBC Act)

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Source: EMM (2022); DFSI (2017, 2020, 2022); GA (2011); ACEN (2022)

Plant community types in the subject land and plot/transect locations

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Figure 4.1

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Table 4.5 PCT 80 - Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

Attribute	Description
PCT ID	80
Common name	Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
Vegetation class	Floodplain Transition Woodlands
Extent within subject land	76.80 hectares (ha), comprising: • High: 1.01 ha • Pasture: 75.26 ha • Poor: 0.17 ha
Survey effort	Plots. 12, 7, 9, 13, 24, 25, 26, 27 and 21
Description and condition	This PCT was identified within the road upgrade corridor in addition to small patches in paddocks and large grasslands to the east of the subject land. The PCT comprises mature Western Grey Box (*Eucalyptus microcarpa*) individuals, which are also likely to have historically occurred within the grassland patches. A number of shrub species occur within this PCT and primarily include *Acacia* spp. in addition to Cough Bush (*Cassinia laevis*), Small-leaf Bluebush (*Maireana microphylla*) and *Solanum chenopodinum* and Narrawa Burr *(Solanum cinereum)*. The groundcover shows signs of disturbance due to current grazing and a moderate exotic species cover. Despite the weed encroachment in vegetation zones, a number of native forbs and grasses persist. These include Hairy Joyweed (*Alternanthera nana*), Yellow Burr Daisy (*Calotis lappulacea*), Swamp Dock (*Rumex brownii*), Slender Rat's Tail Grass (*Sporobolus creber*) and Red Grass (*Bothriochloa decipiens*). Exotic species do occur within the groundcover, including St. Johns Wort (*Hypericum perforatum*), Paspalum (*Paspalum dilatatum*), Bathurst Burr (*Xanthium spinosum*), Saffron Thistle (*Carthamus lanatus*) and Khaki Weed (*Alternanthera pungens*) which are high threat weeds (HTWs). Other common exotic herbaceous species include Flaxleaf Fleabane (*Conyza bonariensis*), Purpletop (*Verbena bonariensis*) and Common Sowthistle (*Sonchus oleraceus*).

Table 4.5 PCT 80 - Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

Attribute	Description
Justification of evidence used to identify the PCT	The pasture grasslands of PCT 80 within the subject land have been modified from the original community, whilst woodland remnants occur as intact canopy. Based upon the data contained in BioNet Vegetation Classification database (DPIE 2022), PCT 80 is considered to be the best fit based on: • presence of Western Grey Box (*Eucalyptus microcarpa*) as an indicator species; • occurrence on alluvial plains; • occurrence in the NSW South Western Slopes IBRA Bioregion and the Inland Slopes subregion; and • floristic description which reflects the floristic assemblage within the PCT in the subject land including: – Western Grey Box; – Small-leaf Bluebush; – Cough Bush; – Purple Burr-Daisy (*Calotis cuneifolia*); – Corrugated Sida (*Sida corrugata*); – Curly Windmill Grass (*Enteropogon acicularis*); – Oxalis perennans; – Yellow Burr-daisy; – Rock Fern (*Cheilanthes sieberi*); – Climbing Saltbush (*Einadia nutans*); – Amulla (*Eremophila debilis*); – Knob Sedge (*Carex inversa*); – Kidney Weed (*Dichondra repens*); – Swamp Dock; – Purple Wiregrass (*Aristida ramosa*); – Variable Glycine (*Glycine tabacina*); – Tufted Bluebell (*Wahlenbergia communis*); and – Stinking Pennywort (*Hydrocotyle laxiflora*).

Table 4.5 PCT 80 - Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

Attribute	Description
Status	**BC Act status:** Conforms to the threatened ecological community Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions EEC on the following points (NSW TSSC 2019): • occurs in the NSW South Western Slopes Bioregion on relatively fertile soils of the western slopes and plains of NSW in which *Eucalyptus microcarpa* (Inland Grey Box) dominates; • floristic description reflects the floristic assemblage within the PCT in the subject land; and • occurs in the Mid-western Regional Council LGA. All zones for PCT 80 within the subject land meet the criteria for inclusion as the BC Act listed community. **EPBC Act status:** The EPBC Act Policy Statement for the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia endangered ecological community (EEC) (DSEWPac 2012) describes the listed community as a woodland or derived native grassland, characterised by a native understorey with a varying proportion of shrubs, grasses and herbs, that is or was historically dominated by Grey Box. To be considered part of the listed community, remnants must also: • be at least 0.5 ha in size; and • have less than 30% of non-grass weeds cover in the ground layer; and • where treed, have more than 10% tree cover in a patch (for woodlands). Further criteria apply to woodland and grassland patches, which is described further in Table 7.3. Using the above criteria, the areas mapped PCT 80-high within the subject land meet the criteria for Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia EEC as listed under the EPBC Act (see Table 7.3 for detailed assessment). Due to differences in the results of the vegetation integrity plots within the same PCT 80- pasture vegetation zone, a different vegetation zone (PCT 80- DNG) was delineated based on results of plot data and ecological principles (see Table 7.3); this zone has also been considered to conform to the EPBC listing. The remaining two vegetation zones for this PCT, namely PCT 80-poor and 80-pasture do not meet these criteria.
Estimate of percent cleared value of PCT	83%

Table 4.6 PCT 281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Attribute	Description
PCT ID	281
Common name	Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion
Vegetation class	Western Slopes Grassy Woodlands
Extent within subject land	291.91 hectares (ha), comprising: • High: 0.35 ha • Medium: 0.55 ha • Pasture: 284.46 ha • Planted: 2.59 ha • Poor: 3.95 ha
Survey effort	Plots 1–6, 8, 10, 11, 15–20, 22 and 23.
Description and condition	This PCT was identified within the road upgrade corridor in addition to small patches in paddocks and large grasslands, primarily in the western parts of the subject land associated with flats and drainage lines. The PCT comprises mature Yellow Box (*Eucalyptus melliodora*) and Blakely's Red Gum (*Eucalyptus blakelyi*). A number of shrub species occur within this PCT and primarily include *Acacia* spp. in addition to *Cassinia Sifton*, Cough Bush, Amulla (*Eremophila debilis*), Sticky Hop-bush (*Dodonaea viscosa*) and Small-leaf Bluebush. The groundcover shows signs of disturbance due to current grazing and a moderate exotic species cover. Despite the weed encroachment in vegetation zones, a number of native forbs, sedges and grasses persist. These include Hairy Joyweed, Yellow Burr Daisy, Tall Sedge (*Carex appressa*), Swamp Dock, Slender Rat's Tail Grass, Kangaroo Grass (*Themeda triandra*) and *Austrostipa* spp. Exotic species do occur within the groundcover, including St. Johns Wort, Paspalum, Bathurst Burr, Saffron Thistle and Khaki Weed which are HTWs. Other common exotic herbaceous species include Purpletop, *Trifolium* spp., Black-berry Nightshade (*Solanum nigrum*) and Perennial Ryegrass (*Lolium perenne*).

Table 4.6 PCT 281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Attribute	Description
Justification of evidence used to identify the PCT	The pasture grasslands of PCT 281 within the subject land have been modified from the original community, whilst woodland remnants occur as intact canopy. Based upon the data contained in BioNet Vegetation Classification database (DPIE 2022), PCT 281 is considered to be the best fit based on: • occurrence within the NSW South Western Slopes IBRA Bioregion and the Inland Slopes subregion; • association with valley floors, flats and drainage lines; • presence of Yellow Box and Blakely's Red Gum within the subject land; and • presence of characteristic species described by the database, present within the subject land including: – Rough-barked Apple (*Angophora floribunda*); – Blakely's Red Gum; – River Red Gum (*Eucalyptus camaldulensis*); – Yellow Box; – Hickory Wattle (*Acacia implexa*); – Sticky Hop-bush; – Slender Bamboo Grass (*Austrostipa verticillata*); – Purple Wiregrass; – Yellow Burr-daisy; – Themeda triandra; – Climbing Saltbush; – Juncus continuus; – Brown's Lovegrass (*Eragrostis brownii*); – Stinking Pennywort; – Slender Tick-trefoil (*Desmodium varians*); – Pitted Bluegrass (*Bothriochloa decipiens* var. *decipiens*); – Tall Sedge; – *Oncinocalyx betchei*; – Weeping Grass (*Microlaena stipoides*); – Nodding Chocolate Lily (*Dichopogon fimbriatus*); – Rock Fern; – Stinging Nettle (*Urtica incisa*); – Native Geranium (*Geranium solanderi*); – Twining glycine (*Glycine clandestina*); – Berry Saltbush (*Einadia hastata*); – Oxalis perennans; – Bear's Ear (*Cymbonotus lawsonianus*); – *Vittadinia dissecta*; and – Purple Burr-Daisy.

Table 4.6 PCT 281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Attribute	Description
Status	**BC Act status:** PCT 281 within the subject land represents 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 (Box Gum Woodland) CEEC (NSW TSSC 2020) listed under the BC Act as it: • occurs on fertile soils in the NSW South Western Slopes IBRA region, where the subject land is located; • is dominated by Yellow Box and Blakely's Red Gum, representative canopy species which occur within the subject land; • has an understorey comprising grasses and herbs, which occurs, albeit at low diversity in some vegetation zones within the subject land, which are similar species to the listed floristic description; and • has a sparse shrub layer. All zones for PCT 281 within the subject land meet the criteria for inclusion as the BC Act listed community. **EPBC Act status: listed** The EPBC Act Policy Statement for White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands (DEH 2006) describes the listed community (under the EPBC Act) as a woodland or derived native grassland, characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, that is dominated by White Box, Yellow Box and/or Blakely's Red Gum. To be considered part of the listed community, remnants must also: • have a predominantly native understorey (ie more than 50% of the perennial ground layer must comprise native species); and • be 0.1 ha or greater in size and contain 12 or more native understorey species (excluding grasses), including one or more identified important species; or • be 2 ha or greater in size and have either natural regeneration of the overstorey species or an average of 20 or more mature trees per ha. Using the above criteria, the areas mapped PCT 281-high within the subject land meet the criteria for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community (CEEC) as listed under the EPBC Act (see Table 7.2 for detailed assessment). All other vegetation zones mapped for PCT 281 do not meet these criteria.
Estimate of percent cleared value of PCT	67%

Photograph 4.1 **PCT 80 – Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion (plot 7)**

Photograph 4.2 **PCT 281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (plot 11)**

5 Threatened species

5.1 Threatened species habitat description

The subject land occurs as a highly fragmented agricultural landscape with intact woodland restricted to the road upgrade corridor, riparian vegetation and small patches and paddocks trees. The land is primarily utilised for agricultural pasture, which has resulted in exotic grassland and native pasture dominating the subject land. These grasslands have limited native diversity and lack habitat features such as hollow logs and rocky areas. The grasslands do contain a small number of isolated paddock trees which contain hollows and are likely to provide refuge to bird species which might traverse these grasslands.

Areas of remnant vegetation in high and moderate condition contain a moderate level of fallen timber and litter cover. The roadside vegetation comprises mature trees which provide suitable small to large hollows for arboreal mammals and large bird species such as cockatoo and owl species. No large raptor nests were observed within the subject land during the habitat assessment. The remnant roadside vegetation within and immediately adjacent the subject land is also likely to provide foraging habitat for many species including birds and arboreal mammals.

Waterways within the subject land are highly degraded due to historical and current agricultural practices and are limited to a series of isolated online dams. These dams lack riparian vegetation and have high turbidity and sediment load due to stock access. Where waterways are connected within the subject land, a highly eroded gully occurs due to the apparent sandy substrate associated with the landscape. These gullies are very shallow and are disconnected by man-made weirs and roads. These waterways are unlikely to provide habitat for threatened fish species.

5.2 Ecosystem credit species

In accordance with Step 3 (Section 5.2.3 of BAM, DPIE 2020), an assessment of habitat constraints and microhabitats was undertaken in the field to determine the suitability of habitat within the subject land for:

- predicted species (ecosystem credit species associated with recorded PCTs, predicted by the Biodiversity Assessment Method Calculator – BAMC).

Ecosystem credits species are threatened species that can be reliably predicted to use an area of land based on habitat surrogates. For the purposes of the BAM (DPIE 2020), ecosystem credit species are deemed to be offset through the habitat surrogates (PCTs) in which they occur.

A list of ecosystem credit species predicted to occur within the subject land, based on the PCTs present and generated by the calculator associated within the BAM (DPIE 2020) is provided in Table 5.1. The potential for these species to occur within the subject land was assessed in accordance with Section 5.2.2 of the BAM (DPIE 2020).

Table 5.1 Assessment of ecosystem credit species within the subject land

Scientific name	Common name	Sensitivity to gain class	Justification for exclusion
Anthochaera phrygia	Regent Honeyeater (Foraging)	High	Excluded from cleared vegetation zones (condition class pasture).
Artamus cyanopterus	Dusky Woodswallow	Moderate	Excluded from cleared vegetation zones (condition class pasture).
Callocephalon fimbriatum	Gang-gang Cockatoo (Foraging)	Moderate	Excluded from cleared vegetation zones (condition class pasture).
Calyptorhynchus lathami	Glossy Black-Cockatoo (Foraging)	High	Excluded as there are no trees from the Casuarinaceae (Sheoaks) family were recorded within the subject land which is their primary food source (As per habitat constraint).
Certhionyx variegatus	Pied Honeyeater	Moderate	Not excluded.
Chalinolobus picatus	Little Pied Bat	High	Not excluded.
Chthonicola sagittata	Speckled Warbler	High	Not excluded.
Circus assimilis	Spotted Harrier	Moderate	Not excluded.
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	High	Excluded from cleared vegetation zones (condition class pasture).
Daphoenositta chrysoptera	Varied Sittella	Moderate	Excluded from cleared vegetation zones (condition class pasture).
Dasyurus maculatus	Spotted-tailed Quoll	High	Excluded from cleared vegetation zones (condition class pasture).
Falco subniger	Black Falcon	Moderate	Not excluded.
Glossopsitta pusilla	Little Lorikeet	High	Excluded from cleared vegetation zones (condition class pasture).
Grantiella picta	Painted Honeyeater	Moderate	Excluded from cleared vegetation zones (condition class pasture).
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	High	Not excluded.
Hieraaetus morphnoides	Little Eagle	Moderate	Not excluded.
Hirundapus caudacutus	White-throated Needletail	High	Not excluded.
Lathamus discolor	Swift Parrot	Moderate	Excluded from cleared vegetation zones (condition class pasture).
Lophochroa leadbeateri	Major Mitchell's Cockatoo	Moderate	Not excluded

Table 5.1 Assessment of ecosystem credit species within the subject land

Scientific name	Common name	Sensitivity to gain class	Justification for exclusion
Lophoictinia isura	Square-tailed Kite	Moderate	Not excluded
Melanodryas cucullata	Hooded Robin (south-eastern form)	Moderate	Excluded from cleared vegetation zones (condition class pasture).
Melithreptus gularis	Black-chinned Honeyeater (eastern subspecies)	Moderate	Excluded from cleared vegetation zones (condition class pasture).
Miniopterus orianae oceanensis	Large Bent-winged Bat	High	Not excluded.
Neophema pulchella	Turquoise Parrot	High	Not excluded.
Ninox connivens	Barking Owl	High	Not excluded.
Ninox strenua	Powerful Owl	High	Not excluded.
Nyctophilus corbeni	Corben's Long-eared Bat	High	Not excluded.
Pachycephala inornata	Gilbert's Whistler	Moderate	Excluded from cleared vegetation zones (condition class pasture).
Petroica boodang	Scarlet Robin	Moderate	Not excluded.
Petroica phoenicea	Flame Robin	Moderate	Not excluded.
Polytelis swainsonii	Superb Parrot	Moderate	Not excluded.
Pomatostomus temporalis	Grey-crowned Babbler (eastern subspecies)	Moderate	Excluded from cleared vegetation zones (condition class pasture).
Pteropus poliocephalus	Grey-headed Flying-fox	High	Excluded from cleared vegetation zones (condition class pasture).
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	High	Not excluded.
Stagonopleura guttata	Diamond Firetail	Moderate	Not excluded.
Tyto novaehollandiae	Masked Owl	High	Not excluded.
Varanus rosenbergi	Rosenberg's Goanna	High	Excluded. Geographic limitations include south-east of a line that runs between Tarcutta and Galong. Birriwa is located approximately 280 km north of Galong.

5.3 Species credit species

5.3.1 Candidate species assessment

In accordance with Step 3 (Section 5.2.3 of BAM (DPIE 2020)), an assessment of habitat constraints and microhabitats was undertaken in the field to determine the suitability of habitat within the subject land for:

- candidate species (species credit species associated with specific geographic and landscape feature constraints).

Candidate species predicted by the BAMC are shown in Table 5.2. An assessment of the geographic and landscape constraints has been provided for each species, with a justification provided where species have been excluded, in accordance with Steps 1 to 3 (Section 5.2.1 to 5.2.3) of the BAM (DPIE 2020).

Table 5.2 Candidate threatened species assessment

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints and vagrant species			Step 3 – Identify candidate species for further assessment
Scientific name	**Common name**	**Habitat/geographic constraints**	**Constraint present in subject land?**	**Vagrant species?**	**Candidate species (yes/no) and rationale**
Acacia ausfeldii	Ausfeld's Wattle	Footslopes and low rises on sandstone.	Yes	N/A	Yes. Footslopes and low rises within the subject land.
Anthochaera phrygia	Regent Honeyeater (Breeding)	Important mapped areas (breeding).	No	N/A	No. The subject land is not a mapped important area.
Aprasia parapulchella	Pink-tailed Legless Lizard	Rocky areas, or within 50m of rocky areas.	No	N/A	No. Rocky areas are absent from the subject land.
Austrostipa wakoolica	*A spear-grass*	Alluvial plains and plains. West of Cowra.	No	N/A	No. Whilst alluvial plains and plains are within the subject land, it is north-east of Cowra.
Burhinus grallarius	Bush Stone-curlew	Fallen/standing dead timber including logs.	Yes	No	Yes. The subject land contains some open areas of Box Gum Woodland with fallen timber.
Caladenia arenaria	Sand-hill Spider Orchid	N/A	N/A	N/A	No. The species occurs in woodland with sandy soil, especially that dominated by White Cypress Pine (*Callitris glaucophylla*) (BCS 2022a). PlantNET states the species grows in sclerophyll forest and on sandhills, usually under Callitris; south from Mudgee district (PlantNET 2022). Callitris is largely absent from the subject land and no sand hill habitat is present, therefore it is considered that suitable microhabitats are absent.
Callocephalon fimbriatum	Gang-gang Cockatoo (Breeding)	Eucalypt tree species with hollows greater than 9 cm diameter.	Yes	No	No. Although the subject land contains eucalypts with hollows greater than 9cm diameter, breeding for the Gang-gang Cockatoo usually occurs between October and January (Summer) where they primarily inhabit mature, wet sclerophyll forests at higher altitudes (DAWE 2022c). As the species breeds in higher altitudes associated with tall mountain forests breeding habitat is not considered to occur within the subject land.

Table 5.2 Candidate threatened species assessment

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints and vagrant species			Step 3 – Identify candidate species for further assessment
Scientific name	**Common name**	**Habitat/geographic constraints**	**Constraint present in subject land?**	**Vagrant species?**	**Candidate species (yes/no) and rationale**
Calyptorhynchus lathami	Glossy Black-Cockatoo (Breeding)	Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground.	Yes	No	Yes. Suitable hollows within the study area.
Cercartetus nanus	Eastern Pygmy-possum	N/A	N/A	No	Yes. Found in a broad range of habitats, usually with a complex midstorey. The habitat in the subject land is considered marginal and there are no recent records within proximity to the subject land. Roadside vegetation with tree and some shrub cover is considered marginal habitat for the species. However, a precautionary assessment has been undertaken and the species has been included as a candidate species. Potential to occur in PCTs 80 and PCT 281, excluding areas lacking tree or shrub cover.
Chalinolobus dwyeri	Large-eared Pied Bat	Cliffs; within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.[1]	Yes	No	Yes. Cliffs and rocky areas occur less than 2 km south of the subject land associated with the ridgeline south of the subject land. There will be no direct disturbance to these potential breeding and roosting areas. In accordance with the BAMC, NSW BioNet Threatened Biodiversity Data Collection (TBDC) and '*Species credit' threatened bats and their habitat: NSW survey guide for the Biodiversity Assessment Method* (OEH 2018), a 2 km buffer has been applied to the identified ridgeline to determine native vegetation that would represent potential foraging/hunting habitat for the species. It is considered unlikely that the species would hunt in the small and isolated patches of woodland within the subject land that are intersected by the 2 km buffer from the ridgeline (refer Figure 6.2). This is because the woodland patches are very small and separated from the identified roosting/breeding habitat (the ridgeline outside of the subject land) by vast areas of predominantly exotic pasture. However, the small and isolated woodland patches within the 2 km buffer have been included conservatively, as species polygon.

Table 5.2 Candidate threatened species assessment

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints and vagrant species			Step 3 – Identify candidate species for further assessment
Scientific name	**Common name**	**Habitat/geographic constraints**	**Constraint present in subject land?**	**Vagrant species?**	**Candidate species (yes/no) and rationale**
					Therefore, the species polygon for potential foraging/hunting habitat for the Large-eared Pied Bat includes PCTs 281_Planted, 281_Poor and 80_Poor within the subject land. PCT 80_Pasture has been excluded as it is considered degraded in accordance with Section 5.2.3 (2) (a) of the BAM (DPIE 2020), and section 2.3 of '*Species credit' threatened bats and their habitat: NSW survey guide for the Biodiversity Assessment Method* (OEH 2018), as follows: • The TBDC describes the following for the species habitat and ecology: 1. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel),* frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years, and 2. Found in well-timbered areas containing gullies, and 3. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy. • The habitat and micro habitats on which the species depend are sufficiently degraded such that the species is unlikely to use the PCT 80_Pasture within the subject land. This vegetation zone has a VI score of 4.8 with the following attribute scores recorded across the five plots in this zone: – Trees: composition of 0 and 0% cover, – Shrubs: composition of 0 and 0% cover, – Stem classes: absent across all classes, and – Hollow-bearing tree: absent.

Table 5.2 Candidate threatened species assessment

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints and vagrant species			Step 3 – Identify candidate species for further assessment
Scientific name	**Common name**	**Habitat/geographic constraints**	**Constraint present in subject land?**	**Vagrant species?**	**Candidate species (yes/no) and rationale**
					• These scores demonstrate that the microhabitats required by the species are absent from PCT 80_Pasture in the subject land (there are no trees and shrubs), and that the habitat is degraded to the point that the species is unlikely to use PCT 80_Pasture in the subject land as foraging/hunting habitat. There is no potential breeding habitat within the subject land, or within 100 m of the subject land, therefore there will be no impact to breeding habitat for the species.
Crinia sloanei	Sloanes Froglet	Semi-permanent/ ephemeral wet areas, containing relatively shallow sections with submergent and emergent vegetation, or within 500 m of wet area. Within 500 m of swamps and waterbodies.	No	No	No. The subject land contains the habitat constraints however the habitat is degraded. The subject land does not support permanent streams, with all waterways declining to disconnected man-made dams during low flow. The subject land does not provide suitable habitat for this species. The subject land is east of the species known distribution. The species is also known to have contracted in range further compared to historical records. There are no recent records of the species within proximity to the subject land.
Dichanthium setosum	Bluegrass	N/A	N/A	N/A	Yes. Potential habitat in within the subject land.
Diuris tricolor	Pine Donkey Orchid	N/A	N/A	N/A	Yes. Potential habitat in derived native grassland and woodland areas with a predominantly native groundcover of PCT 80 and 281.
Euphrasia arguta	-	-	-	-	Yes. Suitable habitat present.

Table 5.2 Candidate threatened species assessment

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints and vagrant species			Step 3 – Identify candidate species for further assessment
Scientific name	**Common name**	**Habitat/geographic constraints**	**Constraint present in subject land?**	**Vagrant species?**	**Candidate species (yes/no) and rationale**
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)	Living or dead mature trees within suitable vegetation within 1 km of a rivers, lakes, large dams or creeks, wetlands and coastlines.			Yes. The subject land contains ephemeral creeks but is greater than 1 km from major rivers, creeks, wetlands. Potential nest trees within study area and subject land.
Hieraaetus morphnoides	Little Eagle (Breeding)	Nest trees – live (occasionally dead) large old trees within vegetation.			Yes. Potential nest trees within study area and subject land.
Lathamus discolor	Swift Parrot (Breeding)	Important mapped areas.[1]			No. The subject land is not a mapped important area.
Litoria booroolongensis	Booroolong Frog	N/A			No. Habitat degraded. The subject land does not support permanent streams, with all waterways declining to disconnected man-made dams during low flow. Further, waterways within the subject land do not support cobble banks or other rock substrate along stream margins that would provide breeding habitat for this species. The subject land does not provide suitable habitat for this species.
Lophochroa leadbeateri	Major Mitchell's Cockatoo (Breeding)	Hollow bearing trees. Living or dead tree with hollows greater than 10 cm diameter.			Yes. Suitable hollows within the study area.
Lophoictinia isura	Square-tailed Kite (Breeding)	Nest trees.			Yes. Suitable potential nest trees within the subject land.

Table 5.2 Candidate threatened species assessment

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints and vagrant species			Step 3 – Identify candidate species for further assessment
Scientific name	**Common name**	**Habitat/geographic constraints**	**Constraint present in subject land?**	**Vagrant species?**	**Candidate species (yes/no) and rationale**
Miniopterus orianae oceanensis	Large Bent-winged Bat (Breeding)	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave;" observation type code "E nest-roost;" with numbers of individuals >500.[1]			No. The required habitat constraints are absent from the subject land. No caves, tunnels, culverts or other structure known or suspected to be used for breeding were identified within the subject land, or within 100 m of the subject land.
Ninox connivens	Barking Owl (Breeding)	Living or dead trees with hollows greater than 20 cm diameter and greater than 4 m above the ground.	Yes	No	Yes. The subject land contains living or dead trees with hollows greater than 20 cm diameter and greater than 4 m above the ground.
Ninox strenua	Powerful Owl (Breeding)	Living or dead trees with hollow greater than 20 cm diameter	Yes	No	Yes. The subject land contains living or dead trees with hollow greater than 20 cm diameter
Petaurus norfolcensis	Squirrel Glider	N/A	N/A	No	Yes. The subject land supports forests and woodlands dominated by Box species, including a shrubby or *Acacia* spp. dominated midstorey in some vegetation zones. Species was considered likely to occur in all PCTs excluding areas lacking tree cover.
Petaurus norfolcensis - endangered population	Squirrel Glider in the Wagga Wagga Local Government Area	Wagga Wagga LGA			No. Subject land not located within the Wagga Wagga LGA.

Table 5.2 Candidate threatened species assessment

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints and vagrant species			Step 3 – Identify candidate species for further assessment
Scientific name	**Common name**	**Habitat/geographic constraints**	**Constraint present in subject land?**	**Vagrant species?**	**Candidate species (yes/no) and rationale**
Petrogale penicillata	Brush-tailed Rock-wallaby	Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliff lines.			No. Habitat degraded. Despite the subject land being located within 1 km of the ridgeline to the south-east, the species is unlikely to utilise the pastures or native woodland patches surrounding this ridgeline due to the isolated and degraded condition of these vegetation zones within the subject land. This habitat is highly fragmented and does not provide suitably connected foraging habitat.
Phascogale tapoatafa	Brush-tailed Phascogale	N/A	N/A	No	Yes. Subject land contains suitable habitat.
Phascolarctos cinereus	Koala (Breeding)	Important' habitat (however this is not a mapped important habitat area), defined by the density of koalas and quality of habitat determined by on-site survey.	Yes	No	Yes. Subject land contains suitable habitat.

Table 5.2 Candidate threatened species assessment

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints and vagrant species			Step 3 – Identify candidate species for further assessment
Scientific name	**Common name**	**Habitat/geographic constraints**	**Constraint present in subject land?**	**Vagrant species?**	**Candidate species (yes/no) and rationale**
Polytelis swainsonii	Superb Parrot (Breeding)	Living or dead *E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta* with hollows greater than 5 cm diameter; greater than 4 m above ground or trees with a DBH of greater than 30 cm.	Yes	Yes	Yes. Subject land contains suitable habitat.
Prasophyllum petilum	Tarengo Leek Orchid	East of Binalong, south and east of Boorowa.	-	-	Yes. Subject land is east of Binalong, south and east of Boorowa, and contains suitable habitat.
Prasophyllum sp. Wybong	-	-	-	-	Yes. Subject land contains suitable habitat.
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	Breeding camps	No	No	No. No breeding camps occur within the subject land.
Swainsona sericea	Silky Swainson-pea	N/A	N/A	N/A	Yes. Species is associated with Box Gum Woodland, which occurs on the subject land.
Tyto novaehollandiae	Masked Owl (Breeding)	Hollow bearing trees Living or dead trees with hollows greater than 20 cm diameter.	-	-	Yes. The subject land contains living or dead trees with hollow greater than 20cm diameters.

5.3.2 Candidate species credit species requiring further assessment

Resulting from the assessment in Table 5.2, the candidate species requiring further assessment are listed in Table 5.3.

Table 5.3 Candidate species credit species requiring further assessment

Scientific name	Common name	EPBC Act listing	BC Act listing	Flora or fauna
Acacia ausfeldii	Ausfeld's Wattle	-	V	Flora
Burhinus grallarius	Bush-stone Curlew	-	E	Fauna
Calyptorhynchus lathami	Glossy Black Cockatoo	-	V	Fauna
Cercartetus nanus	Eastern Pygmy possum	-	V	Fauna
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Fauna – foraging habitat assumed present
Dichanthium setosum	Bluegrass	V	V	Flora
Diuris tricolor	Pine Donkey Orchid	-	V	Flora
Euphrasia arguta	-	CE	CE	Flora
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	Ma	Fauna
Hieraaetus morphnoides	Little Eagle	-	V	Fauna
Lophochroa leadbeateri	Major Mitchells Cockatoo	-	V	Fauna
Lophoictinia isura	Square-tailed Kite	-	V	Fauna
Ninox connivens	Barking Owl	-	V	Fauna – assumed present
Ninox strenua	Powerful Owl	-	V	Fauna – assumed present
Petaurus norfolcensis	Squirrel Glider	-	V	Fauna
Phascogale tapoatafa	Brush-tailed Phascogale	-	V	Fauna
Phascolarctos cinereus	Koala	E	V	Fauna
Polytelis swainsonii	Superb Parrot	V	V	Fauna
Prasophyllum petilum	Tarengo Leek Orchid	E	E	Flora
Prasophyllum sp. Wybong	-	CE	-	Flora
Swainsona sericea	Silky Swainson-pea	-	V	Flora
Tyto novaehollandiae	Masked Owl	-	V	Fauna – assumed present

V= Vulnerable; E= Endangered; CE= Critically Endangered; Ma= Marine

Three owl species and one bat species which require survey as per Table 5.3 have been assumed as present, and subsequently retained in the BAMC within suitable habitat or via species polygons (refer to Section 5.3.4).

5.3.3 Targeted survey methods

i Targeted flora surveys

Targeted flora searches were conducted in accordance with *Surveying threatened plants and their habitats- NSW survey guide for the Biodiversity Assessment Method* (DPIE 2020). The flora surveys were conducted in areas of high condition woodland. The pasture grasslands within the subject land are not considered to contain habitat for the threatened flora species. This is due to the historical and continual disturbance of these grasslands for grazing and observations made on site during preliminary surveys. These pasture grasslands lack native species diversity and have a variable annual exotic species cover during different seasons of the year (Photograph 5.1 and Photograph 5.2). These grasslands were considered during times when annual weed cover was low and were still determined to be unlikely to contain suitable habitat to support threatened species occurrence.

Photograph 5.1 Pasture grassland taken 21 September 2021

Photograph 5.2 Pasture grassland taken 13 April 2022

Parallel field traverses were conducted at a distance of 10 metres apart across the subject land, in accordance with the requirements outlined by DPIE (2020). The high condition woodland generally occurs as an open woodland and therefore meets the 10 metre specifications for open vegetation and groundcover species. The traverses took place on the 20 to 24 September 2021, and 14 to 17 December 2021. This meets the survey timing requirements for target species (Table 5.4). All traverses were recorded using a global positioning system (GPS) and are shown in Figure 4.1 and Figure 5.1.

Reference sites were checked for Pine Donkey orchid (*Diuris tricolor*) near Muswellbrook, and Silky Swainson-pea (*Swainsonia sericea*) in Mudgee, with both refence populations detected in flower, validating the targeted flora surveys within the study area.

Table 5.4 Targeted flora survey method

Scientific name	Common name	Recommended survey period (BioNet TBDC/BAMC)	Survey date
Acacia ausfeldii	Ausfeld's Wattle	August–October	20–24 September 2021
Dichanthium setosum	Bluegrass	November–May	14–17 December 2021
Diuris tricolor	Pine Donkey Orchid	September–October	20–24 September 2021
Euphrasia arguta	–	November–March	14–17 December 2021
Prasophyllum petilum	Tarengo Leek Orchid	September–December	20–24 September 2021
Prasophyllum sp. Wybong	–	September–October	20–24 September 2021
Swainsona sericea	Silky Swainson-pea	September–November	20–24 September 2021

ii Targeted fauna surveys

Targeted fauna surveys were undertaken over 39 days between 20 September 2021 to 7 January 2022. Survey methods and effort for all fauna species targeted are summarised in Table 5.5, and are further discussed for each fauna group below. Fauna survey locations are illustrated in Figure 5.1.

Table 5.5 Targeted fauna survey method

Target species group	Target species	Survey method	Recommended survey period (TBDC/BAMC)	Survey timing
Arboreal mammals	Squirrel Glider (*Petaurus norfolcensis*)	• Arboreal trapping; 40 traps 4 nights • Spotlighting • Camera trapping-incidental	Year round	20–24 September 2021; 11–14 January 2022
	Brush-tailed Phascogale (*Phascogale tapoatafa*)	• Arboreal trapping • Camera trapping • Spotlighting	December to June	20–24 September 2021; 14–17 December 2021; 11–14 January 2022
	Eastern Pygmy Possum (*Cercartetus nanus*)	• Camera trapping • Spotlighting	October to March	14–17 December 2021; 11–14 January 2022
	Koala (*Phascolarctos cinereus*)	• Spotlighting • Dog detection surveys	Year round	11–14 January 2022; 3–5 May 2022
Diurnal birds	Glossy Black Cockatoo (*Calyptorhynchus lathami*)	• Transect and area searches • Targeted nest surveys	January to September	20–24 September 2021
	Major Mitchells Cockatoo (*Lophochroa leadbeateri*)		September to December	
	White-bellied Sea-Eagle (*Haliaeetus leucogaster*)		July to December	

Table 5.5 Targeted fauna survey method

Target species group	Target species	Survey method	Recommended survey period (TBDC/BAMC)	Survey timing
	Little Eagle (*Hieraaetus morphnoides*)		August to October	
	Square-tailed Kite (*Lophoictinia isura*)		September to January	
	Superb Parrot (*Polytelis swainsonii*)		September to November	
Nocturnal birds	Bush-stone Curlew (*Burhinus grallarius*)	• Call playback	Year-round	11–14 January 2022

a Arboreal mammals

Arboreal mammal surveys were undertaken for the following species:

- Squirrel Glider;
- Brush-tailed Phascogale;
- Eastern Pygmy possum; and
- Koala.

Methods and survey effort have been developed in accordance with DEC (2004), DSEWPaC (2011) and Phillips and Callaghan (2011) for the Koala. Methods and survey effort is outlined in Table 5.6.

Table 5.6 Methods and survey effort – arboreal mammals

Method	Survey description	Survey effort
Arboreal trapping	Forty Elliot B traps were placed at 2 m above the ground. Where possible, traps were placed at least 50 m apart on suitable trees within and adjacent to the subject land: • traps were baited with a mixture of peanut butter, rolled oats and honey; • a mixture of water and honey was sprayed on each tree trunk; • traps were checked early in the morning and closed for the day; and • traps were re-opened and rebaited in the late afternoon.	DEC (2004) requires 24 trap nights over 3–4 consecutive days per 50 ha of stratification unit, with replication for every additional 100 ha. Based on the above stratification units, this would equate to a minimum survey effort of 72 trap nights. Due to the small size of stratification units within the subject land and isolated nature of each vegetation zone, traps were placed in suitable habitat within and adjacent to the subject land. This included the road upgrade corridor and connected vegetation which extends outside of the subject land. Surveys were undertaken within the subject land and adjacent habitat over 4 nights, equating to 160 trap nights. The minimum survey effort was exceeded.

Table 5.6 Methods and survey effort – arboreal mammals

Method	Survey description	Survey effort
Spotlighting	Spotlight surveys were undertaken using handheld LED spotlights and included: • 2 km transects were undertaken by two observers (4 km total transect length). • Observers moved at a speed of less than 1 km per hour (ie one hour for the 1 km transect) scanning vegetation and trees for animals using both spotlights.	DSEWPaC (2011) recommends two parallel transects per 5 ha site, while DEC (2004) recommends two transects per 200 ha of stratification unit, repeated across two nights. In line with DSEWPaC (2011) and DEC (2004), a survey effort of two transects was undertaken within and immediately adjacent to suitable habitat within the subject land. Three transects (2 km minimum distance) were completed across 3 nights, totalling 6 km in length.
Camera trapping	Ten arboreal camera traps were placed in areas of high condition woodland where the species is most likely to occur. The camera traps were placed on suitable trees within and adjacent to the subject land: • traps were baited with a mixture of peanut butter, rolled oats and honey; and • a mixture of water and honey was sprayed on each tree trunk.	DEC (2004) has not described camera trapping survey effort. The threatened biodiversity profile data collection (TBDC) states that for the Brush-tailed phascogale survey effort must be undertaken using baited cameras: • A baited canister with small holes and capped at either end, to limit bait theft by other species, or honey-water, sprayed very liberally in front of each camera. Cameras should be set at head height, or above, facing the branch or tree trunk where a honey-based bait has been placed. • Cameras must remain in place for a minimum of 4 weeks with cameras checked and baits replaced after 2 weeks. • A minimum of 4 cameras, independent of the size of the subject land, must be used for sites up to 1 ha, then an additional 2 cameras for every ha of potential habitat thereafter. For 1.36 ha of suitable habitat within the subject land, this equates to 168 camera trap nights. As per the arboreal trapping, cameras were placed in suitable habitat within and adjacent to the subject land. This included roadside and connected vegetation which extends outside of the subject land. A total of 10 arboreal camera traps were installed across the study area over 28 nights, equalling a total of 280 camera trap nights. The minimum survey effort was exceeded.
Koala detection dogs	A field detection dog was used to detect Koala scats, comprising the following method: • A handheld GPS unit was used to record scat locations. Tracks were also recorded. • The dog was led through the study area where suitable habitat for the Koala occurs. • Qualified dog detection professionals were used to complete the surveys (Tate Animals).	One handler and one dog over two days.

b Diurnal birds

Diurnal bird surveys were undertaken for the following species:

- Glossy Black Cockatoo;
- Major Mitchells Cockatoo;
- White-bellied Sea Eagle;
- Little Eagle;
- Square-tailed Kite; and
- Superb Parrot.

Bird survey methods and survey effort have been developed in accordance with DEC (2004) and DSEWPaC (2010) guidelines. Methods include a mix of transect and area searches, to record bird activity, and targeted nest and hollow surveys. Methods and survey effort are outlined in Table 5.7.

Table 5.7 Methods and survey effort – diurnal birds

Method	Survey description	Survey effort
Transect and area searches	• Land based areas searches and transects. • Surveyors walked transect and conducted area searches within and immediately adjacent to the subject land. • All calls and habitat features were investigated.	DEC (2004) has not resolved bird survey requirements and does not provide guidance on survey effort. For the Glossy Black Cockatoo and Major Mitchell's Cockatoo, the TBCD outlines that signs of breeding should be assessed (begging birds of any age or sex, lone individuals identified during the breeding season or an occupied nest). If these are observed, potential nest trees should be identified. For the raptor species, the TBCD outlines that breeding habitat may constitute 'live' (occasionally dead) large old trees within suitable vegetation and the presence of a male and female; or female with nesting material; or an individual on a large stick nest in the top half of the tree canopy. For the Superb Parrot, the TBDC states that breeding habitat can be identified by the presence of habitat features and observed nest, or two or more birds seen on site. DSEWPaC (2010) was reviewed, and sympatric species survey efforts indicated a requirement for 12 hours over 4 days (3 hours per day) for sites less than 50 ha. No survey effort for larger sites is provided. A total of four bird surveys have been completed within the study area, with a total of sixteen people hours.
Targeted nest searches	• Targeted nest searches were completed in conjunction with transect and area searches. • Observers travelled across available habitat, seeking out habitat features including nest trees and hollows. • Suitable nest or breeding hollows were marked.	DEC (2004) has not resolved nest search requirements and does not provide guidance on survey effort. DSEWPaC (2010) was reviewed, and sympatric species survey efforts indicated 12 hours over 4 days (3 hours per day) for sites less than 50 ha. A total of sixteen hours was completed across four days.

c Nocturnal birds

Nocturnal bird surveys were undertaken for the following species:

- Bush-stone Curlew.

Bird survey methods and survey effort were developed in accordance with DEC (2004). Methods included call playback and spotlighting. Methods and survey effort are outlined in Table 5.8.

Table 5.8 Methods and survey effort – nocturnal birds

Method	Survey description	Survey effort
Call playback and spotlighting	DEC (2004) recommends call playback and spotlighting are undertaken to target the Bush-stone Curlew. • Surveys were commenced with a 15 minute listening period. Calls were played for 30 seconds, followed by 4.5 minutes of listening. This 5-minute cycle was repeated three times. • Call playback was conducted at each end of the subject land, at the furthest points from the previous call playback survey. • This was followed by spotlighting on foot for one hour throughout the study area.	DEC (2004) recommends a number of survey methods for the Bush-stone Curlew including: • Call Playback – 2–4 km apart and conducted during the breeding season. • Day habitat search- flushing of Bush-stone Curlew by walking through potential habitat. • Spotlighting: by foot or from a vehicle driven in first gear. • Call playbacks and spotlighting were completed simultaneously. Based on the above, and availability of suitable habitat, call playback sites were surveyed in conjunction with three transects (2 km minimum distance) completed across 3 consecutive nights, totalling 6 km in length. The minimum survey effort was reached.

5.3.4 Targeted survey results

No candidate flora species were recorded during the targeted surveys.

The Koala was recorded in the form of scats during the Koala dog detection surveys (Figure 1.1). The presence of the Koala is associated with the high condition vegetation zones of PCTs 80 and 281, which are also connected to the vegetation in the wider landscape. No other candidate fauna species were recorded during the targeted surveys.

i Candidate species presence, extent and habitat quality

Table 5.9 defines the presence (or absence) of candidate species in the subject land and habitat quality. The number of individuals impacted by the project is provided for count-based species, while the area of habitat impacted is provided for area-based species. The area of habitat has been used to define the species polygon for area-based species, in accordance with Step 4 to 6 of the BAM (DPIE 2020) (Section 5.2.4 to 5.2.6).

Table 5.9 Candidate species presence, extent and habitat quality

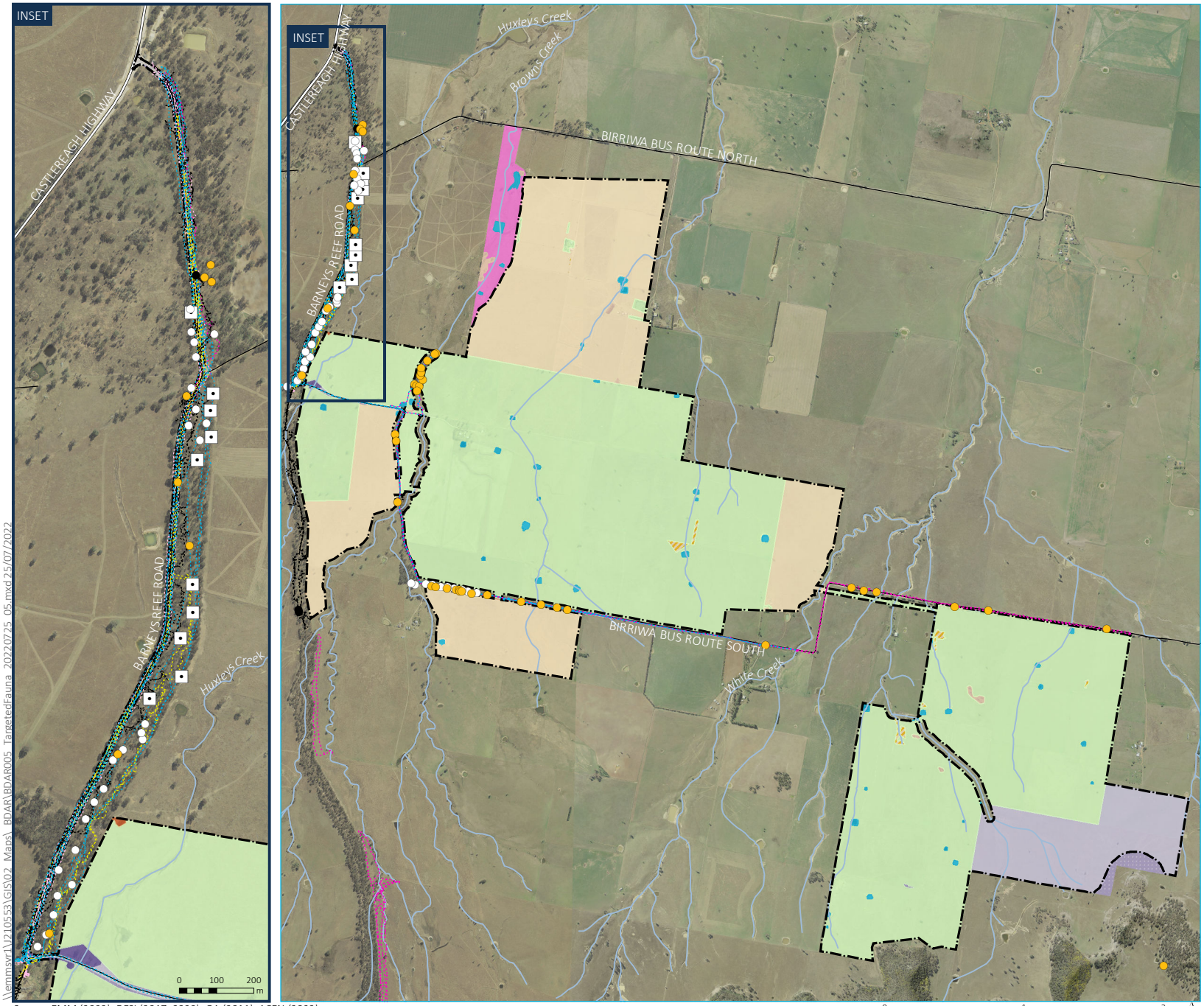
Scientific name	Common name	Step 4 – determine candidate species presence/absence	Step 5 – determine the area or count, and location of suitable habitat for a species credit species		Step 6 – determine the habitat condition within the species polygon for species assessed by area	
			Individuals impacted (count-based species)	Area impacted (area-based species)	Associated vegetation zone/s	Vegetation integrity score
Acacia ausfeldii	Ausfeld's Wattle	Not recorded	-	-	-	-
Burhinus grallarius	Bush-stone Curlew	Not recorded	-	-	-	-
Calyptorhynchus lathami	Glossy Black Cockatoo	Not recorded	-	-	-	-
Cercartetus nanus	Eastern Pygmy Possum	Not recorded	-	-	-	-
Chalinolobus dwyeri	Large-eared Pied Bat	Assumed present based on suitable foraging habitat (woodland patches) within the subject land	-	0.48 ha	281_Planted (0.19 ha) 281_Poor (0.12 ha) 80_Poor (0.17 ha)	281_Planted: 55.5 281_Poor: 39.5 80_Poor: 41.1
Dichanthium setosum	Bluegrass	Not recorded	-	-	-	-
Diuris tricolor	Pine Donkey Orchid	Not recorded	-	-	-	-
Euphrasia arguta	-	Not recorded	-	-	-	-
Hieraaetus morphnoides	Little Eagle	Not recorded	-	-	-	-
Lophochroa leadbeateri	Major Mitchells Cockatoo	Not recorded	-	-	-	-
Lophoictinia isura	Square-tailed Kite	Not recorded	-	-	-	-

Table 5.9 Candidate species presence, extent and habitat quality

Scientific name	Common name	Step 4 – determine candidate species presence/absence	Step 5 – determine the area or count, and location of suitable habitat for a species credit species		Step 6 – determine the habitat condition within the species polygon for species assessed by area	
			Individuals impacted (count-based species)	Area impacted (area-based species)	Associated vegetation zone/s	Vegetation integrity score
Ninox connivens	Barking Owl	Assumed present based on suitable hollows within the subject land	N/A	3.88 ha	281_DNG (3.28 ha) 281_High (0.18 ha) 80_High (0.42 ha)	281_DNG: 2.7 281_High:99.2 80_High: 95.3
Ninox strenua	Powerful Owl	Assumed present based on suitable hollows within the subject land	N/A	3.88 ha	281_DNG (3.28 ha) 281_High (0.18 ha) 80_High (0.42 ha)	281_DNG: 2.7 281_High:99.2 80_High: 95.3
Petaurus norfolcensis	Squirrel Glider	Not recorded	-	-	-	-
Phascogale tapoatafa	Brush-tailed Phascogale	Not recorded	-	-	-	-
Phascolarctos cinereus	Koala	Recorded during targeted survey	N/A	8.62 ha	80_High (1.01 ha) 80_Poor (0.17 ha) 281_High (0.35 ha) 281_Medium (0.55 ha) 281_Planted (2.59 ha) 281_Poor (3.95 ha)	80_High: 95.3 80_Poor: 41.1 281_High: 99.2 281_Medium: 59.3 281_Planted: 55.5 281_Poor: 39.5
Polytelis swainsonii	Superb Parrot	Not recorded	-	-	-	-
Prasophyllum petilum	Tarengo Leek Orchid	Not recorded	-	-	-	

Table 5.9 Candidate species presence, extent and habitat quality

Scientific name	Common name	Step 4 – determine candidate species presence/absence	Step 5 – determine the area or count, and location of suitable habitat for a species credit species		Step 6 – determine the habitat condition within the species polygon for species assessed by area	
			Individuals impacted (count-based species)	Area impacted (area-based species)	Associated vegetation zone/s	Vegetation integrity score
Prasophyllum sp. Wybong	Prasophyllum sp. Wybong	Not recorded	-	-	-	-
Swainsona sericea	Silky Swainson-pea	Not recorded	-	-	-	-
Tyto novaehollandiae	Masked Owl	Assumed present based on suitable hollows within the subject land	N/A	3.88 ha	281_DNG (3.28 ha) 281_High (0.18 ha) 80_High (0.42 ha)	281_DNG: 2.7 281_High:99.2 80_High: 95.3



KEY

- Subject land
- Hollow-bearing tree

Mammal survey

- Camera trap - December 2021 - January 2022
- Arboreal Elliot B trapping - September 2021
- Koala scats
- Koala Detection Dog survey - May 2022
- Spotlight transect - January 2022

Diurnal bird survey

- September 2021

Targeted flora survey

- September 2021
- December 2021

Existing environment

- Major road
- Minor road
- Watercourse/drainage line
- Cleared
- Dam
- Exotic (trees, grassland)

Plant community type

PCT 80 | Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

- High
- Poor
- Derived native grassland (DNG)
- Pasture

PCT 281 | Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

- High
- Medium
- Poor
- Pasture
- Planted
- Tussock

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Source: EMM (2022); DFSI (2017, 2022); GA (2011); ACEN (2022)

Targeted survey method and results

Birriwa Solar and Battery Project
Biodiversity Development Assessment Report
Figure 5.1

EMM
creating opportunities

Stage 2 – Impact assessment

6 Impact assessment

This chapter identifies the potential impacts of the project on biodiversity values and the measures taken to avoid and minimise impacts. This chapter also makes recommendations to assist in the design of a project that further avoids any residual impacts.

6.1 Potential direct, indirect and prescribed impacts

6.1.1 Direct impacts

Without any measures to avoid, minimise or mitigate impacts, the project would result in the following impacts on biodiversity:

- direct impacts:
  - loss of native vegetation; and
  - loss and degradation of native fauna habitats.

ACEN is committed to avoiding areas of high environmental value in the development of its solar projects. Wherever possible, direct impacts have been avoided and/or minimised through the design of the project (Section 6.3). Impacts will be further managed and mitigated through the development of a biodiversity management plan (BMP), using the measures recommended in the below sections. Any residual impacts would be compensated through implementation of the biodiversity offset scheme.

6.1.2 Indirect impacts

Section 8.2 of the BAM (DPIE 2020) requires the assessment of indirect impacts on native vegetation, TECs and threatened species habitats.

Without any measures to avoid, minimise or mitigate impacts, the project would result in the following indirect impacts on biodiversity:

- erosion and sedimentation;
- weed introduction and spread;
- potential inadvertent disturbance of retained habitats; and
- increased noise, vibration and dust levels resulting in disturbance of fauna species, and consequent abandonment of habitat, or changes in behaviour (including breeding behaviour).

i Erosion and sedimentation

Construction of the project may lead to erosion and sedimentation and potential reduction in water quality to several watercourses within the subject land, including Huxleys, Browns and White Creeks. During the project, sediment may be mobilised and transported by surface water during rainfall events, potentially discharging into watercourses and drainage lines and potentially reducing water quality in downstream aquatic habitats and the Talbragar River. Increased suspended sediments can reduce light penetration into the water column, reducing photosynthesis of aquatic macrophytes, and decreasing dissolved oxygen levels.

Erosion and sediment control measures will be implemented during the project. Strict controls will be put in place to ensure sediment does not runoff into watercourses, and includes the measures outlined in Section 6.3.

ii Weed introduction and spread

The project has the potential to facilitate dispersal of weed species. As the subject land contains high threat weeds and additional exotic species, weed spread has the potential to occur across the subject land. Uncontrolled movement of vehicles, equipment and personnel within the subject land is the key vector of transmission, in particular vehicles and equipment sourced from regions beyond the subject land which may also introduce new species. Many weed species thrive on ground disturbance and will rapidly colonise disturbed areas in advance of native species recolonisation.

Weed impacts will be mitigated during the proposed activity and includes the measures outlined in Section 6.3.

iii Disturbance of retained habitats

Potential inadvertent disturbance of retained habitats could occur if vegetation to be retained is not clearly marked and defined during construction of the project. These impacts will be mitigated via exclusion fencing ('no-go' zones) and signage and includes the measures outlined in Section 6.3.

Exclusion fencing ('no-go' zones) shall be used that includes temporary fencing, bunting tape or similar and signage to protect or avoid habitats to be retained. This should be maintained and checked daily through construction.

iv Noise and dust disturbance

Noise may adversely affect fauna by interfering with communication (eg territorial bird song), masking the sound of predators and prey, causing avoidance reactions and displacement from habitat. Noise will be generated by the project through the use of equipment and vehicles and will vary from short intermittent noise from plant and equipment. Night works are not expected to occur as part of the project.

Increased dust from vegetation clearing and vehicle movements during construction has the potential to temporarily and locally impact flora and fauna values in the vicinity of the subject land. Excess generation of dust and subsequent deposition on leaves can impair plant photosynthesis and productivity (also resulting in reduced habitat quality for fauna) and impact on respiratory systems of fauna.

Potential noise and dust impacts will be temporary as they will only be evident during vegetation clearing and construction. Dust levels will be monitored and when needed dust suppression implemented such as wetting down dirt roads or reducing vehicle speeds, as per the measures outlined in Section 6.3.

6.2 Prescribed and uncertain impacts

An assessment of prescribed and uncertain impacts has been undertaken in accordance with Section 6 of the BAM (DPIE 2020) and is provided in Table 6.1.

Table 6.1 Assessment of prescribed and uncertain impacts

Prescribed/uncertain impact	The project
Impacts of development on the habitat of threatened species associated with: • karst, caves, crevices, cliffs, rocks, and other geological features of significance; or human-made structures and non-native vegetation.	A ridgeline occurs within the assessment area which is likely to have areas of geological significance such as crevices and geological habitat. This ridgeline does not occur within the subject land itself and will not be impacted by the project. A species polygon has been created for the Large-eared Pied Bat which may use these geological features and has been offset accordingly. Species polygons have also been created for Large-eared Pied Bat, Barking Owl, Masked Owl and Powerful Owl which intersect non-native vegetation and therefore will not generate species credits under the BAM (DPIE 2020). Mitigation measures to minimise impacts to these species ensure prescribed impacts to the species are addressed in Section 6.3.
Impacts of development on the connectivity of different areas of habitat of threatened entities that facilitates the movement of those entities across their range.	The locality of the subject land is considered highly fragmented with native vegetation often occurring in isolated patches surrounded by a matrix of agricultural land. A vegetated road corridor provides connectivity along the western extent of the subject land to the ridgeline to the south. Ecosystem and species credit species predicted to occur in the subject land predominantly comprise highly mobile birds and mammals, and therefore most species will not be impacted by fragmentation. The road corridor is known to provide habitat for the Koala; however fragmentation is unlikely to occur due to the nature of the project (see Section 7.1.2).
Impacts of development on movement of threatened entities that maintains their life cycle.	The main impact to threatened entities life cycles is fragmentation, as species like Koalas need some level of connectivity in vegetation to access mates during the breeding season. As fragmentation impacts are temporary and restricted to the construction period, potential life-cycle impacts will be managed through managing connectivity. Impact to connectivity such as fragmentation is unlikely to occur due to the nature of the project removing linear patches of woodland along the road corridor and already isolated woodland patches within the subject land (see Section 7.1.2).
Impacts of development on water quality, water bodies and hydrological processes that sustain threatened entities (including from subsidence or upsidence resulting from underground mining).	The subject land intersects a number of named and unnamed waterways including Huxleys Creek, Browns Creek and White Creek. The waterways within the subject land and assessment area largely lack wooded riparian vegetation which may support aquatic and terrestrial species, however there are some riparian remnants which occur downstream immediately outside of the subject land which provide canopy cover and shading for the creek lines. The project has been designed to exclude Huxleys Creek, Browns Creek and White Creek where possible, with exception of five bridges to allow access (Figure 1.2). These bridges are not expected to contain instream structures or impact on the aquatic environment. The bridges will be designed to have impact to the surrounding terrestrial environment, which has been included in this BDAR and will be offset. ACEN have committed to avoiding in stream impacts regarding bridge design. Mitigation measures will be in place to minimise potential impacts to these waterways and are outlined in Section 6.3. Due to the nature of the project, the project is not expected to intersect groundwater or impact on groundwater dependent ecosystems. Therefore, impacts on threatened species and ecological communities because of changes in water quality, water bodies and hydrological processes are not expected during construction or operation.
Impacts of wind turbine strikes on protected animals.	The project does not include wind turbines; therefore this prescribed impact is not relevant to the project. Accordingly, management of this prescribed impact is not required.

Table 6.1 Assessment of prescribed and uncertain impacts

Prescribed/uncertain impact	The project
Impacts of vehicle strikes on threatened fauna, or on animals that are part of a TEC.	The project traffic impact assessment (appended to the EIS) concluded that the project would result in up to 360 light vehicle trips and up to 135 heavy vehicle trips per day during the construction phase, and minor increases in vehicle movements during operation. A BMP will address mitigation measures for Koala and animal strike. The Koala is already found in the existing road upgrade corridor, the project is not predicted to significantly increase animal vehicle strikes above existing levels. Accordingly, management of this prescribed impact is not required.

6.3 Avoidance and minimisation strategy

This BDAR has been carried out in parallel with, and has informed the evolution of, the project design. As part of consultation with landowners and associated technical assessments, the original design of the project has been reduced and located in areas with lower biodiversity values, where possible. This process has ensured the avoidance of environmental constraints, including impacts on Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia EEC as listed under the EPBC Act and high condition 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. Threatened species habitat has also been avoided as far as practicable.

Iterative project planning, informed by the baseline studies outlined above, has allowed a range of impacts to be avoided and others to be minimised throughout the life of the project. To compensate for unavoidable disturbance, biodiversity offsets will be provided.

Key avoidance measures that have been implemented by ACEN comprise:

- avoidance of 4.9 ha of PCT 80 – DNG (EEC) in the south-east corner of the study area (Figure 6.1);
- avoidance of 20.7 ha of PCT 281 – tussock in the north portion of the study area;
- minimisation of impacts to PCT 281-high and PCT 80-high wherever feasible;
- minimisation of direct impacts by utilising an existing access track within the subject land; and
- avoidance of Huxleys Creek, Browns Creek and White Creek where possible and avoidance of instream impacts as part of the bridge design.

Public road crossings have been located within the subject land within areas of minimal vegetation, thereby avoiding the need to remove vegetation for these crossings.

Refinements to the project layout have also excluded as many higher order streams from the subject land, as possible. Three third order streams are excluded from the subject land, thereby avoiding impacts to any associate riparian vegetation, with the exception of that required for the provision of fencing, access and electrical reticulation (i.e., private internal access roads and electrical cables).

In addition, a key design principle within the project refinement process has been to maximise the placement of project infrastructure in cleared areas and, wherever possible, limit impacts to native vegetation of low quality only.

In relation to the road upgrade corridor within the subject land, the conceptual road upgrade design has sought to minimise the clearance of native vegetation as much as possible. The concept design was developed in consultation with EMM ecologists and with Mid-Western Regional Council and Warrumbungle Shire Council to develop a design that avoids as much of the native vegetation along the existing road verge as possible. Residual impacts to biodiversity values will be mitigated through pre-clearance surveys, planting locally native species characteristic of Box Gum woodland and Grey Box woodland in future landscaping, retention of logs and debris in the subject land post-construction, and weed hygiene measures. It is also noted that ACEN will continue its consultation post EIS lodgement with both Councils with the view to refine the road design and further reduce its impacts on the roadside vegetation. An updated design is expected prior to Determination.

The original study area for the development design encompassed approximately 1,330.22 ha. The final area of the subject land has been reduced to 1,159.19 ha, which is a reduction in the original design by 171 ha and will reduce impacts on the TECs within the study area. Accordingly, the reduction in impact on Box Gum Woodland and derived native grassland and Grey Box woodland and grassland also reduces the impact on native flora and fauna habitat.

Table 6.2 summarises the avoidance and minimisation measures to minimise the potential for development-related impacts on biodiversity.

Table 6.2 Impact avoidance and minimisation strategy

Impact	Action	Intended outcome	Timing
Removal of Box Gum Woodland and derived native grassland and Grey Box woodland and grassland.	Change design to occur primarily within cropped land to avoid intact woodland.	Prioritise retention of high to moderate quality Box Gum Woodland and derived native grassland and Grey Box woodland and grassland, minimise impact on TECs resulting from project.	Design
Removal of Box Gum Woodland and derived native grassland and Grey Box woodland and grassland.	Following construction, include species consistent with PCT 80 and PCT 281 into landscaping.	Increase the floristic and structural diversity present in the subject land consistent with PCT 80 and PCT 281.	Post-construction
Removal of potential habitat for native fauna (including hollow-bearing trees).	Pre-clearance surveys, by a suitably qualified ecologist, to be conducted prior to removal of hollow-bearing trees within the subject land (at the locations specified in the BDAR) (Figure 5.1).	Mitigate injury to potential fauna species inhabiting hollows.	Pre-construction
Removal of logs and debris from the subject land.	Retain hollow logs and debris to be used post construction.	Retain and improve potential fauna habitat within the indirect impact area and study area post construction.	Post-construction
Indirect impacts on native vegetation to be retained including Box Gum woodland and Grey Box woodland to be retained.	Exclusion fencing ('no-go' zones) shall be used that includes temporary fencing, bunting tape or similar and signage to protect or avoid habitats to be retained. This should be maintained and checked daily through construction.	Avoid indirect impact to retained trees.	Pre-construction; construction

Table 6.2 Impact avoidance and minimisation strategy

Impact	Action	Intended outcome	Timing
Indirect impacts on native vegetation to be retained including Box Gum woodland and Grey Box woodland to be retained.	All workers to be made aware of ecologically sensitive areas and the need to avoid impacts. This includes adjacent native vegetation.	Avoid unintentional impacts to Box Gum woodland, Grey Box woodland and native vegetation.	Pre-construction
Indirect impacts on native vegetation to be retained including Box Gum woodland and Grey Box woodland to be retained.	Chemicals and fuel will be managed in accordance with Safe Work Australia guidelines (eg employ use of barriers, inspecting tanks and containers, etc) use of appropriate spill containment materials (or spill kits) to clean-up spills if they occur.	Avoid unintentional impacts to Box Gum woodland, Grey Box woodland and native vegetation due to chemical or fuel runoff.	Construction
Erosion and sedimentation	Sediment controls, including fencing and sediments traps, should be installed in any areas where works will occur in proximity to waterways.	Avoid increased sedimentation and erosion of watercourses within the subject land.	Pre-construction
Weed introduction and spread	Dependent on the weed species and cover in any particular construction area, remove weeds prior to or during clearing. Weeds are to be stockpiled appropriately prior to removal from the subject land to avoid the spread of seed and other propagules.	Minimise weed introduction and spread.	Construction
Weed introduction and spread	Weed hygiene protocols are in place prior to entering the subject land. This includes wash-down procedures to all plant and machinery.	Avoid weed introduction from outside of the subject land.	Construction
Weed introduction and spread	Coolatai Grass (*Hyparrhenia hirta*), and St. Johns Wort (*Hypericum perforatum*) are to be managed as per the Biosecurity Act 2015 and their regional recommended measures (Section 7.3). If any other priority weeds of NSW are identified in the subject land during construction, they must be removed from the subject land. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.	Avoid spread and introduction of priority weeds within the subject land	Construction

Table 6.2 Impact avoidance and minimisation strategy

Impact	Action	Intended outcome	Timing
Dust disturbance	Monitor dust levels and implement suppression strategies where required such as wetting down dirt roads or reducing vehicle speeds.	Reduce dust settlement on native vegetation and habitat for native species.	Construction

6.4 Serious and Irreversible Impacts

An impact is to be regarded as serious and irreversible (SAII) if it is likely to contribute significantly to the risk of a threatened species (including endangered populations) or an ecological community becoming extinct based on the following 4 principles:

- Principle 1: The impact will cause a further decline of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline.
- Principle 2: The impact 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.
- Principle 3: The impact is made on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.
- Principle 4: The impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity, and therefore its members are not replaceable.

Candidate SAII entities with regards to the project are listed in Table 6.3, along with the relevant principles for the listing of the SAII entity, based on information from the Threatened Biodiversity Data Collection (TBDC). No assessment of any other threatened entities at risk of an SAII has been requested by the decision-maker. SAII assessments are provided in Sections 6.4.1 and 6.4.2.

Table 6.3 Candidate SAII entities for the project

Threatened community or species	Principle 1	Principle 2	Principle 3	Principle 4
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Population reduction of >=80% in 10 years or three generations	<50 individuals or <250 individuals where threats are known	-	-
Regent Honeyeater	Population reduction of >=80% in 10 years or three generations	<50 individuals or <250 individuals where threats are known	-	-
Large-eared Pied Bat[1]	-	-	-	-

1. TBCD does not provide information as to which principle the Large-eared Pied Bat meets threshold.

6.4.1 Threatened ecological communities

Section 9.1.1 of BAM (DPIE 2020) requires additional impact assessment for threatened ecological communities that are also listed as candidate entities for Serious and Irreversible Impacts (SAII). An assessment of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland against the assessment criteria provided in Section 9.1.1 of BAM (DPIE 2020) is provided in Table 6.4 and Table 6.5.

Table 6.4 Current status of White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland CEEC

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
Current total geographic extent (ha) of the threatened ecological community (TEC) in NSW.	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland has undergone a very large reduction in geographic distribution. The best estimate of the extent of occurrence (EOO) is 702,800 km^2, based on a minimum convex polygon enclosing likely occurrences of the community. The best estimate of the area of occupancy (AOO) is 151,100 km^2.	• NSW TSSC 2020	Not all areas occupied by the community are covered by maps of appropriate scale and accuracy. Therefore, the values for EOO and AOO quoted may underestimate the true values.
Estimated reduction in geographic extent of the TEC since 1970	Approximately greater than 90% reduction in pre-1750 distribution. According to the NSW TSSC (2020): The TSSC (2006) estimated that less than 5% of the original distribution remained, however the extent to which remaining examples continue to support characteristic biota, their interactions and function is unknown. The very large historical decline in geographic distribution is corroborated by other sources although there is some uncertainty surrounding the current extent of the community and its pre-1750 distribution. Considering the evidence for historical, recent and contemporary clearing in combination, it is very likely that the reduction in the distribution of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland exceeds 90% when averaged across the entire range of the community.	• NSW TSSC 2020 • Commonwealth TSSC 2006	No estimate of vegetation extent as of 1970 is available.

Table 6.4 Current status of White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland CEEC

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
Extent of reduction in ecological function, describing the degree of environmental degradation or disruption to biotic processes	The Threatened Biodiversity Profile description (BCS 2022a) lists the following threats affecting the ecological function of the TEC: • habitat loss, degradation and fragmentation from agricultural, forestry, mining, infrastructure and residential development; • degradation by over grazing and trampling by introduced and native herbivores resulting in losses of plant species and structural diversity (simplification of the understorey and ground layer and suppression of overstorey regeneration), erosion and other soil changes (eg loss of cryptogams, increased nutrient status); • degradation of remnants by non-native plant species, including noxious weeds, exotic pasture species and environmental weeds, including garden escapes, olives and pines; • degradation of remnants by feral pest animals resulting in the loss or modification of habitat and predation of native fauna that are part of the White Box Yellow Box Blakely's Red Gum Woodland TEC; • removal of native ground layer in box-gum woodland remnants where trees have been partially or fully removed; and • altered fire regimes. These threats affect the ecological function of the TEC at varying levels and lead to different states of the TEC. The extent to which this reflects a permanent or temporary loss depends on the mechanism and severity of disturbance as well as any measures that are undertaken to reverse decline. As such, the extent of reduction in ecological function is unknown.	• BCS 2022a • NSW TSSC 2020	Data on the extent of reduction is not available.
Evidence of restricted geographic distribution based on the TEC's geographic range in NSW:			
Extent of occurrence (ha)	702,800 km^2	• NSW TSSC 2020	Not all areas occupied by the community are covered by maps of appropriate scale and accuracy. Therefore, the values for EOO and AOO quoted may underestimate the true values.

Table 6.4 Current status of White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland CEEC

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
Area of occupancy (ha)	151,100 km^2	• NSW TSSC 2020	Not all areas occupied by the community are covered by maps of appropriate scale and accuracy. Therefore, the values for EOO and AOO quoted may underestimate the true values.
Number of threat-defined locations	The BAM (DPIE 2020) defines threat-defined locations in terms of threatened species but does not mention TECs. According to the Guidelines for the application of IUCN Red List of Ecosystems Categories and Criteria (IUCN 2017), a threat-defined location is: • A geographically or ecologically distinct area in which a single threatening event can rapidly affect all occurrences of an ecosystem type. The IUCN definition is similar to that included in the BAM (DPIE 2020)and is considered to encompass the intent of the requirements of BAM (DPIE 2020) for TECs. The most serious plausible threat to the TEC is land clearing, particularly for agriculture, including the intensification of agricultural activity through conversion of land use from grazing of native pastures to improved pastures or cropping. In line with the approach suggested in IUCN (2017), broad interpretation of threat-defined locations identifies two jurisdictional zones with different regulatory controls on land clearing: • the leasehold Western Division of New South Wales, and • the freehold Central Division and Eastern Division of New South Wales. An alternative interpretation of threat-defined locations based on biogeographical regions (bioregions) would produce an estimate of six threat-defined locations.	• DPIE 2020 • IUCN 2017 • NSW TSSC 2020	Data is not strictly defined by the BAM (DPIE 2020). Assumptions have been made from additional data sources.

Table 6.5 Impact assessment of White Box Yellow Box Blakely's Red Gum Woodland CEEC

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
Impact on the geographic extent of the TEC (Principles 1 and 3)			
Area of TEC to be impacted by the proposal (ha)	The project would impact on 291.91 ha of the TEC.	-	-
Area of TEC to be impacted by the proposal as a % of the current geographic extent in NSW (%)	The best estimate of the extent of occurrence (EOO) is 702,800 km^2. The project would impact on 0.00042% of its current extent.	NSW TSSC 2020	Not all areas occupied by the community are covered by maps of appropriate scale and accuracy. Therefore, the values for EOO and AOO quoted may underestimate the true values.
Direct/indirect impacts likely as a result of the proposal to contribute to loss of flora/fauna species characteristic of the TEC	The project would result in the removal of 291.91 ha of the TEC, which is 0.00042% of the current extent. Indirect impacts to the TEC include weed introduction and spread and erosion and sedimentation. Retained areas of the TEC outside the subject land will be avoided. Weed management and erosion mitigation measures in accordance with Table 6.2 will also be developed and implemented in retained areas of the community within the indirect impact areas. There will be no change to fire regimes.	-	-
Impacts likely to contribute to further environmental degradation or disruption of biotic processes (Principle 2)			
Remaining extent of isolated areas of TEC (ha)	The remaining connected local occurrence of the TEC includes approximately 58 ha which is connected to the subject land (see section 7.1.2). This occurrence primarily consists of woodland and surrounded by patches of grassland in varying condition.	• DPIE 2015	Patch connectivity has been assessed using regional vegetation mapping
Average distance between remaining remnants – remnant is retained (m)	Were the remnant is to be retained, the patch would remain connected to adjacent patches (including derived grasslands of the TEC).	-	-

Table 6.5 Impact assessment of White Box Yellow Box Blakely's Red Gum Woodland CEEC

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
Average distance between remaining remnants – remnant is removed (m)	Were the remnant to be removed, the patch would remain connected to adjacent patches (including derived grasslands of the TEC). The project would result in the removal of the TEC where connectedness of patches will vary, from immediately connected adjacent to the subject land and approximately 1.5 km in a north-south direction and 1 km in an east-west direction, however the TEC is likely to continue to be connected outside of the subject land based on regional mapping (DPIE 2015).	-	-
Estimated maximum dispersal distance of species associated with the TEC (km)	According to Corlett (2009), typical maximum dispersal distances for different dispersal mechanisms are as follows: No specialised mechanism: 0–10 m Ant dispersal: 0–10 m Wind (large-winged fruits): 10–100 m Rodents: 10–100 m Small to medium-sized forest birds and arboreal mammals: 100 m–1 km Flying-foxes (large seeds): 100 m–1 km Large and open-country birds: 1 km–10 km Wind (small plumed seeds): 1 km–10 km Terrestrial mammals: 1 km–10 km Wind (tiny seeds/spores, and very small plumed seeds): > 10 km Flying-foxes (small seeds): > 10 km Eucalyptus spp. (including *Eucalyptus melliodora and Eucalyptus blakelyi* characteristic of the tree growth form component of the TEC within the subject land) have very limited seed dispersal capabilities, likely in the 0–10 range or 10–100 m range for any given event and species and are considered capable of migrating across landscapes only in the order of ~71–142 m in 71 years (Booth, 2017).	• Corlett 2009 • Booth 2017 • Corangamite Seed Supply & Revegetation Network and references therein, 2006	-

Table 6.5 Impact assessment of White Box Yellow Box Blakely's Red Gum Woodland CEEC

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
	Hickory Wattle and Sticky Hop-bush are shrub species which are characteristic of the TEC and occur within the subject land. Hickory Wattle has large pods which are likely dispersed by birds and ants (Corangamite Seed Supply & Revegetation Network and references therein, 2006). This results in a maximum dispersal distance of up to 1 km by small to medium-sized forest birds. Sticky Hop-bush on the other hand is likely dispersed by wind, however, has large winged seeds which limit dispersal of the seed by up to 100 m. The subject land contains characteristic grass species of the TEC in the genera Aristida and Austrostipa and are likely to be animal-dispersed and capable of dispersing between 1 and 10 km. The grasses in the genera *Bothriochloa* spp. are likely wind-dispersed, as are most species of forbs in the family Asteraceae. The wind-dispersed grasses are likely to be capable of dispersing between 1 and 10 km. The very small plumed seeds of many species of in the Asteraceae (daisy family) are likely to be capable of dispersing more than 10 km. Many of the forb and grass species that make up the ground layer of the TEC are likely to have no specialised dispersal mechanism or to be ant-dispersed and only capable of dispersal to distances of less than 10 m.		
Area to perimeter ratio of remaining remnants (ratio)	The project is unlikely to significantly increase the edge to area ratio of remaining areas of the TEC, due to the high condition woodland patches occurring adjacent to an existing road. The existing areas of the TEC are already exposed to edge effects including weed encroachment.	-	-
Vegetation integrity analysis	Vegetation integrity for the TEC is presented in the summary table below:		

Vegetation zone	Area in subject land (ha)	VI score
PCT281_high	0.35	99.2
PCT281_medium	0.55	59.3
PCT281_pasture	284.46	2.7
PCT281_planted	2.59	55.5
PCT281_poor	3.95	39.5
Total	**291.91**	**-**

6.4.2 Threatened species

Section 9.1.2 of the BAM (DPIE 2020) requires additional impact assessment for threatened species that are also listed as candidate entities for Serious and Irreversible Impacts (SAII). An assessment of the Regent Honeyeater and Large-eared Pied Bat against the assessment criteria provided in Section 9.1.2 of BAM (DPIE 2020) are provided in Table 6.6 to Table 6.9.

i Regent Honeyeater

Table 6.6 Current status of Regent Honeyeater

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
Evidence of rapid decline (Principle 1)			
Change in population size in NSW in the past 10 years or 3 generations (indicate whether as a direct estimate of the population or if indicated by an index or surrogate).	The Regent Honeyeater has undergone a population reduction and continuing decline, with the apparent loss of some of its minor breeding populations and its two major breeding sites; Capertee Valley and Bundarra-Barraba (NSW TSSC 2021). In 1997 the global population of Regent Honeyeaters was estimated as 1,500 mature birds, with 1,000 shared between the Capertee Valley and Bundarra-Barraba breeding sites; however the Capertee Valley population declined from around 140 birds in spring 2005 to 40 birds in spring 2006 and in 2007, no breeding was detected. In autumn 2008, about 40 birds reappeared in the Capertee Valley and persisted until August. The apparent decline in the Capertee Valley, from hundreds in the mid 1990s to tens in 2008, represents a decline in index of abundance of more than 80% in three generations (15 years), although the influence of greater dispersal due to failed eucalypt flowering combined with variable survey effort may have contributed to this apparent decline. In the Bundarra-Barraba area, numbers have apparently declined from around 100 in the 1990s, to 50 birds in subsequent breeding seasons, and about 30 birds in recent years. In 2007 there was no eucalypt flowering, and no Regent Honeyeaters could be found in the Bundarra-Barraba region and northwards to Inverell-Ashford.	• NSW TSSC 2021	N/A

Table 6.6 Current status of Regent Honeyeater

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
Evidence of small population size (Principle 2)			
Current population size in NSW	As of 2010, the total population size is estimated at 350–400 mature individuals within Australia. It is estimated that the NSW population of Regent Honeyeaters may now be fewer than 250 mature individuals. A population count within NSW in 2009 resulted in a maximum count of 40 individuals.	• DE 2016 • NSW TSSC 2021 • DE 2015a	Population surveys within NSW have not been conducted since 2009/2010.
Decline in species' population size in 3 years or one generation	Data is not available on population decline within the previous three years or one generation.	No data available	Insufficient survey data exists to provide an accurate or current assessment of population trends.
Number or percentage of mature individuals in each subpopulation or whether the species is likely to undergo extreme fluctuations	Populations of Regent Honeyeaters at particular locations fluctuate greatly between years and sites, according to seasonal conditions (Garnett & Crowley 2000). The Capertree Valley population varies from around 100 birds in good years to fewer than 10 found in poor years.	• NSW TSSC 2021 • Garnett & Crowley 2000	N/A
Evidence of limited geographic range (Principle 3)			
Extent of occurrence	The global extent of occurrence (EOO) of the Regent Honeyeater was estimated as 300 000 km^2 in 2000, with a high level of confidence, with about 70% of its distribution falling in NSW. The species' EOO in NSW would therefore be less than 210 000 km^2.	• NSW TSSC 2021	The extent of occurrence has not updated since 2000.
Area of occupancy	The global area of occupancy (AOO) of the species was estimated as 250 km^2 in 2000, with a low level of confidence; most of this area (about 80%) would fall in NSW. The species' AOO in NSW would therefore be less than 200 km^2.	• NSW TSSC 2021	The area of occupancy has not updated since 2000.

Table 6.6 Current status of Regent Honeyeater

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
Number of threat-defined locations	The BAM (DPIE 2020) defines threat-defined locations as geographically or ecologically distinct areas in which a single threatening event may rapidly affect species occurrences. Where two or more subpopulations occur in an area that may be threatened by one such event, they are counted as a single location. Where a subpopulation covers an area larger than what a single event is likely to impact, this is counted as two or more locations. The main threats to the Regent Honeyeater are clearing, fragmentation and degradation of its habitat (DE 2015a and references therein). The Regent Honeyeater occurs as breeding sub-populations in NSW, which are fragmented and now occur mainly around the Capertee Valley in central-eastern NSW and the Bundarra-Barraba region in northern inland NSW. Each of these sub-populations are likely to represent a separate threat-defined location.	• DE 2015a and references therein	N/A
Whether the species' population is likely to undergo extreme fluctuations	Populations of Regent Honeyeaters at particular locations fluctuate greatly between years and sites, according to seasonal conditions (Garnett & Crowley 2000). The Capertree Valley population varies from around 100 birds in good years to fewer than 10 found in poor years.	• Garnett & Crowley 2000 • NSW TSSC 2021	N/A

Table 6.7 SAII assessment for Regent Honeyeater

Assessment question	Response
Number of individuals (mature and immature) present in the subpopulation on the subject land	The subject land does not contain any previous records of Regent Honeyeater (BioNet). The purpose of the SAII assessment is due to potential foraging habitat occurring within the subject land. The nearest previously recorded Regent Honeyeater was located approximately 11 km from the subject land, associated with Tuckland State Forest.
Number of individuals (mature and immature) present as a percentage of total NSW population (%)	As above, the subject land does not contain any known occurrences of the Regent Honeyeater (in the form of previous records).
Number of individuals (mature and immature) to be impacted by the proposal	The number of individuals expected to be impacted by the proposal is unknown. This is due to the subject land containing potential foraging habitat, and not containing any known occurrences of the species. The potential foraging habitat within the subject land occurs across 8.62 ha, which may support a small number of individuals of the species if it was to occur.
Individuals (mature and immature) to be impacted by the proposal as a percentage of total NSW population (%)	As above, the subject land does not contain any known occurrences of the Regent Honeyeater. Given the small area of potential foraging habitat in the subject land (when compared to habitat within the locality), a small proportion of the total NSW population could be impacted.
Area of habitat to be impacted (ha) (for species measured by area only)	8.62 ha of potential foraging habitat would be impacted by the project.
Area of the species' geographic range to be impacted by the proposal	The estimated geographic range of Regent Honeyeater is 210 000 km^2. The 8.62 ha of potential habitat within the subject land represents less than 0.0001% of the species' geographic range.
Area of the species' geographic range to be impacted as a percentage of the total area or extent of occupancy (%)	8.62 ha of potential foraging habitat within the subject land represents 0.04 % of the species known area of occupancy (less than 200 km^2).
Individuals impacted	No known occurrences of Regent Honeyeater will be impacted. The potential foraging habitat within the subject land occurs across 8.62 ha, which may support a small number of individuals of the species if it was to occur.
Viability of a fragmented population	No known population is likely to be fragmented because of the proposed development. The 8.62 ha of potential foraging habitat within the subject land occurs in a fragmented landscape, however, is still connected to additional foraging habitat to the south. The species is also highly mobile; the removal of 8.62 ha of foraging habitat is unlikely to fragment surrounding individuals or populations.

ii Large-eared Pied Bat

Table 6.8 Current status of Large-eared Pied Bat

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
Evidence of rapid decline (Principle 1)			
Change in population size in NSW in the past 10 years or 3 generations (indicate whether as a direct estimate of the population or if indicated by an index or surrogate).	The species is listed as vulnerable under the EPBC act on the basis of population decline (DERM 2011). Data is not available on population decline.	No data available	Insufficient survey data exists to provide an accurate or current assessment of population trends.
Evidence of small population size (Principle 2)			
Current population size in NSW.	Data is not available on population decline.	No data available	Insufficient survey data exists to provide an accurate or current assessment of population trends.
Decline in species' population size in 3 years or one generation.	Data is not available on population decline.	No data available	Insufficient survey data exists to provide an accurate or current assessment of population trends.
Number or percentage of mature individuals in each subpopulation or whether the species is likely to undergo extreme fluctuations.	Data is not available on population fluctuations.	No data available	Insufficient survey data exists to provide an accurate or current assessment of population trends.
Evidence of limited geographic range (Principle 3)			
Extent of occurrence.	The EOO of the Large-eared Pied Bat is estimated as 400,000 km^2 within NSW, QLD and ACT, with about 65% of its distribution falling in NSW.	(DERM 2011).	These area calculations have been estimated from information provided in DERM 2011.
Area of occupancy.	The estimated AOO for the Large-eared Pied Bat is around 250,000 km^2 in NSW.	(DERM 2011).	These area calculations have been estimated from information provided in DERM 2011.

Table 6.8 Current status of Large-eared Pied Bat

Criteria	Data/information	Data sources	Details of data deficiency, assumptions, reasons for low confidence in information
Number of threat-defined locations.	The BAM (DPIE 2020) defines threat-defined locations as geographically or ecologically distinct areas in which a single threatening event may rapidly affect species occurrences. Where two or more subpopulations occur in an area that may be threatened by one such event, they are counted as a single location. Where a subpopulation covers an area larger than what a single event is likely to impact, this is counted as two or more locations. The main threats to the Large-eared Pied Bat are: • Destruction of and interference with maternity and other roosts. • Mining of roosts. • Mine induced subsidence of cliff lines. • Disturbance from human recreational activities. • Habitat disturbance by other animals, including livestock and feral animals. • Predation by introduced predators. • Vegetation clearance in the proximity of roosts. • Fire in the proximity of roosts. • Loss of genetic diversity. It has not been determined if specific populations of the Large-eared Pied Bat are at higher threat levels than others. A better understanding of distribution, population size, roost preference and threats is required before particular populations can be identified as being under greater threat than others. Proposed surveys and research will better identify the populations under direct threat and allow management plans to be developed in order to target a reduction in pressure to these populations (DERM 2011).	(DERM 2011).	Maternity caves are likely to be where this species is most at risk.
Whether the species' population is likely to undergo extreme fluctuations	Data is not available on population fluctuations.	No data available	Insufficient survey data exists to provide an accurate or current assessment of population trends.

Table 6.9 SAII assessment for Large-eared Pied Bat

Assessment question	Response
Number of individuals (mature and immature) present in the subpopulation on the subject land	The size of the population in the locality has not been comprehensively studied. There is a total of 62 records of Large-eared Pied Bat within the BioNet database from within a 20 km radius of the subject land (BCS 2021). No key management sites occur within or surrounding the subject land. There are no caves or roosting habitat within the subject land. The proposal will result in the clearing of approximately 0.48 ha of potential foraging/hunting habitat within 2 km of potential breeding habitat. This is considered a relatively minor reduction in available foraging habitat in comparison the available higher quality foraging habitat within the locality.
Number of individuals (mature and immature) present as a percentage of total NSW population (%)	The subject land does not contain any roosting habitat and is only likely to be utilised for foraging/hunting and bats flying over while dispersing to other locations to hunt or roost.
Number of individuals (mature and immature) to be impacted by the proposal	The proposal is not likely to impact any individuals of Large-eared pied Bat. The proposal will slightly reduce the amount of foraging/hunting habitat within the locality by 0.48 ha.
Individuals (mature and immature) to be impacted by the proposal as a percentage of total NSW population (%)	As mentioned above, the proposal is not likely to impact any individuals of Large-eared pied Bat. The proposal will slightly reduce the amount of foraging/hunting habitat within the locality by 0.48 ha.
Area of habitat to be impacted (ha) (for species measured by area only)	0.48 ha of potential foraging/hunting habitat.
Area of the species' geographic range to be impacted by the proposal (ha)	0.48 ha of foraging/hunting habitat to be removed by the proposal is a negligible amount considering the species has a geographic range around 400,000 km^2, or 40 million hectares.
Area of the species' geographic range to be impacted as a percentage of the total area or extent of occupancy (%)	The amount of foraging/hunting habitat to be removed by the proposal is a negligible amount in comparison to the extent of occupancy.
Individuals impacted	No known occurrences of Large-eared Pied Bat will be impacted. The potential foraging/hunting habitat within the subject land occurs across 0.48 ha, which may support a small number of individuals of the species if it was to occur.
Viability of a fragmented population	No known population is likely to be fragmented because of the proposed development. The 0.48 ha of potential foraging/hunting habitat within the subject land occurs in a fragmented landscape, however large areas of foraging habitat exist within the locality. The species is also highly mobile; the removal of 0.48 ha of foraging habitat is unlikely to fragment surrounding individuals or populations, considering these small and highly fragmented woodland patches are already surround by predominately exotic pasture.

6.5 Impacts not requiring offsets

In accordance with Section 9.2.1 of BAM (DPIE 2020), impacts on vegetation zones and threatened species habitat do not require offsets where:

- a vegetation zone representative of a critically endangered or endangered ecological community has a vegetation integrity score less than, or equal to, 15;
- a vegetation zone representative of a vulnerable ecological community and/or threatened species habitat has a vegetation integrity score less than, or equal to, 17; and/or
- a vegetation zone that is not listed has a vegetation integrity score less than, or equal to, 20.

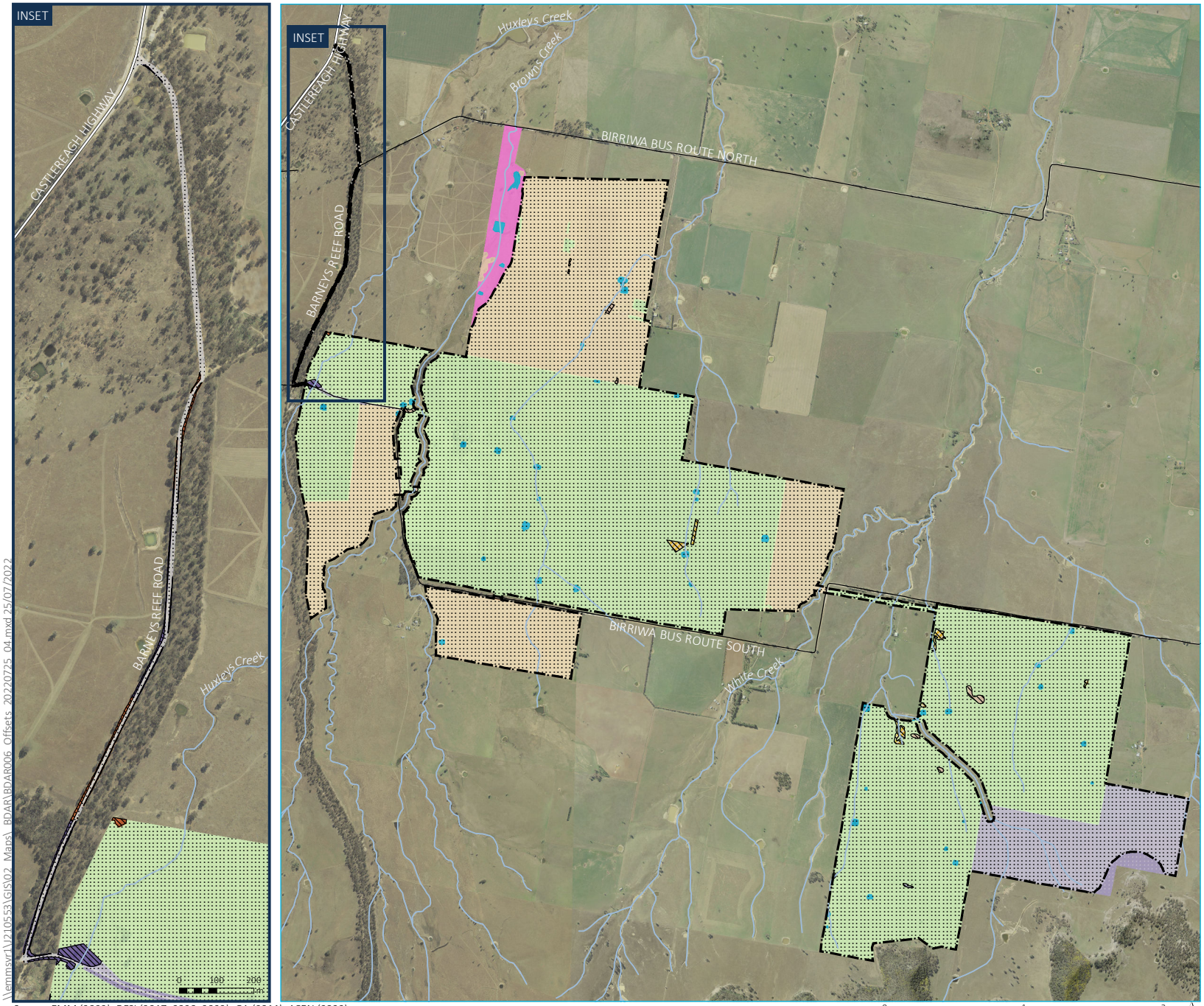
Table 6.10 and Figure 6.1 provide a summary of the vegetation zones that do not trigger the above thresholds.

Table 6.10 Summary of impacts not requiring offsets – ecosystem credits

Vegetation zone	PCT	Vegetation zone name	Area (ha)	Current VI score	Future VI score	Change in VI score	Biodiversity risk weighting	Ecosystem credits required
2	PCT 80 – Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	80_Pasture	75.62	4.8	0.0	-4.8	2	0
6	PCT 281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	281_Pasture	284.46	2.7	0.0	-2.7	2.5	0
Total number of ecosystem credits required								**0**

Areas not requiring assessment in accordance with Section 9.3 of BAM (DPIE 2020) include:

- existing roads;
- cleared and highly disturbed land; and
- watercourses.



KEY

- Subject land
- Impacts requiring offsets
- Impacts not requiring offsets

Existing environment

- Major road
- Minor road
- Watercourse/drainage line
- Cleared
- Dam
- Exotic (trees, grassland)

Plant community type

PCT 80 | Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

- High
- Poor
- Derived native grassland (DNG)
- Pasture

PCT 281 | Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

- High
- Medium
- Poor
- Pasture
- Planted
- Tussock

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Source: EMM (2022); DFSI (2017, 2020, 2022); GA (2011); ACEN (2022)

Impacts requiring offsets, impacts not requiring offsets and areas not requiring assessment

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Figure 6.1

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6.6 Impacts requiring offset

This section provides an assessment of the impacts requiring offsetting in accordance with Section 9.2 of BAM (DPIE 2020).

i Impacts on native vegetation

Impacts to native vegetation requiring offsets include:

- direct impacts on 1.18 ha of PCT 80 – Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion; and
- direct impacts on 7.45 ha of PCT 281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion.

A summary of the ecosystem credits required for all vegetation zones, including changes in vegetation integrity score, are provided in Table 6.11 and shown in Figure 6.1. A total of 281 ecosystem credits are required to offset the residual impacts of the project. A credit report is provided in Appendix 7.

Offsets will be provided through implementation of the biodiversity offset scheme.

Table 6.11 Summary of impacts requiring offsets – ecosystem credits

Vegetation zone number	PCT	Vegetation zone name	Area (ha)	Current VI score	Future VI score	Change in VI score	Biodiversity Risk Weighting	Ecosystem credits required
1	PCT 80 – Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	80_High	1.01	95.3	0.0	-95.3	2	48
3	PCT 80 – Western Grey Box – White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	80_Poor	0.17	41.1	0.0	-41.1	2	3
4	PCT 281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	281_High	0.35	99.2	0.0	-99.2	2.5	22
5	PCT 281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	281_Medium	0.55	59.3	0.0	-59.3	2.5	20
7	PCT 281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	281_Planted	2.59	55.5	0.0	-55.5	2.5	90
8	PCT 281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	281_Poor	3.95	39.5	0.0	-39.5	2.5	98
Total number of ecosystem credits required								**281**

ii Impacts on threatened species

Impacts to threatened species habitat requiring offsets include:

- direct impacts on 0.48 ha of foraging habitat for the Large-eared Pied Bat;
- direct impacts on 3.88 ha of habitat for the Barking Owl;
- direct impacts on 3.88 ha of habitat for the Powerful Owl;
- direct impacts on 8.62 ha of habitat for the Koala; and
- direct impacts on 3.88 ha of habitat for the Masked Owl.

A summary of the species credits required for all vegetation zones occupied by the threatened species, including changes in vegetation integrity score, are provided in Table 6.12 and Figure 6.2. A total of 350 species credits are required to offset the residual impacts of the project. A credit report is provided in Appendix 7.

Table 6.12 Impacts that require offsets – species credits

Species	Vegetation zone name	Area (ha)/individual (HL)	Habitat condition (VI score)	Future habitat condition	Loss of habitat condition (VI loss)	Candidate SAII	Biodiversity Risk Weighting	Species credits required
Large-eared Pied Bat	281_Planted	0.19 ha	55.5	0.0	-55.5	Yes	3	8
	281_Poor	0.12 ha	39.5	0.0	-39.5			4
	80_Poor	0.17 ha	41.1	0.0	-41.1			5
Barking Owl	281_DNG	3.28 ha	2.7	0.0	-2.7	No	2	4
	281_High	0.18 ha	99.2	0.0	-99.2			9
	80_High	0.42 ha	95.3	0.0	-95.3			20
Powerful Owl	281_DNG	3.28 ha	2.7	0.0	-2.7	No	2	4
	281_High	0.18 ha	99.2	0.0	-99.2			9
	80_High	0.42 ha	95.3	0.0	-95.3			20
Koala	80_High	1.01	95.3	0.0	-95.3	No	2	48
	80_Poor	0.17	41.1	0.0	-41.1			3
	281_High	0.35	99.2	0.0	-99.2			17
	281_Medium	0.55	59.3	0.0	-59.3			16
	281_Planted	2.59	55.5	0.0	-55.5			72
	281_Poor	3.95	39.5	0.0	-39.5			78
	281_DNG	3.28 ha	2.7	0.0	-2.7	No	2	4
	281_High	0.18 ha	99.2	0.0	-99.2			9
Masked Owl	80_High	0.42 ha	95.3	0.0	-95.3			20
Total number of species credits required								**350**

KEY

- Subject land
- Koala species polygon
- Large-eared Pied Bat species polygon
- Owl species polygon
  - Masked Owl
  - Powerful Owl
  - Barking Owl

Existing environment

- Major road
- Minor road
- Watercourse/drainage line

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Source: EMM (2022); DFSI (2017, 2020, 2022); GA (2011); ACEN (2022)

Species polygons

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Figure 6.2

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6.7 Biodiversity offset strategy

Offsets will be provided in accordance with the Biodiversity Offset Scheme.

Regarding the satisfaction of credit obligations prior to commencing any on-ground works for the project, it is ACEN's intent to upgrade the site access before the solar component, to enable a staged offset delivery model. This strategy is based on clearly defined stages of vegetation clearing for the project, with the road upgrade corridor forming the first stage and the solar farm (all other development areas) forming the second stage. It is ACEN's intent to meet the offset obligations for the road, then separately meet offsets for the solar components (all other development areas). This allows flexibility in starting construction for the road and solar components separately to each other.

As the BAMC for the project combines all impact areas related to the project (i.e. they are not split by road corridor and all other development areas), the following equations (as per Section 9.2 of the BAM, DPIE 2020) have been manually calculated used to determine the split of credits by project components:

- *Equation 1: Determine the number of ecosystem credits required for the impact on vegetation that is a TEC, contain threatened species habitat, or is any other PCT* (refer to Plate 6.1); and
- *Equation 2: Determine the number of fauna species credits or flora species credits required for the impact of development, activity, clearing or biodiversity certification* (refer to Plate 6.2).

Equation 1 Determine the number of ecosystem credits required for the impact on vegetation that is a TEC, contains threatened species habitat, or is any other PCT

$$\text{Ecosystem credits required for each vegetation zone} = \sum_{i=1}^{n} (\Delta\text{VI Loss} \times BRW \; x \; area) \; x \; 0.25$$

where:

i = the i^{th} vegetation zone on land directly impacted by the proposal

ΔVI Loss = the change (loss) in the vegetation integrity score of a vegetation zone at the development site as determined by Equation 27

BRW = means the biodiversity risk weighting applied to the vegetation zone. The biodiversity risk weighting for a TEC or a PCT containing threatened species habitat is based on the sensitivity to loss class of the TEC/PCT and the highest sensitivity to gain class of the predicted threatened species. For a PCT or TEC not associated with threatened species habitat, the sensitivity to loss class for the PCT or TEC is used with the low sensitivity gain class

area = the area in hectares of the vegetation zone

Plate 6.1 Equation 1, section 9.2 of the BAM (DPIE 2020)

Equation 2 Determine the number of fauna species credits or flora species credits required for the impact of development, activity, clearing or biodiversity certification

$$Number\ of\ fauna\ or\ flora\ species\ credits\ required = [\sum_{n=i}(HC_i \times HL_i)] \times BRW \times 0.25$$

where:

HC_i = the condition of fauna or flora habitat within each vegetation zone (or portion thereof) which occurs within the i^{th} species polygon

HL_i = the area of habitat within each vegetation zone (or portion thereof) which occurs within the i^{th} species polygon for the development site or biodiversity certification proposal, prepared in accordance with Box 2

$HC_i \times HL_i$ is summed for each vegetation zone (or portion thereof) which occurs within the i^{th} species polygon

BRW = the biodiversity risk weighting for the species as set out in the TBDC

Plate 6.2 Equation 2, section 9.2 of the BAM (DPIE 2020)

The results of the ecosystem credit calculations for the road corridor (stage one of the proposed offset strategy) are shown in Table 6.13.

Table 6.13 Ecosystem credit requirements – road corridor

Vegetation zone	Area (ha)	Current VI	Future VI	Change in VI	Biodiversity Risk Weighting	Credits required (road corridor)
281_High	0.30	99.20	0.00	-99.20	2.50	**19**
281_Medium	0.00	59.30	0.00	-59.30	2.50	0
281_Pasture[1]	0.26	2.70	0.00	-2.70	2.50	-
281_Planted	0.00	55.50	0.00	-55.50	2.50	0
281_Poor	0.00	39.50	0.00	-39.50	2.50	0
80_High	0.49	95.30	0.00	-95.30	2.00	**23**
80_Pasture[1]	0.24	4.80	0.00	-4.80	2.00	-
80_Poor	0.00	41.10	0.00	-41.10	2.00	0
Totals	**1.29**					**42**

Notes: 1. The VI score of both PCT 281_Pasture and PCT 80_Pasture are below the condition threshold for requiring offset.

The results of the ecosystem credit calculations for all other development areas (stage two of the proposed offset strategy) are shown in Table 6.14.

Table 6.14 Ecosystem credit requirements – all other development areas

Vegetation zone	Area (ha)	Current VI	Future VI	Change in VI	Biodiversity Risk Weighting	Credits required (all other development areas)
281_High	0.05	99.20	0.00	-2.50	2.50	3
281_Medium	0.55	59.30	0.00	-2.50	2.50	20
281_Pasture[1]	284.20	2.70	0.00	-2.50	2.50	-
281_Planted	2.59	55.50	0.00	-2.50	2.50	90
281_Poor	3.95	39.50	0.00	-2.50	2.50	98
80_High	0.52	95.30	0.00	-2.00	2.00	25
80_Pasture[1]	75.38	4.80	0.00	-2.00	2.00	-
80_Poor	0.17	41.10	0.00	-2.00	2.00	3
Totals	**367.41**					**239**

Notes: 1. The VI score of both PCT 281_Pasture and PCT 80_Pasture are below the condition threshold for requiring offset.

The results of the species credit calculations for the road corridor (stage one of the proposed offset strategy) are shown in Table 6.15, with results of the species credit calculations for all other development areas (stage two of the proposed offset strategy) shown in Table 6.16.

Table 6.15 Species credit requirements – road corridor

Species polygons	Area (ha)	Habitat condition (VI)	Future habitat condition	Change in habitat condition	Biodiversity Risk Weighting	Credits required (road corridor)
Large-eared Pied Bat						
80_Poor	0.00	41.10	0.00	-41.10	3.00	0
281_Planted	0.00	55.50	0.00	-55.50	3.00	0
281_Poor	0.00	39.50	0.00	-39.50	3.00	0
Barking Owl						
80_High	0.22	95.30	0.00	-95.30	2.00	11
281_High	0.18	99.20	0.00	-99.20	2.00	9
281_Pasture	0.00	2.70	0.00	-2.70	2.00	0
Powerful Owl						
80_High	0.22	95.30	0.00	-95.30	2.00	11
281_High	0.18	99.20	0.00	-99.20	2.00	9
281_Pasture	0.00	2.70	0.00	-2.70	2.00	0
Koala						
80_High	0.49	95.30	0.00	-95.30	2.00	23
80_Poor	0.00	41.10	0.00	-41.10	2.00	0
281_High	0.30	99.20	0.00	-99.20	2.00	15
281_Medium	0.00	59.30	0.00	-59.30	2.00	0
281_Planted	0.00	55.50	0.00	-55.50	2.00	0
281_Poor	0.00	39.50	0.00	-39.50	2.00	0
Masked Owl						
80_High	0.22	95.30	0.00	-95.30	2.00	11
281_High	0.18	99.20	0.00	-99.20	2.00	9
281_Pasture	0.00	2.70	0.00	-2.70	2.00	0
Total						**98**

Table 6.16 Species credit requirements – all other development areas

Species polygons	Area (ha)	Habitat condition (VI)	Future habitat condition	Change in habitat condition	Biodiversity Risk Weighting	Credits required (all other development areas)
Large-eared Pied Bat						
80_Poor	0.17	41.10	0.00	-41.10	3.00	5
281_Planted	0.19	55.50	0.00	-55.50	3.00	8
281_Poor	0.12	39.50	0.00	-39.50	3.00	4
Barking Owl						
80_High	0.18	95.30	0.00	-95.30	2.00	9
281_High	0.00	99.20	0.00	-99.20	2.00	0
281_Pasture	3.28	2.70	0.00	-2.70	2.00	4
Powerful Owl						
80_High	0.18	95.30	0.00	-95.30	2.00	9
281_High	0.00	99.20	0.00	-99.20	2.00	0
281_Pasture	3.28	2.70	0.00	-2.70	2.00	4
Koala						
80_High	0.52	95.30	0.00	-95.30	2.00	25
80_Poor	0.17	41.10	0.00	-41.10	2.00	3
281_High	0.05	99.20	0.00	-99.20	2.00	2
281_Medium	0.55	59.30	0.00	-59.30	2.00	16
281_Planted	2.59	55.50	0.00	-55.50	2.00	72
281_Poor	3.95	39.50	0.00	-39.50	2.00	78
Masked Owl						
80_High	0.18	95.30	0.00	-95.30	2.00	9
281_High	0.00	99.20	0.00	-99.20	2.00	0
281_Pasture	3.28	2.70	0.00	-2.70	2.00	4
Total						**252**

A summary of the total credit requirements (ecosystem and species) for the road corridor (first stage) and the solar farm (all other development areas) (second stage) is provided within Table 6.17.

Table 6.17 Summary of staged offset delivery

PCT/species	1 - road corridor		2 - all other development areas		Total project credits
	Area (ha)	Credits[1]	Area (ha)	Credits[1]	
PCT 281	0.56	19	291.34	211	
PCT 80	0.73	23	76.07	28	
Total PCT credits		**42**		**239**	**281**
Large-eared Pied Bat	0.00	0	0.48	17	
Barking Owl	0.41	20	3.47	13	
Powerful Owl	0.41	20	3.47	13	
Koala	0.79	38	7.83	196	
Masked Owl	0.41	20	3.47	13	
Total species credits		**98**		**252**	**350**

Notes: 1. All zones of PCTs 281 and 80 requiring offset, require Hollow Bearing Tree (HBT) credits (refer like-for-like credit report, Appendix 7)

7 Assessment of other relevant biodiversity legislation

7.1 Environment Protection and Biodiversity Conservation Act 1999

This section provides an assessment of the project's impacts specific to species and communities listed under the EPBC Act (together defined as MNES).

7.1.1 Likelihood of occurrence assessment

The Protected Matters Search Tool (PMST) (DAWE 2022d) (Appendix 4) produced a list of MNES that may occur within the subject land. A likelihood of occurrence (LoO) assessment was undertaken to assess the likelihood that these MNES could occur within or adjacent to the subject land. The criteria for assessing LoO for the list of MNES predicted by the PMST is listed in Table 7.1.

Table 7.1 Likelihood of occurrence criteria

Likelihood	Description	Further assessment conducted?
Negligible	• The potential for the species to occur in the subject land is considered so unlikely as to not be worth considering.	No
Low	• Based on data collected during field investigations it was considered that the species was unlikely to occur in the subject land or use habitats in the subject land. The species may utilise the study area on rare occasions. • The species is considered vagrant in the bioregion and is thus considered unlikely to occur in the subject land.	No
Moderate	• The species is known to occur in the locality and the subject land provides some habitat value for the species. Habitat values are somewhat degraded and considered suboptimal.	Yes
High	• The species is known to occur in the locality and the subject land supports optimal habitat features for the species.	Yes
Known	• The species has been recorded during current surveys.	Yes

The LoO assessment is provided in Appendix 5, with a summary of the assessment presented in the following sections.

i Threatened ecological communities

Three TECs were predicted to occur within the subject land by the PMST (DAWE 2022d) (Appendix 4):

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

PCT 281 is consistent with White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered ecological community (CEEC). PCT 80 is consistent with Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia Endangered ecological community (EEC).

The EPBC listing for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is dependent on condition, patch size and presence or absence of important species. Table 7.2 outlines the assessment process taken place to determine whether the vegetation zones (in relation to associated BAM plots) within the subject land conform to the EPBC listing (DEH 2006).

Table 7.2 EPBC listing determination against White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland criteria (DEH 2006)

Question	Criteria	Determination	Associated BAM plot	Discussion	Condition pathway
1	Is, or was previously, at least one of the most common overstorey species White Box, Yellow Box or Blakely's Red Gum (or Western Grey Box or Coastal Grey Box in the Nandewar Bioregion)?	Yes	All plots	All vegetation zones are dominated by Yellow Box or Blakely's Red Gum, or are considered to be a derived grassland from the TEC.	Move to question 2
2	Does the patch have a predominantly native understorey?	Yes	Plots 8, 10, 11, 15, 18, 19 and 20.	Percentages range from 69% to 99% cover.	Move to question 3
		No	Plots 1, 2, 3, 4, 5, 6, 16 and 17.	Percentages fall below 50% cover. These plots do not meet the condition threshold.	Not listed under the EPBC Act
3	Is the patch 0.1 ha or greater in size?	Yes	Plots 8, 10, 11, 15, 18, 19 and 20.	Patch sizes range from 0.51 ha to greater than 49 ha.	Move to question 4
4	There are 12 or more native understorey species present (excluding grasses). There must be at least one important species.	Yes	Plots 8, 10 and 11.	These plots range from 14 to 20 native understorey species with 5 to 9 important species.	**These plots meet the EPBC Act condition thresholds. These plots occur within the PCT 281_High vegetation condition**
		No	Plots 15, 18, 19 and 20.	These plots do not have at least 12 or more native understorey species present.	Move to question 5
5	Is the patch 2 ha or greater in size?	Yes	Plot 18	Patch size is greater than 49 ha.	Move to question 6
		No	Plots 15, 19 and 20.	Patch sizes range from 0.51 ha to 1.9 ha.	Not listed under the EPBC Act
6	Does the patch have an average of 20 or more mature trees per hectare, or is there natural regeneration of the dominant overstorey eucalypts?	No	Plot 18	Plot 18 is associated with 281_pasture vegetation zone- no canopy or regeneration of canopy is present.	Not listed under the EPBC Act

The EPBC listing for Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia Endangered ecological community (EEC) is also dependent on a number of condition thresholds (DEWSPaC 2012). Table 7.3 outlines the assessment process taken place to determine whether the vegetation zones (in relation to associated BAM plots) within the subject land and study area conform to the EPBC listing (DEWSPaC 2012).

Table 7.3 EPBC listing determination against Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands criteria (DEWSPaC 2012)

Question	Criteria	Determination	Associated BAM plot	Discussion	Condition pathway
1	Is the property within or near the area shown on the Grey Box Grassy Woodland distribution map on page 13?	Yes	All plots	The subject land is located within the mapped distribution.	Move to question 2
2	Is at least 50% of the plant cover in the ground layer made up of perennial native species? OR Is at least 10% of plant cover in ground layer made up of perennial native grass species?	Yes	All plots	All plots with the exception of plot 27, range in percentage from 64% to 99% perennial native species. Plot 27 has a percentage of 49%, however does have a perennial native grass cover of 26%.	Move to question 3
3	Is (or was previously) the most common tree species (or group of species) one of the following? Grey box (*Eucalyptus microcarpa*)	Yes	All plots	All plots have or were previously associated with Grey Box.	Move to question 4 (Flowchart 2)
4	Is the patch at least 0.5 ha in size?	Yes	Plots 7, 9, 12, 13, 24, 25, 26 and 27.	Patch sizes range from greater than 2 ha to greater than 80 ha.	Move to question 5
		No	Plot 21	Plot 21 has a patch size of 0.102 ha.	Not listed under the EPBC Act
5	Do non-grass weeds make up more than 30% of the plant cover in the ground layer?	No	Plots 7, 9, 12, 13, 24, 25, 26 and 27.	Percentage of non-grass weed cover ranges from 0.7% to 27.4%.	Move to question 6
6	Do trees cover at least 10% of patch?	Yes	Plots 7, 9 and 12.	Tree cover ranges from 30% to 35%.	Move to question 7
		No	Plots 13, 24, 25, 26 and 27.	These plots are associated with 80_pasture vegetation zone, no canopy is present.	Move to question 10.
7	Is the patch bigger than 2 ha?	Yes	Plots 7, 9 and 12.	Patch sizes range from greater than 2 ha to 5.58 ha.	Move to question 8

Table 7.3 EPBC listing determination against Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands criteria (DEWSPaC 2012)

Question	Criteria	Determination	Associated BAM plot	Discussion	Condition pathway
8	Are there at least 8 trees/ha: a) that contain hollows; or b) have a diameter >60 cm at 1.3 m above ground level?	Yes	Plots 7, 9 and 12.	These plots all have suitable tree density per hectare with trees greater than 60 DBH and hollows	Move to question 9
9	Is at least 10% of the plant cover in the ground layer made up of perennial native grass species?	Yes	Plots 7, 9 and 12.	Percentages range from 20% to 68.5%.	**These plots meet the EPBC Act condition thresholds. These plots occur within the PCT 80_High vegetation condition**
10	Is there evidence that Grey Box trees were once common in the patch?	Yes	Plots 13, 24, 25, 26 and 27.	It is evident from surrounding vegetation that Grey Box was historically common.	Move to question 11
11	Are there at least 12 perennial native species in the mid and ground layers?	Yes	Plot 13	This plot has 19 perennial native species.	Move to question 12
		No	Plots 24, 25, 26 and 27.	Perennial native species diversity ranges from 5 to 9 species.	Not listed under the EPBC Act.
12	Is at least 50% of the plant cover in the ground layer made up of perennial native species?	Yes	Plot 13	This plot has 80.8% of perennial native species.	**Meets EPBC Act condition threshold. Vegetation zone 80_DNG has been excluded from the subject land to avoid impacts.**

No Weeping Myall Woodlands TEC occurs within the study area.

ii Threatened species

The PMST (DAWE 2022d) and/or BAMC predicted that 43 species listed as a threatened species under the EPBC Act could occur within the subject land. The likelihood of occurrence for these species is assessed in Appendix 5. One EPBC Act listed species was recorded in the subject land; Koala. Five species were considered to have a moderate to high likelihood of occurrence following the desktop assessment and field survey. These species include:

- Koala (*Phascolarctos cinereus*)- recorded within the subject land;
- Painted Honeyeater (*Grantiella picta*);
- Regent Honeyeater (*Anthochaera phrygia*);
- White-throated Needletail (*Hirundapus caudacutus*);
- Gang-gang Cockatoo (*Callocephalon fimbriatum*); and
- Large-eared Pied Bat (*Chalinolobus dwyeri*).

The significant impact assessments are provided in Appendix 6, with the results of the assessments listed in Table 7.4.

iii Migratory species

Eleven species listed as migratory species under the EPBC Act were predicted to occur in the subject land based on database searches undertaken. Three of these species have already been assessed as they are also listed as a threatened species under the EPBC Act (Appendix 5). An assessment of the likelihood of the remaining eight migratory species utilising habitat within the subject land was carried out. No species listed as migratory or marine under the EPBC Act were recorded as being present in subject land. One migratory species is considered to have moderate likelihood of occurrence in the subject land; White-throated Needletail.

An impact assessment based on the migratory specification for the White-throated Needletail has been completed (Appendix 6). The remaining migratory species may fly high over the subject land but are unlikely to utilise the vegetation or other habitats present at or near ground level.

7.1.2 Significant impact assessments results

Two TECs and five species listed under the EPBC Act were considered to have a moderate to known likelihood of occurrence following the desktop assessment and field survey. These species and the result of the significant impact assessment are listed in Table 7.4. As outlined in Table 7.4, the project is considered unlikely to significantly impact the identified TECs and species considered to have moderate to known likelihood of occurrence within the subject land. Notwithstanding, ACEN expects to submit a referral under the EPBC Act to DCCEEW prior to commencing construction of the project.

Table 7.4 TECs and species considered to have moderate to known likelihood of occurrence and subject to significant impact assessments

Scientific name	Common name	EPBC status	Likelihood of occurrence	Significant impact assessment result
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC	-	Critically Endangered	Known	Unlikely
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia EEC	-	Endangered	Known	Unlikely
Phascolarctos cinereus	Koala	Endangered	Known	Unlikely
Anthochaera phrygia	Regent Honeyeater	Critically Endangered	Moderate	Unlikely
Callocephalon fimbriatum	Gang-gang Cockatoo	Endangered	Moderate	Unlikely
Grantiella picta	Painted Honeyeater	Vulnerable	Low	Unlikely
Hirundapus caudacutus	White-throated Needletail	Vulnerable; Migratory	Low	Unlikely
Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	Moderate	Unlikely

7.2 Fisheries Management Act 1994

As discussed in Section 3.1.2, Browns Creek and White Creek are mapped as KFH (DPI 2021b). These creeks, in addition to Huxleys Creek, are also mapped within the freshwater threatened species distribution for the Purple-Spotted Gudgeon (*Mogurnda adspersa*) (DPI 2021a).

A likelihood of occurrence assessment for species listed under the FM Act was conducted based on database searches (Section 1.6, Appendix 5) and concluded that no aquatic threatened ecological communities, endangered populations or species have a moderate to high likelihood of occurring within the subject land.

7.3 Biosecurity Act 2015

Two state priority weeds identified in the *Central Tablelands Regional Strategic Weed Management Plan 2017-2022* (LLS, 2017) were identified within the subject land:

- Coolatai Grass (*Hyparrhenia hirta*); and
- St. Johns Wort (*Hypericum perforatum*).

The Mid-Western Regional Council and Warrumbungle LGA are classed as a core infestation areas for Coolatai Grass (DPI n.d). Land managers should mitigate spread from their land and reduce impacts from the plant on priority assets. The St John's Wort is regulated with a regional recommended measure to mitigate spread on land whilst the plant should not be bought, sold, grown, carried or released into the environment. An additional measure is to protect grazing land that is free of St. John's wort.

The biodiversity management plan for the project would directly address the control of both these priority weeds.

If any other priority weeds of NSW are identified in the subject land during construction, they must be removed from the subject land. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable. Conservation areas, natural environments and primary production lands should be protected that are free of the priority weeds.

8 Conclusion

This BDAR has been prepared based on the requirements of, and information provided under, the BAM (DPIE 2020) and clause 6.15 of the BC Act.

The mitigation actions recommended within this BDAR have been developed in parallel with, and have informed the evolution of, the project design. This process has ensured the avoidance and minimisation of biodiversity constraints as far as practicable. Residual impacts include:

- loss of 76.80 ha of PCT 80, of which 1.18 ha requires offsetting, and associated habitat for flora and fauna species; and
- loss of 291.91 ha of PCT 281, of which 7.45 ha requires offsetting, and associated habitat for flora and fauna species.

Mitigation and management measures have been proposed to address predicted impacts on biodiversity. These include pre-clearance, construction, and operational phase measures to avoid impacts at all stages of the project.

The offset requirements determined for the project are summarised in Table 8.1.

Table 8.1 Summary of credit requirements

Entity	Area (ha)/count	Number of credits
PCT 80	76.80 ha	51
PCT 281	291.91 ha	230
Large-eared Pied Bat	0.48 ha	17
Barking Owl	3.88 ha	33
Powerful Owl	3.88 ha	33
Koala	8.62 ha	234
Masked Owl	3.88 ha	33

This BDAR has informed assessments of SAII TECs and species which occur or have the potential to occur within the subject land:

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland;
- Regent Honeyeater; and
- Large-eared Pied Bat.

ACEN will compensate for these residual impacts through the implementation of a biodiversity offset strategy.

The BDAR has also considered impacts on species and ecological communities listed under the EPBC Act. The proposed development is not expected to result in significant impacts to MNES including threatened ecological communities and species, and migratory species.

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Appendix 1

Vegetation integrity assessment field datasheets

EMM
creating opportunities

BAM Site – Field Survey Form

Plot ID:	Plot 1	**Date:**	26/10/21	**Project number:**	J210553	**Plot dimensions:**	20 x 20
Datum:	GDA94	**Easting:**	734,804	**Recorders:**	ED		
Zone:	55	**Northing:**	6,443,167	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	165
Plant Community Type:	281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion			**Condition class:**	Pasture	**PCT confidence:**	high
Vegetation Class:	Western Slopes Grassy Woodlands			**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	3
	Forbs:	6
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	22.1
	Forbs:	0.7
	Ferns:	0
	Other:	0
High Threat Weed cover:		7

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	3	0	1	1	2
Average litter cover (%):	1.4				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Flat, floodplain, grey loam

Plot Disturbance

Clearing, grazing, sowing exotic grass

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	ED	**Plot ID:**	Plot 1	**Date:**	26/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Carthamus lanatus (Saffron Thistle)	2	100		HTE
	Verbena bonariensis (Purpletop)	1	20		E
	Gamochaeta calviceps (Cudweed)	3	200		E
Forb (FG)	*Euchiton sphaericus (Star Cudweed)*	0.1	10		N
	Trifolium repens (White Clover)	5	200		E
	Aira elegantissima (Delicate Hairgrass)	5	100		E
	Sonchus oleraceus (Common Sowthistle)	3	100		E
	Sonchus asper (Prickly Sowthistle)	0.2	30		E
Grass & grasslike (GG)	*Luzula densiflora (Woodrush)*	0.1	5		N
Forb (FG)	*Cotula australis (Common Cotula)*	0.2	30		N
	Polygonum aviculare (Wireweed)	0.1	5		E
	Petrorhagia nanteuilii (Proliferous Pink)	0.1	10		E
	Lolium perenne (Perennial Ryegrass)	40	1000		E
	Paronychia brasiliana (Chilean Whitlow Wort, Brazilian Whitlow)	1	100		E
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	20	100		N
	Briza minor (Shivery Grass)	2	200		E
	Trifolium campestre (Hop Clover)	5	200		E
Forb (FG)	*Calotis lappulacea (Yellow Burr-daisy)*	0.1	3		N
	Briza maxima (Quaking Grass)	0.1	10		E
	Cerastium vulgare (Mouse-ear Chickweed)	0.1	10		E
	Bromus molliformis (Soft Brome)	10	500		E
	Bromus diandrus (Great Brome)	5	200		HTE
	Vulpia bromoides (Squirrel Tail Fesque)	15	500		E
Forb (FG)	*Linum marginale (Native Flax)*	0.1	15		N
Forb (FG)	*Oxalis perennans*	0.1	10		N
	Trifolium subterraneum (Subterranean Clover)	5	300		E
Grass & grasslike (GG)	*Chloris truncata (Windmill Grass)*	2	70		N
	Parentucellia latifolia (Red Bartsia)	0.2	40		E
	Avena fatua (Wild Oats)	0.5	50		E
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.1	1		N

BAM Site – Field Survey Form

Plot ID:	Plot 2	**Date:**	26/10/21	**Project number:**	J210553	**Plot dimensions:**	20x20
Datum:	GDA94	**Easting:**	734,516	**Recorders:**	ED		
Zone:	55	**Northing:**	6,442,500	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	94
Plant Community Type:		281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion		**Condition class:**	Pasture	**PCT confidence:**	high
Vegetation Class:		Western Slopes Grassy Woodlands		**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	3
	Forbs:	7
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	10.5
	Forbs:	3
	Ferns:	0
	Other:	0
High Threat Weed cover:		30

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	3	5	1	1	0
Average litter cover (%):	2				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Floodplain, flat

Plot Disturbance

Grazing, sowing exotic grasses

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	ED	**Plot ID:**	Plot 2	**Date:**	26/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Gamochaeta calviceps (Cudweed)	5	300		E
Forb (FG)	*Cotula australis (Common Cotula)*	1	100		N
Grass & grasslike (GG)	*Chloris truncata (Windmill Grass)*	10	1000		N
	Trifolium subterraneum (Subterranean Clover)	1	200		E
	Cerastium vulgare (Mouse-ear Chickweed)	1	100		E
Grass & grasslike (GG)	*Centrolepis strigosa subsp. strigosa*	0.1	2		N
	Vulpia bromoides (Squirrel Tail Fesque)	40	1000		E
	Capsella bursa-pastoris (Shepherd's Purse)	0.1	10		E
Forb (FG)	*Calotis lappulacea (Yellow Burr-daisy)*	0.5	5		N
	Arctotheca calendula (Capeweed)	0.1	6		E
	Bromus diandrus (Great Brome)	25	500		HTE
Grass & grasslike (GG)	*Juncus subsecundus (Finger Rush)*	0.4	10		N
	Lolium perenne (Perennial Ryegrass)	20	1000		E
Forb (FG)	*Oxalis perennans*	0.1	5		N
	Petrorhagia nanteuilii (Proliferous Pink)	0.1	5		E
	Avena fatua (Wild Oats)	2	50		E
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.1	5		N
	Sonchus oleraceus (Common Sowthistle)	1	10		E
Forb (FG)	*Geranium solanderi (Native Geranium)*	1	10		N
	Conyza bonariensis (Flaxleaf Fleabane)	0.8	20		E
	Carthamus lanatus (Saffron Thistle)	5	20		HTE
Forb (FG)	*Linum marginale (Native Flax)*	0.1	4		N
Forb (FG)	*Euchiton involucratus (Star Cudweed)*	0.2	20		N

BAM Site – Field Survey Form

Plot ID:	Plot 3	**Date:**	27/10/21	**Project number:**	J210553	**Plot dimensions:**	20 x 20
Datum:	GDA94	**Easting:**	737,929	**Recorders:**	ED		
Zone:	55	**Northing:**	6,442,220	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	246
Plant Community Type:	281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion			**Condition class:**	Pasture	**PCT confidence:**	high
Vegetation Class:	Western Slopes Grassy Woodlands			**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	2
	Forbs:	7
	Ferns:	1
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	10.5
	Forbs:	1.6
	Ferns:	0.1
	Other:	0
High Threat Weed cover:		1.5

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	0	1	0	0	0
Average litter cover (%):	0.2				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Low slopes

Plot Disturbance

Exotic pasture, planting, grazing, clearing

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	ED	**Plot ID:**	Plot 3	**Date:**	27/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Lolium perenne (Perennial Ryegrass)	50	1000		E
	Bromus catharticus (Praire Grass)	10	100		E
Forb (FG)	*Cotula australis (Common Cotula)*	1	50		N
	Carthamus lanatus (Saffron Thistle)	1	50		HTE
	Gamochaeta calviceps (Cudweed)	15	500		E
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	10	300		N
Forb (FG)	*Calotis lappulacea (Yellow Burr-daisy)*	0.1	5		N
Forb (FG)	*Urtica incisa (Stinging Nettle)*	0.1	2		N
	Trifolium subterraneum (Subterranean Clover)	20	100		E
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.1	8		N
Forb (FG)	*Oxalis perennans*	0.1	5		N
Forb (FG)	*Geranium solanderi (Native Geranium)*	0.1	4		N
	Taraxacum officinale (Dandelion)	0.1	5		E
	Hypochaeris radicata (Catsear)	0.1	6		E
	Vulpia bromoides (Squirrel Tail Fesque)	10	300		E
Forb (FG)	*Linum marginale (Native Flax)*	0.1	2		N
	Triticum aestivum (Wheat)	1	40		E
	Acetosella vulgaris (Sheep Sorrel)	0.5	15		HTE
Fern (EG)	*Cheilanthes sieberi (Rock Fern)*	0.1	2		N
Grass & grasslike (GG)	*Juncus subsecundus (Finger Rush)*	0.5	40		N
	Polygonum aviculare (Wireweed)	0.1	3		E
	Trifolium repens (White Clover)	5	40		E

BAM Site – Field Survey Form

Plot ID:	Plot 4	**Date:**	27/10/21	**Project number:**	J210553			**Plot dimensions:**	20 x 20
Datum:	GDA94	**Easting:**	735,459	**Recorders:**	ED				
Zone:	55	**Northing:**	6,441,870	**IBRA region:**	NSW South Western Slopes (Inland Slopes)			**Midline bearing:**	232
Plant Community Type:			281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion			**Condition class:**	Pasture	**PCT confidence:**	high
Vegetation Class:			Western Slopes Grassy Woodlands			**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	3
	Forbs:	8
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	46
	Forbs:	2.7
	Ferns:	0
	Other:	0
High Threat Weed cover:		0.3

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	1	0	0	1	0
Average litter cover (%):	0.4				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Slight rise above floodplain. Very gently sloping

Plot Disturbance

Clearing, sowing grasses/cultivation. Cattle grazing

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	ED	**Plot ID:**	Plot 4	**Date:**	27/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	*Cotula australis (Common Cotula)*	2	100		N
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	10		E
	Gamochaeta calviceps (Cudweed)	5	200		E
	Lolium perenne (Perennial Ryegrass)	50	1000		E
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	20	1000		N
	Parentucellia latifolia (Red Bartsia)	0.1	20		E
	Paronychia brasiliana (Chilean Whitlow Wort, Brazilian Whitlow)	0.1	30		E
Grass & grasslike (GG)	*Chloris truncata (Windmill Grass)*	25	100		N
Forb (FG)	*Chamaesyce drummondii (Caustic Weed)*	0.1	20		N
	Polygonum aviculare (Wireweed)	0.1	5		E
Grass & grasslike (GG)	*Juncus subsecundus (Finger Rush)*	1	30		N
	Conyza sumatrensis (Tall fleabane)	0.1	5		E
Forb (FG)	*Linum marginale (Native Flax)*	0.1	3		N
	Cerastium balearicum (Lesser Mouse-ear Chickweed)	0.1	3		E
	Bromus brevis	2	50		E
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.1	5		N
	Acetosella vulgaris (Sheep Sorrel)	0.1	20		HTE
	Trifolium repens (White Clover)	10	300		E
	Trifolium campestre (Hop Clover)	10	200		E
Forb (FG)	*Euchiton involucratus (Star Cudweed)*	0.1	20		N
Forb (FG)	*Calotis lappulacea (Yellow Burr-daisy)*	0.1	4		N
	Vulpia bromoides (Squirrel Tail Fesque)	10	300		E
Forb (FG)	*Oxalis perennans*	0.1	5		N
Forb (FG)	*Erodium crinitum (Blue Crowfoot)*	0.1	10		N
	Capsella bursa-pastoris (Shepherd's Purse)	0.1	10		E
	Carthamus lanatus (Saffron Thistle)	0.2	10		HTE

BAM Site – Field Survey Form

Plot ID:	Plot 5	**Date:**	27/10/21	**Project number:**	J210553	**Plot dimensions:**	20 x 20
Datum:	GDA94	**Easting:**	736,043	**Recorders:**	ED		
Zone:	55	**Northing:**	6,444,223	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	81
Plant Community Type:	281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion			**Condition class:**	Pasture	**PCT confidence:**	high
Vegetation Class:	Western Slopes Grassy Woodlands			**EEC:**	no	**EEC confidence:**	low

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	5
	Forbs:	5
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	32.2
	Forbs:	6.7
	Ferns:	0
	Other:	0
High Threat Weed cover:		0.4

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	2	1	4	1
Average litter cover (%):	2.6				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Very slight slope, grey brown loam

Plot Disturbance

Gazing, pasture improvement

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	ED	**Plot ID:**	Plot 5	**Date:**	27/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Cerastium glomeratum (Mouse-ear Chickweed)	0.5	50		E
	Lolium perenne (Perennial Ryegrass)	20	500		E
	Conyza bonariensis (Flaxleaf Fleabane)	5	100		E
	Gamochaeta calviceps (Cudweed)	10	400		E
	Trifolium repens (White Clover)	15	200		E
Forb (FG)	*Cotula australis (Common Cotula)*	5	500		N
Forb (FG)	*Oxalis perennans*	0.1	5		N
	Polygonum aviculare (Wireweed)	0.1	10		E
Grass & grasslike (GG)	*Chloris truncata (Windmill Grass)*	5	300		N
	Briza maxima (Quaking Grass)	2	200		E
	Capsella bursa-pastoris (Shepherd's Purse)	0.5	50		E
	Vulpia bromoides (Squirrel Tail Fesque)	5	100		E
	Sonchus oleraceus (Common Sowthistle)	3	100		E
	Rapistrum rugosum (Turnip Weed)	0.5	30		E
Grass & grasslike (GG)	*Austrostipa aristiglumis (Plains Grass)*	0.1	3		N
	Parentucellia latifolia (Red Bartsia)	0.1	10		E
	Acetosella vulgaris (Sheep Sorrel)	0.4	40		HTE
	Trifolium arvense (Haresfoot Clover)	0.6	20		E
Forb (FG)	*Erodium crinitum (Blue Crowfoot)*	0.5	15		N
	Hypochaeris radicata (Catsear)	0.1	6		E
Grass & grasslike (GG)	*Centrolepis strigosa subsp. strigosa*	0.1	5		N
	Petrorhagia nanteuilii (Proliferous Pink)	0.1	10		E
Forb (FG)	*Linum marginale (Native Flax)*	0.1	10		N
	Trifolium subterraneum (Subterranean Clover)	5	200		E
Forb (FG)	*Crassula sieberiana (Australian Stonecrop)*	1	10		N
	Sisymbrium officinale (Hedge Mustard)	5	20		E
	Verbena bonariensis (Purpletop)	5	100		E
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	2	50		N
	Triticum aestivum (Wheat)	1	50		E
Grass & grasslike (GG)	*Panicum effusum (Hairy Panic)*	25	1000		N

BAM Site – Field Survey Form

Plot ID:	Plot 6	**Date:**	28/10/21	**Project number:**	J210553	**Plot dimensions:**	20 x 20
Datum:	GDA94	**Easting:**	736,360	**Recorders:**	ED		
Zone:	55	**Northing:**	6,444,702	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	237
Plant Community Type:	281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion			**Condition class:**	Pasture	**PCT confidence:**	high
Vegetation Class:	Western Slopes Grassy Woodlands			**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	2
	Forbs:	6
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	0.2
	Forbs:	1.1
	Ferns:	0
	Other:	0
High Threat Weed cover:		40

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	1	1	1	0	2
Average litter cover (%):	1				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plain, grey brown loam

Plot Disturbance

Cultivation lines, grazing

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	ED	**Plot ID:**	Plot 6	**Date:**	28/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Aira elegantissima (Delicate Hairgrass)	0.1	20		E
	Hordeum vulgare (Barley)	0.1	10		E
	Medicago lupulina (Black Medic)	10	100		E
	Gamochaeta calviceps (Cudweed)	25	1000		E
	Anthoxanthum odoratum (Sweet Vernal Grass)	0.1	15		E
	Vulpia bromoides (Squirrel Tail Fesque)	15	100		E
Forb (FG)	*Erodium crinitum (Blue Crowfoot)*	0.1	5		N
Forb (FG)	*Calotis lappulacea (Yellow Burr-daisy)*	0.5	50		N
Forb (FG)	*Cotula australis (Common Cotula)*	0.2	50		N
	Trifolium subterraneum (Subterranean Clover)	5	50		E
	Parentucellia latifolia (Red Bartsia)	0.1	5		E
Grass & grasslike (GG)	*Eragrostis leptostachya (Paddock Lovegrass)*	0.1	4		N
	Carthamus lanatus (Saffron Thistle)	10	60		HTE
	Acetosella vulgaris (Sheep Sorrel)	30	500		HTE
Grass & grasslike (GG)	*Juncus subsecundus (Finger Rush)*	0.1	10		N
Forb (FG)	*Euchiton sphaericus (Star Cudweed)*	0.1	5		N
	Lolium perenne (Perennial Ryegrass)	15	200		E
	Conyza bonariensis (Flaxleaf Fleabane)	0.5	50		E
	Cerastium glomeratum (Mouse-ear Chickweed)	0.1	10		E
Forb (FG)	*Oxalis perennans*	0.1	5		N
	Trifolium arvense (Haresfoot Clover)	0.1	10		E
	Arctotheca calendula (Capeweed)	0.1	5		E
	Bromus catharticus (Praire Grass)	0.5	30		E
	Linum trigynum (French Flax)	0.1	10		E
Forb (FG)	*Linum marginale (Native Flax)*	0.1	2		N
	Sisymbrium officinale (Hedge Mustard)	1	8		E

BAM Site – Field Survey Form

Plot ID:	Plot 7	**Date:**	15/12/21	**Project number:**	J210553	**Plot dimensions:**	20x 50m
Datum:	GDA94	**Easting:**	734,311	**Recorders:**	ED, EJ		
Zone:	55	**Northing:**	6,443,809	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	230
Plant Community Type:	80: Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion			**Condition class:**	High	**PCT confidence:**	high
Vegetation Class:	Floodplain Transition Woodlands			**EEC:**	yes	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	3
	Grasses etc.:	10
	Forbs:	15
	Ferns:	1
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	35
	Shrubs:	1.2
	Grasses etc.:	68.5
	Forbs:	22.3
	Ferns:	0.1
	Other:	0.6
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	4
80 + cm:	2		
50 – 79 cm:	0		
30 – 49 cm:	10		
20 – 29 cm:	8	Tree hollow count	2
10 – 19 cm:	3		
5 – 9 cm:	8		
< 5 cm:	9		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	90	75	60	70	95
Average litter cover (%):	78				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Road maintainence, mitre drains on edge of plot

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	ED, EJ	**Plot ID:**	Plot 7	**Date:**	15/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	*Oxalis perennans*	0.1	20		N
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	10		N
Fern (EG)	*Cheilanthes sieberi (Rock Fern)*	0.1	10		N
Grass & grasslike (GG)	*Cyperus gracilis (Slender Flat-sedge)*	0.2	30		N
Forb (FG)	*Sida corrugata (Corrugated Sida)*	0.1	10		N
Forb (FG)	*Einadia nutans subsp. nutans (Climbing Saltbush)*	0.2	100		N
Forb (FG)	*Einadia hastata (Berry Saltbush)*	0.5	10		N
Forb (FG)	*Sonchus spp. (Sowthistle)*	0.1	6		N
Shrub (SG)	*Solanum cinereum (Narrawa Burr)*	0.1	5		N
Forb (FG)	*Calotis lappulacea (Yellow Burr-daisy)*	10	300		N
Grass & grasslike (GG)	*Austrostipa verticillata (Slender Bamboo Grass)*	35	500		N
Shrub (SG)	*Eremophila debilis (Amulla)*	1	50		N
Other (OG)	*Glycine clandestina (Twining glycine)*	0.5	50		N
Forb (FG)	*Calotis cuneifolia (Purple Burr-Daisy)*	10	200		N
	Lepidium africanum (Common Peppercress)	0.1	10		E
Grass & grasslike (GG)	*Eriochloa crebra (Cup Grass, Tall Cupgrass)*	0.6	30		N
Grass & grasslike (GG)	*Carex inversa (Knob Sedge)*	0.1	10		N
Forb (FG)	*Wahlenbergia communis (Tufted Bluebell)*	0.1	10		N
Grass & grasslike (GG)	*Austrostipa nodosa (A Speargrass)*	0.5	30		N
Grass & grasslike (GG)	*Themeda triandra*	20	800		N
Forb (FG)	*Chrysocephalum semipapposum (Clustered Everlasting)*	0.1	1		N
Forb (FG)	*Thelionema caespitosum (Tufted Blue-lily)*	0.2	6		N
Grass & grasslike (GG)	*Chloris truncata (Windmill Grass)*	5	100		N
Other (OG)	*Hardenbergia violacea (False Sarsaparilla)*	0.1	1		N
Forb (FG)	*Dichopogon fimbriatus (Nodding Chocolate Lily)*	0.5	50		N
	Cirsium vulgare (Spear Thistle)	0.1	1		E
	Marrubium vulgare (White Horehound)	0.2	10		E
	Fumaria capreolata subsp. capreolata (Climbing Fumitory)	0.3	15		E
	Modiola caroliniana (Red-flowered Mallow)	0.2	20		E
	Solanum chenopodioides (Whitetip Nightshade)	0.5	10		E
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.1	5		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.1	4		N
Grass & grasslike (GG)	*Juncus subsecundus (Finger Rush)*	0.1	1		N
	Verbascum virgatum (Twiggy Mullein)	0.1	4		E
Tree (TG)	*Eucalyptus microcarpa (Western Grey Box)*	35	17		N
Shrub (SG)	*Maireana microphylla (Small-leaf Bluebush)*	0.1	4		N
Grass & grasslike (GG)	*Dichelachne crinita (Longhair Plumegrass)*	2	100		N
Grass & grasslike (GG)	*Anthosachne scabra (Wheatgrass, Common Wheatgrass)*	5	200		N
Forb (FG)	*Cynoglossum australe*	0.1	5		N

BAM Site – Field Survey Form

Plot ID:	Plot 8	**Date:**	16/12/21	**Project number:**	J210553	**Plot dimensions:**	20x50
Datum:	GDA94	**Easting:**	734,481	**Recorders:**	ED, EJ		
Zone:	55	**Northing:**	6,444,171	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	26
Plant Community Type:		281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion		**Condition class:**	High	**PCT confidence:**	high
Vegetation Class:		Western Slopes Grassy Woodlands		**EEC:**	yes	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	3
	Grasses etc.:	8
	Forbs:	18
	Ferns:	1
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	35
	Shrubs:	0.8
	Grasses etc.:	38.1
	Forbs:	11.1
	Ferns:	0.1
	Other:	2.5
High Threat Weed cover:		0.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	26
80 + cm:	1		
50 – 79 cm:	4		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	0
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	95	90	90	50	50
Average litter cover (%):	75				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Mitre drains on road

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	ED, EJ	**Plot ID:**	Plot 8	**Date:**	16/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	*Xerochrysum viscosum (Sticky Everlasting)*	0.1	2		N
Tree (TG)	*Eucalyptus melliodora (Yellow Box)*	5	1		N
Tree (TG)	*Angophora floribunda (Rough-barked Apple)*	5	3		N
Tree (TG)	*Eucalyptus blakelyi (Blakely's Red Gum)*	25	15		N
	Polygonum aviculare (Wireweed)	0.1	10		E
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	3		N
Forb (FG)	*Chrysocephalum semipapposum (Clustered Everlasting)*	0.1	10		N
Forb (FG)	*Laxmannia gracilis (Slender Wire Lily)*	0.1	5		N
Grass & grasslike (GG)	*Luzula densiflora (Woodrush)*	0.1	1		N
	Cirsium vulgare (Spear Thistle)	0.1	1		E
Forb (FG)	*Sonchus spp. (Sowthistle)*	0.1	5		N
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.1	4		N
	Solanum nigrum (Black-berry Nightshade)	0.1	1		E
Shrub (SG)	*Solanum cinereum (Narrawa Burr)*	0.1	5		N
	Marrubium vulgare (White Horehound)	0.1	3		E
	Trifolium arvense (Haresfoot Clover)	0.1	5		E
	Rapistrum spp.	0.1	1		E
Grass & grasslike (GG)	*Rytidosperma setaceum (Small-flowered Wallaby-grass)*	1	20		N
Grass & grasslike (GG)	*Eriochloa crebra (Cup Grass, Tall Cupgrass)*	1	50		N
Grass & grasslike (GG)	*Rytidosperma erianthum (Wallaby Grass)*	5	80		N
Forb (FG)	*Diuris dendrobioides*	0.1	1		N
Grass & grasslike (GG)	*Themeda triandra*	6	60		N
	Verbena bonariensis (Purpletop)	0.1	3		E
Fern (EG)	*Cheilanthes sieberi (Rock Fern)*	0.1	10		N
Other (OG)	*Glycine clandestina (Twining glycine)*	2	50		N
Forb (FG)	*Dichopogon fimbriatus (Nodding Chocolate Lily)*	0.1	20		N
Forb (FG)	*Calotis lappulacea (Yellow Burr-daisy)*	5	100		N
	Modiola caroliniana (Red-flowered Mallow)	0.1	10		E
Shrub (SG)	*Dodonaea viscosa (Sticky Hop-bush)*	0.2	1		N
Forb (FG)	*Calotis cuneifolia (Purple Burr-Daisy)*	3	100		N
Forb (FG)	*Einadia nutans subsp. linifolia (Climbing Saltbush)*	0.5	20		N
Forb (FG)	*Einadia hastata (Berry Saltbush)*	0.5	20		N
	Conyza spp. (A Fleabane)	0.1	1		E
Other (OG)	*Desmodium varians (Slender Tick-trefoil)*	0.5	30		N
	Petrorhagia nanteuilii (Proliferous Pink)	0.1	10		E
	Eleusine tristachya (Goose Grass)	0.1	5		E
Shrub (SG)	*Eremophila debilis (Amulla)*	0.5	10		N
	Setaria pumila (Pale Pigeon Grass)	0.2	10		E
Forb (FG)	*Dysphania pumilio (Small Crumbweed)*	0.1	10		N
	Bidens bipinnata (Bipinnate Beggar's Ticks)	0.1	5		HTE
	Trifolium repens (White Clover)	0.1	10		E
	Lepidium africanum (Common Peppercress)	0.1	20		E
Grass & grasslike (GG)	*Chloris truncata (Windmill Grass)*	5	100		N
Forb (FG)	*Thelionema caespitosum (Tufted Blue-lily)*	0.5	40		N
	Avena fatua (Wild Oats)	5	50		E
Forb (FG)	*Wahlenbergia communis (Tufted Bluebell)*	0.1	30		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.1	20		N
Grass & grasslike (GG)	*Austrostipa nodosa (A Speargrass)*	10	100		N

Project name:	J210553				
Recorders:	ED, EJ	**Plot ID:**	Plot 8	**Date:**	16/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	*Portulaca oleracea (Pigweed)*	0.1	20		N
	Fumaria capreolata subsp. capreolata (Climbing Fumitory)	0.1	10		E
Forb (FG)	*Thysanotus tuberosus subsp. tuberosus*	0.4	5		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	10	100		N

BAM Site – Field Survey Form

Plot ID:	Plot 9	**Date:**	16/12/21	**Project number:**	J210553	**Plot dimensions:**	20x 50m
Datum:	GDA94	**Easting:**	734,626	**Recorders:**	ED, EJ		
Zone:	55	**Northing:**	6,444,579	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	72
Plant Community Type:	80: Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion			**Condition class:**	High	**PCT confidence:**	high
Vegetation Class:	Floodplain Transition Woodlands			**EEC:**	yes	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	3
	Grasses etc.:	8
	Forbs:	17
	Ferns:	1
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	35
	Shrubs:	1.3
	Grasses etc.:	20.6
	Forbs:	64.5
	Ferns:	0.5
	Other:	1.2
High Threat Weed cover:		1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	28
80 + cm:	2		
50 – 79 cm:	1		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	2
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	90	85	70	95	85
Average litter cover (%):	85				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Mitre drains on road

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	ED, EJ	**Plot ID:**	Plot 9	**Date:**	16/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Shrub (SG)	*Eremophila debilis (Amulla)*	0.2	20		N
Forb (FG)	*Calotis lappulacea (Yellow Burr-daisy)*	30	500		N
Forb (FG)	*Cymbonotus lawsonianus (Bear's Ear)*	0.1	10		N
Forb (FG)	*Einadia nutans (Climbing Saltbush)*	0.5	20		N
Other (OG)	*Desmodium varians (Slender Tick-trefoil)*	0.2	10		N
Forb (FG)	*Einadia hastata (Berry Saltbush)*	1	40		N
Grass & grasslike (GG)	*Austrostipa nodosa (A Speargrass)*	5	100		N
Forb (FG)	*Calotis cuneifolia (Purple Burr-Daisy)*	25	500		N
Forb (FG)	*Dichopogon fimbriatus (Nodding Chocolate Lily)*	5	500		N
	Conyza spp. (A Fleabane)	0.1	10		E
Shrub (SG)	*Cassinia laevis (Cough Bush)*	0.1	1		N
Forb (FG)	*Sida corrugata (Corrugated Sida)*	0.1	10		N
Forb (FG)	*Oxalis perennans*	0.1	10		N
Grass & grasslike (GG)	*Rytidosperma caespitosum (Ringed Wallaby Grass)*	5	100		N
Shrub (SG)	*Solanum cinereum (Narrawa Burr)*	1	40		N
Forb (FG)	*Laxmannia gracilis (Slender Wire Lily)*	0.1	10		N
	Chloris gayana (Rhodes Grass)	1	20		HTE
Grass & grasslike (GG)	*Rytidosperma setaceum (Small-flowered Wallaby-grass)*	0.5	50		N
Grass & grasslike (GG)	*Anthosachne scabra (Wheatgrass, Common Wheatgrass)*	5	50		N
Grass & grasslike (GG)	*Eriochloa crebra (Cup Grass, Tall Cupgrass)*	2	40		N
Grass & grasslike (GG)	*Panicum effusum (Hairy Panic)*	1	50		N
	Solanum nigrum (Black-berry Nightshade)	0.1	10		E
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.5	20		N
Fern (EG)	*Cheilanthes sieberi (Rock Fern)*	0.5	40		N
Grass & grasslike (GG)	*Themeda triandra*	2	50		N
Grass & grasslike (GG)	*Eragrostis alveiformis*	0.1	3		N
	Fumaria capreolata subsp. capreolata (Climbing Fumitory)	0.1	10		E
Other (OG)	*Glycine clandestina (Twining glycine)*	1	50		N
Forb (FG)	*Alternanthera nana (Hairy Joyweed)*	0.1	1		N
Forb (FG)	*Chamaesyce dallachyana*	0.1	1		N
	Verbena bonariensis (Purpletop)	0.1	6		E
	Marrubium vulgare (White Horehound)	2	50		E
Forb (FG)	*Sonchus spp. (Sowthistle)*	0.1	5		N
Forb (FG)	*Cullen cinereum (Annual Verbine)*	1	10		N
Forb (FG)	*Thelionema caespitosum (Tufted Blue-lily)*	0.2	6		N
Tree (TG)	*Eucalyptus microcarpa (Western Grey Box)*	35	30		N
	Verbascum virgatum (Twiggy Mullein)	0.1	5		E
Forb (FG)	*Brachyscome ciliaris (Variable Daisy)*	0.5	50		N
Forb (FG)	*Velleia paradoxa*	0.1	5		N

BAM Site – Field Survey Form

Plot ID:	Plot 10	**Date:**	16/12/21	**Project number:**	J210553	**Plot dimensions:**	20x50m
Datum:	GDA94	**Easting:**	734,653	**Recorders:**	ED, EJ		
Zone:	55	**Northing:**	6,444,949	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	24
Plant Community Type:	281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion			**Condition class:**	High	**PCT confidence:**	high
Vegetation Class:	Western Slopes Grassy Woodlands			**EEC:**	yes	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	3
	Grasses etc.:	12
	Forbs:	12
	Ferns:	1
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	17
	Shrubs:	0.7
	Grasses etc.:	75
	Forbs:	8.2
	Ferns:	0.1
	Other:	1
High Threat Weed cover:		0.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	78
80 + cm:	2		
50 – 79 cm:	5		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	5
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	20	60	90	75	75
Average litter cover (%):	64				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Mitre drains on road

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	ED, EJ	**Plot ID:**	Plot 10	**Date:**	16/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.2	40		N
Other (OG)	*Desmodium varians (Slender Tick-trefoil)*	1	30		N
Forb (FG)	*Thysanotus tuberosus (Common Fringe-lily)*	0.1	5		N
Forb (FG)	*Dichopogon fimbriatus (Nodding Chocolate Lily)*	0.2	20		N
Forb (FG)	*Calotis cuneata (Mountain Burr-Daisy)*	2	20		N
Forb (FG)	*Calotis lappulacea (Yellow Burr-daisy)*	5	100		N
Grass & grasslike (GG)	*Austrostipa nodosa (A Speargrass)*	5	200		N
Grass & grasslike (GG)	*Austrostipa setacea (Corkscrew Grass)*	5	200		N
	Verbena bonariensis (Purpletop)	20	500		E
	Plantago lanceolata (Lamb's Tongues)	5	50		E
Fern (EG)	*Cheilanthes sieberi (Rock Fern)*	0.1	10		N
	Hypericum perforatum subsp. veronense (St John's Wort)	2	100		E
Forb (FG)	*Velleia paradoxa*	0.1	10		N
Grass & grasslike (GG)	*Themeda triandra*	10	20		N
Grass & grasslike (GG)	*Rytidosperma caespitosum (Ringed Wallaby Grass)*	2	50		N
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	10		N
Shrub (SG)	*Eremophila debilis (Amulla)*	0.1	10		N
	Trifolium arvense (Haresfoot Clover)	0.1	30		E
	Tribulus terrestris (Cat-head)	0.1	2		E
	Lepidium africanum (Common Peppercress)	0.1	5		E
	Bidens bipinnata (Bipinnate Beggar's Ticks)	0.1	10		HTE
Shrub (SG)	*Solanum cinereum (Narrawa Burr)*	0.1	5		N
Grass & grasslike (GG)	*Eriochloa crebra (Cup Grass, Tall Cupgrass)*	2	50		N
Grass & grasslike (GG)	*Poa labillardierei var. labillardierei (Tussock)*	2	40		N
Forb (FG)	*Dysphania pumilio (Small Crumbweed)*	0.1	10		N
	Salvia verbenaca (Vervain)	0.1	5		E
Shrub (SG)	*Cassinia laevis (Cough Bush)*	0.5	4		N
	Trifolium campestre (Hop Clover)	0.1	10		E
	Solanum nigrum (Black-berry Nightshade)	0.1	6		E
Forb (FG)	*Oxalis perennans*	0.1	10		N
Forb (FG)	*Portulaca oleracea (Pigweed)*	0.1	5		N
	Eleusine tristachya (Goose Grass)	0.1	6		E
	Brassica nigra (Black Mustard)	0.1	5		E
Grass & grasslike (GG)	*Carex spp.*	5	50		N
Grass & grasslike (GG)	*Anthosachne scabra (Wheatgrass, Common Wheatgrass)*	5	60		N
Grass & grasslike (GG)	*Juncus subsecundus (Finger Rush)*	2	100		N
Grass & grasslike (GG)	*Carex inversa (Knob Sedge)*	10	400		N
	Phalaris aquatica (Phalaris)	0.1	5		E
Forb (FG)	*Thelionema caespitosum (Tufted Blue-lily)*	0.1	2		N
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	2	50		N
Forb (FG)	*Brachyscome ciliaris (Variable Daisy)*	0.1	10		N
Grass & grasslike (GG)	*Eleocharis pallens (Pale Spike Sedge)*	25	30		N
Tree (TG)	*Eucalyptus blakelyi (Blakely's Red Gum)*	15	25		N
Tree (TG)	*Eucalyptus melliodora (Yellow Box)*	1	5		N
Tree (TG)	*Angophora floribunda (Rough-barked Apple)*	1	1		N

BAM Site – Field Survey Form

Plot ID:	Plot 11	**Date:**	16/12/21	**Project number:**	J210553	**Plot dimensions:**	20x 50m
Datum:	GDA94	**Easting:**	734,703	**Recorders:**	ED, EJ		
Zone:	55	**Northing:**	6,445,341	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	7
Plant Community Type:	281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion			**Condition class:**	High	**PCT confidence:**	high
Vegetation Class:	Western Slopes Grassy Woodlands			**EEC:**	yes	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	2
	Grasses etc.:	13
	Forbs:	11
	Ferns:	1
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	39
	Shrubs:	0.7
	Grasses etc.:	62.7
	Forbs:	38.4
	Ferns:	0.1
	Other:	0.4
High Threat Weed cover:		1.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	68
80 + cm:	4		
50 – 79 cm:	1		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	3
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	90	75	80	50	85
Average litter cover (%):	76				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Mitre drains on road

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	ED, EJ	**Plot ID:**	Plot 11	**Date:**	16/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Shrub (SG)	*Acacia ixodes (Motherumbung)*	0.2	1		N
	Sonchus oleraceus (Common Sowthistle)	0.5	20		E
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	20	1000		N
Grass & grasslike (GG)	*Poa billardierei*	5	400		N
Grass & grasslike (GG)	*Themeda triandra*	5	100		N
	Sonchus asper (Prickly Sowthistle)	0.1	10		E
Shrub (SG)	*Solanum cinereum (Narrawa Burr)*	0.5	20		N
Forb (FG)	*Thelionema caespitosum (Tufted Blue-lily)*	0.5	5		N
	Plantago lanceolata (Lamb's Tongues)	1	100		E
Forb (FG)	*Calotis lappulacea (Yellow Burr-daisy)*	20	500		N
Forb (FG)	*Oxalis perennans*	0.1	10		N
Other (OG)	*Desmodium varians (Slender Tick-trefoil)*	0.2	20		N
	Marrubium vulgare (White Horehound)	5	50		E
Grass & grasslike (GG)	*Carex inversa (Knob Sedge)*	0.1	10		N
	Fumaria capreolata subsp. capreolata (Climbing Fumitory)	0.1	5		E
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	2		N
Other (OG)	*Glycine tabacina (Variable Glycine)*	0.2	20		N
Forb (FG)	*Einadia hastata (Berry Saltbush)*	15	500		N
Grass & grasslike (GG)	*Austrostipa nodosa (A Speargrass)*	5	60		N
	Solanum nigrum (Black-berry Nightshade)	0.1	10		E
Forb (FG)	*Calotis cuneifolia (Purple Burr-Daisy)*	2	60		N
Fern (EG)	*Cheilanthes sieberi (Rock Fern)*	0.1	5		N
	Verbena rigida var. rigida (Veined Verbena)	0.5	40		E
Forb (FG)	*Cymbonotus lawsonianus (Bear's Ear)*	0.1	5		N
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.2	15		N
	Verbena bonariensis (Purpletop)	3	50		E
Grass & grasslike (GG)	*Rytidosperma caespitosum (Ringed Wallaby Grass)*	5	100		N
Grass & grasslike (GG)	*Eriochloa crebra (Cup Grass, Tall Cupgrass)*	10	200		N
	Setaria parviflora	1	50		E
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	3	150		N
Grass & grasslike (GG)	*Chloris truncata (Windmill Grass)*	3	100		N
	Hypericum perforatum (St. Johns Wort)	1	30		HTE
Grass & grasslike (GG)	*Rytidosperma carphoides (Short Wallaby Grass)*	0.5	50		N
	Heliotropium amplexicaule (Blue Heliotrope)	0.1	30		HTE
Forb (FG)	*Chamaesyce drummondii (Caustic Weed)*	0.1	6		N
Grass & grasslike (GG)	*Juncus subsecundus (Finger Rush)*	1	10		N
Tree (TG)	*Eucalyptus blakelyi (Blakely's Red Gum)*	14	4		N
Tree (TG)	*Eucalyptus melliodora (Yellow Box)*	15	42		N
Tree (TG)	*Eucalyptus microcarpa (Western Grey Box)*	10	2		N
	Salvia verbenaca (Vervain)	0.1	15		E
Grass & grasslike (GG)	*Deyeuxia quadriseta*	0.1	5		N
Forb (FG)	*Oncinocalyx betchei*	0.1	10		N
Forb (FG)	*Vittadinia dissecta*	0.2	20		N
Grass & grasslike (GG)	*Eragrostis parviflora (Weeping Lovegrass)*	5	100		N

BAM Site – Field Survey Form

Plot ID:	Plot 12	**Date:**	16/12/21	**Project number:**	J210553	**Plot dimensions:**	20x 50m
Datum:	GDA94	**Easting:**	734,659	**Recorders:**	ED, EJ		
Zone:	55	**Northing:**	6,445,751	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	299
Plant Community Type:	80: Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion			**Condition class:**	High	**PCT confidence:**	high
Vegetation Class:	Floodplain Transition Woodlands			**EEC:**	yes	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	4
	Grasses etc.:	12
	Forbs:	12
	Ferns:	1
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	30
	Shrubs:	25.3
	Grasses etc.:	57.3
	Forbs:	22.9
	Ferns:	0.1
	Other:	0.6
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	58
80 + cm:	3		
50 – 79 cm:	4		
30 – 49 cm:	0		
20 – 29 cm:	1	Tree hollow count	3
10 – 19 cm:	0		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	60	75	50	40	40
Average litter cover (%):	53				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Mitre drains on road

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	ED, EJ	**Plot ID:**	Plot 12	**Date:**	16/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Lolium perenne (Perennial Ryegrass)	2	50		E
Shrub (SG)	*Acacia verticillata subsp. verticillata*	25	500		N
	Solanum nigrum (Black-berry Nightshade)	3	30		E
	Sonchus oleraceus (Common Sowthistle)	0.1	10		E
Forb (FG)	*Einadia hastata (Berry Saltbush)*	2	25		N
Other (OG)	*Desmodium varians (Slender Tick-trefoil)*	0.5	30		N
Shrub (SG)	*Solanum chenopodinum*	0.1	2		N
Grass & grasslike (GG)	*Poa billardierei*	1	40		N
Forb (FG)	*Oxalis perennans*	0.1	10		N
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	6		E
Forb (FG)	*Calotis lappulacea (Yellow Burr-daisy)*	15	200		N
Forb (FG)	*Velleia paradoxa*	0.1	10		N
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	5		N
	Oxalis thompsoniae	0.1	10		E
Forb (FG)	*Calotis cuneifolia (Purple Burr-Daisy)*	5	100		N
Forb (FG)	*Vittadinia dissecta*	0.1	6		N
Forb (FG)	*Dichopogon fimbriatus (Nodding Chocolate Lily)*	0.1	5		N
Grass & grasslike (GG)	*Carex inversa (Knob Sedge)*	0.5	40		N
	Verbena bonariensis (Purpletop)	0.4	15		E
Grass & grasslike (GG)	*Austrostipa nodosa (A Speargrass)*	10	100		N
Fern (EG)	*Cheilanthes sieberi (Rock Fern)*	0.1	5		N
Shrub (SG)	*Eremophila debilis (Amulla)*	0.1	2		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	15	300		N
Forb (FG)	*Sida corrugata (Corrugated Sida)*	0.1	5		N
Grass & grasslike (GG)	*Rytidosperma caespitosum (Ringed Wallaby Grass)*	5	200		N
Grass & grasslike (GG)	*Anthosachne scabra (Wheatgrass, Common Wheatgrass)*	5	200		N
Shrub (SG)	*Solanum cinereum (Narrawa Burr)*	0.1	6		N
Grass & grasslike (GG)	*Lomandra multiflora subsp. multiflora (Many-flowered Mat-rush)*	0.1	1		N
Forb (FG)	*Thelionema caespitosum (Tufted Blue-lily)*	0.1	1		N
	Setaria parviflora	0.5	20		E
Other (OG)	*Convolvulus angustissimus*	0.1	1		N
	Marrubium vulgare (White Horehound)	0.5	15		E
Grass & grasslike (GG)	*Rytidosperma carphoides (Short Wallaby Grass)*	10	400		N
	Lepidium africanum (Common Peppercress)	0.1	6		E
Grass & grasslike (GG)	*Themeda triandra*	5	300		N
Forb (FG)	*Wahlenbergia communis (Tufted Bluebell)*	0.1	60		N
Grass & grasslike (GG)	*Eriochloa crebra (Cup Grass, Tall Cupgrass)*	5	200		N
Forb (FG)	*Plantago varia*	0.1	6		N
Grass & grasslike (GG)	*Chloris truncata (Windmill Grass)*	0.2	30		N
	Eragrostis pilosa (Soft Lovegrass)	0.5	50		E
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	0.5	50		N
Tree (TG)	*Eucalyptus microcarpa (Western Grey Box)*	30	40		N

BAM Site – Field Survey Form

Plot ID:	Plot 13	**Date:**	12/01/22	**Project number:**	J210553	**Plot dimensions:**	20 x 50m
Datum:	GDA94	**Easting:**	739,938	**Recorders:**	ED, EJ		
Zone:	55	**Northing:**	6,439,825	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	130
Plant Community Type:	80: Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion			**Condition class:**	Pasture	**PCT confidence:**	high
Vegetation Class:	Floodplain Transition Woodlands			**EEC:**	yes	**EEC confidence:**	medium

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	12
	Forbs:	6
	Ferns:	0
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	102.9
	Forbs:	1
	Ferns:	0
	Other:	0.2
High Threat Weed cover:		5.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	3	5	8	3
Average litter cover (%):	4.8				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Slight slope with loam soil

Plot Disturbance

Historical clearing

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	ED, EJ	**Plot ID:**	Plot 13	**Date:**	12/01/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Vulpia bromoides (Squirrel Tail Fesque)	2	100		E
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	65	1000		N
Grass & grasslike (GG)	*Bothriochloa macra (Red Grass)*	20	1000		N
	Cyclospermum leptophyllum (Slender Celery)	2	100		E
Forb (FG)	*Einadia hastata (Berry Saltbush)*	0.1	26		N
	Verbena bonariensis (Purpletop)	0.5	20		E
Grass & grasslike (GG)	*Eragrostis brownii (Brown's Lovegrass)*	1	200		N
Forb (FG)	*Calotis lappulacea (Yellow Burr-daisy)*	0.1	5		N
Grass & grasslike (GG)	*Anthosachne scabra (Wheatgrass, Common Wheatgrass)*	0.5	50		N
Grass & grasslike (GG)	*Panicum effusum (Hairy Panic)*	5	100		N
Grass & grasslike (GG)	*Eriochloa crebra (Cup Grass, Tall Cupgrass)*	5	100		N
	Petrorhagia nanteuilii (Proliferous Pink)	0.1	20	no	E
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	5		E
	Modiola caroliniana (Red-flowered Mallow)	0.1	5		E
Forb (FG)	*Euchiton sphaericus (Star Cudweed)*	0.1	30		N
Grass & grasslike (GG)	*Eragrostis alveiformis*	5	400		N
	Hypericum perforatum (St. Johns Wort)	5	300		HTE
Forb (FG)	*Oxalis perennans*	0.1	10		N
Grass & grasslike (GG)	*Rytidosperma caespitosum (Ringed Wallaby Grass)*	0.5	50		N
Grass & grasslike (GG)	*Rytidosperma erianthum (Wallaby Grass)*	0.2	50		N
Grass & grasslike (GG)	*Lachnagrostis filiformis*	0.1	10		N
	Linum trigynum (French Flax)	0.1	20		E
Other (OG)	*Glycine tabacina (Variable Glycine)*	0.1	20		N
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.5	10		N
	Setaria parviflora	5	500		E
	Carthamus lanatus (Saffron Thistle)	0.1	10		HTE
	Lysimachia arvensis (Scarlet Pimpernel)	0.1	10		E
Grass & grasslike (GG)	*Paspalidium distans*	0.5	50		N
Other (OG)	*Convolvulus angustissimus*	0.1	10		N
	Eleusine tristachya (Goose Grass)	0.2	30		E
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	5		N
	Cirsium vulgare (Spear Thistle)	0.1	1		E
Grass & grasslike (GG)	*Juncus subsecundus (Finger Rush)*	0.1	2		N
	Gamochaeta calviceps (Cudweed)	0.1	5		E

BAM Site – Field Survey Form

Plot ID:	Plot 15	**Date:**	11/04/22	**Project number:**	J210553	**Plot dimensions:**	20 x 50 m
Datum:	GDA94	**Easting:**	735,172	**Recorders:**	BS, EJ		
Zone:	55	**Northing:**	6,443,738	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	193
Plant Community Type:	281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion			**Condition class:**	Poor	**PCT confidence:**	high
Vegetation Class:	Western Slopes Grassy Woodlands			**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	0
	Grasses etc.:	6
	Forbs:	3
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	10.1
	Shrubs:	0
	Grasses etc.:	8.8
	Forbs:	0.7
	Ferns:	0
	Other:	0
High Threat Weed cover:		0.7

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	35
80 + cm:	3		
50 – 79 cm:	3		
30 – 49 cm:	10		
20 – 29 cm:	5	Tree hollow count	2
10 – 19 cm:	2		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	0	10	1	1	5
Average litter cover (%):	3.4				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Along creekline

Plot Disturbance

Weedy

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	BS, EJ	**Plot ID:**	Plot 15	**Date:**	11/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Angophora floribunda (Rough-barked Apple)*	5	8		N
Tree (TG)	*Eucalyptus blakelyi (Blakely's Red Gum)*	5	2		N
	Verbena bonariensis (Purpletop)	0.1	20		E
	Onopordum acanthium subsp. acanthium (Scotch Thistle)	0.1	20		E
	Setaria pumila (Pale Pigeon Grass)	0.1	30		E
	Sonchus oleraceus (Common Sowthistle)	0.1	20		E
	Solanum nigrum (Black-berry Nightshade)	0.5	20		E
	Plantago lanceolata (Lamb's Tongues)	0.1	20		E
	Rumex crispus (Curled Dock)	0.2	40		E
	Conyza bonariensis (Flaxleaf Fleabane)	2	500		E
	Bidens subalternans (Greater Beggar's Ticks)	0.5	100		HTE
Forb (FG)	*Persicaria subsessilis (Hairy Knotweed)*	0.5	100		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	0.5	50		N
Grass & grasslike (GG)	*Carex appressa (Tall Sedge)*	3	50		N
	Lepidium africanum (Common Peppercress)	0.1	20		E
Forb (FG)	*Daucus spp.*	0.1	50		N
	Polycarpon tetraphyllum (Four-leaved Allseed)	0.1	50		E
	Polygonum aviculare (Wireweed)	0.1	20		E
Forb (FG)	*Alternanthera nana (Hairy Joyweed)*	0.1	20		N
	Paspalum dilatatum (Paspalum)	0.1	50		HTE
	Gamochaeta spp.	0.1	30		E
Grass & grasslike (GG)	*Paspalum distichum (Water Couch)*	5	500		N
	Echinochloa crus-galli (Barnyard Grass)	2	100		E
	Aster subulatus (Wild Aster)	0.1	1		E
	Cyperus eragrostis (Umbrella Sedge)	0.1	40		HTE
	Medicago sativa (Lucerne)	0.1	15		E
	Lysimachia arvensis (Scarlet Pimpernel)	0.2	50		E
	Modiola caroliniana (Red-flowered Mallow)	0.1	10		E
Grass & grasslike (GG)	*Juncus continuus*	0.1	20		N
	Lolium rigidum (Wimmera Ryegrass)	0.1	20		E
Tree (TG)	*Melia azedarach (White Cedar)*	0.1	1		N
	Schinus areira (Pepper Tree)	1	1		E
Grass & grasslike (GG)	*Eragrostis brownii (Brown's Lovegrass)*	0.1	20		N
Grass & grasslike (GG)	*Bromus spp. (A Brome)*	0.1	10		N

BAM Site – Field Survey Form

Plot ID:	Plot 16	**Date:**	11/04/22	**Project number:**	J210553	**Plot dimensions:**	20 x 50 m
Datum:	GDA94	**Easting:**	735,125	**Recorders:**	BS, EJ		
Zone:	55	**Northing:**	6,443,554	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	331
Plant Community Type:	281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion			**Condition class:**	Poor	**PCT confidence:**	high
Vegetation Class:	Western Slopes Grassy Woodlands			**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	0
	Grasses etc.:	11
	Forbs:	3
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	7
	Shrubs:	0
	Grasses etc.:	2.8
	Forbs:	0.3
	Ferns:	0
	Other:	0.1
High Threat Weed cover:		0.6

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**		
80 + cm:	2	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	25
50 – 79 cm:	3		
30 – 49 cm:	6		
20 – 29 cm:	5	**Tree hollow count**	1
10 – 19 cm:	4		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	0	10	0	10	15
Average litter cover (%):	7				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Creekline

Plot Disturbance

Weedy

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	BS, EJ	**Plot ID:**	Plot 16	**Date:**	11/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus blakelyi (Blakely's Red Gum)*	2	3		N
Tree (TG)	*Angophora floribunda (Rough-barked Apple)*	5	4		N
	Verbena bonariensis (Purpletop)	0.1	30		E
	Bidens subalternans (Greater Beggar's Ticks)	0.1	30		HTE
	Setaria pumila (Pale Pigeon Grass)	20	500		E
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	30		E
Grass & grasslike (GG)	*Carex appressa (Tall Sedge)*	0.5	15		N
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	0.1	4		N
Grass & grasslike (GG)	*Aristida vagans (Threeawn Speargrass)*	0.2	20		N
Grass & grasslike (GG)	*Lomandra spp. (Mat-rush)*	0.1	15		N
Other (OG)	*Glycine clandestina (Twining glycine)*	0.1	5		N
Grass & grasslike (GG)	*Paspalidium aversum (Bent Summer Grass)*	0.3	150		N
	Hypochaeris radicata (Catsear)	0.1	20		E
Grass & grasslike (GG)	*Cynodon dactylon (Common Couch)*	0.5	200		N
	Bromus catharticus (Praire Grass)	0.2	100		E
	Gomphrena celosioides (Gomphrena Weed)	0.1	50		E
Grass & grasslike (GG)	*Eragrostis spp. (A Lovegrass)*	0.3	200		N
	Paspalum dilatatum (Paspalum)	0.2	100		HTE
	Echinochloa crus-galli (Barnyard Grass)	0.2	100		E
	Solanum nigrum (Black-berry Nightshade)	0.1	5		E
Forb (FG)	*Persicaria subsessilis (Hairy Knotweed)*	0.1	10		N
	Rumex crispus (Curled Dock)	0.1	10		E
Forb (FG)	*Alternanthera nana (Hairy Joyweed)*	0.1	20		N
	Silybum marianum (Variegated Thistle)	0.1	1		E
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	0.3	50		N
	Acetosa sagittata (Rambling Dock)	0.1	20		HTE
	Echium plantagineum (Patterson's Curse)	0.1	1		E
Grass & grasslike (GG)	*Enteropogon spp. (Windmill Grass)*	0.1	1		N
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.1	5		N
	Xanthium spinosum (Bathurst Burr)	0.1	1		HTE
	Lysimachia arvensis (Scarlet Pimpernel)	0.2	30		E
	Sonchus oleraceus (Common Sowthistle)	0.1	1		E
	Lepidium africanum (Common Peppercress)	0.1	10		E
Grass & grasslike (GG)	*Juncus continuus*	0.3	20		N
Grass & grasslike (GG)	*Bolboschoenus spp.*	0.1	1		N
	Cyperus eragrostis (Umbrella Sedge)	0.1	15		HTE

BAM Site – Field Survey Form

Plot ID:	Plot 17	**Date:**	11/04/22	**Project number:**	J210553	**Plot dimensions:**	20 x 50 m
Datum:	GDA94	**Easting:**	735,023	**Recorders:**	BS, EJ		
Zone:	55	**Northing:**	6,442,727	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	341
Plant Community Type:	281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion			**Condition class:**	Poor	**PCT confidence:**	high
Vegetation Class:	Western Slopes Grassy Woodlands			**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	0
	Grasses etc.:	8
	Forbs:	0
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	10
	Shrubs:	0
	Grasses etc.:	6.3
	Forbs:	0
	Ferns:	0
	Other:	0
High Threat Weed cover:		50.3

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	16
80 + cm:	1		
50 – 79 cm:	4		
30 – 49 cm:	0		
20 – 29 cm:	0	**Tree hollow count**	4
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	25	10	15	20	15
Average litter cover (%):	17				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Parallel to creekline

Plot Disturbance

Evidence of grazing

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	BS, EJ	**Plot ID:**	Plot 17	**Date:**	11/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Cenchrus clandestinus (Kikuyu Grass)	50	1000		HTE
	Verbena bonariensis (Purpletop)	0.1	50		E
Grass & grasslike (GG)	*Austrostipa setacea (Corkscrew Grass)*	0.1	10		N
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	20		E
	Cyperus eragrostis (Umbrella Sedge)	0.1	10		HTE
	Setaria pumila (Pale Pigeon Grass)	0.2	50		E
	Lepidium africanum (Common Peppercress)	0.1	25		E
Tree (TG)	*Eucalyptus blakelyi (Blakely's Red Gum)*	10	3		N
Grass & grasslike (GG)	*Eragrostis brownii (Brown's Lovegrass)*	0.1	10		N
Grass & grasslike (GG)	*Austrostipa spp. (A Speargrass)*	0.1	5		N
	Bidens subalternans (Greater Beggar's Ticks)	0.1	10		HTE
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	0.2	30		N
Grass & grasslike (GG)	*Carex appressa (Tall Sedge)*	0.2	20		N
Grass & grasslike (GG)	*Aristida ramosa (Purple Wiregrass)*	0.5	50		N
	Alternanthera pungens (Khaki Weed)	0.1	50		HTE
	Cirsium vulgare (Spear Thistle)	0.1	2		E
Grass & grasslike (GG)	*Cynodon dactylon (Common Couch)*	5	1000		N
	Solanum nigrum (Black-berry Nightshade)	0.1	6		E
Grass & grasslike (GG)	*Themeda triandra*	0.1	5		N

BAM Site – Field Survey Form

Plot ID:	Plot 18	**Date:**	12/04/22	**Project number:**	J210553	**Plot dimensions:**	20 x 50m
Datum:	GDA94	**Easting:**	736,284	**Recorders:**	BS, EJ		
Zone:	55	**Northing:**	6,441,872	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	282
Plant Community Type:	281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion			**Condition class:**	Pasture	**PCT confidence:**	high
Vegetation Class:	Western Slopes Grassy Woodlands			**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	6
	Forbs:	1
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	71.1
	Forbs:	0.1
	Ferns:	0
	Other:	0
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	2	4	2	2	3
Average litter cover (%):	2.6				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Pasture

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	BS, EJ	**Plot ID:**	Plot 18	**Date:**	12/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	50	1000		N
Grass & grasslike (GG)	*Bothriochloa decipiens var. decipiens (Pitted Bluegrass)*	10	500		N
Grass & grasslike (GG)	*Juncus continuus*	5	400		N
Grass & grasslike (GG)	*Eragrostis parviflora (Weeping Lovegrass)*	5	400		N
Forb (FG)	*Calotis cuneifolia (Purple Burr-Daisy)*	0.1	30		N
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	50		E
Grass & grasslike (GG)	*Eragrostis brownii (Brown's Lovegrass)*	0.1	20		N
Grass & grasslike (GG)	*Cynodon dactylon (Common Couch)*	1	100		N
	Medicago sativa (Lucerne)	0.1	20		E
	Setaria pumila (Pale Pigeon Grass)	0.1	10		E

BAM Site – Field Survey Form

Plot ID:	Plot 19	**Date:**	12/04/22	**Project number:**	J210553	**Plot dimensions:**	20 x 50 m
Datum:	GDA94	**Easting:**	737,008	**Recorders:**	BS, EJ		
Zone:	55	**Northing:**	6,442,438	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	271
Plant Community Type:	281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion			**Condition class:**	Planted	**PCT confidence:**	high
Vegetation Class:	Western Slopes Grassy Woodlands			**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	0
	Grasses etc.:	9
	Forbs:	2
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	5.5
	Shrubs:	0
	Grasses etc.:	17.6
	Forbs:	0.3
	Ferns:	0
	Other:	0
High Threat Weed cover:		0.9

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	20
80 + cm:	0		
50 – 79 cm:	1		
30 – 49 cm:	5		
20 – 29 cm:	3	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	2	5	2	2	5
Average litter cover (%):	3.2				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Grazed

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	BS, EJ	**Plot ID:**	Plot 19	**Date:**	12/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus melliodora (Yellow Box)*	4	1		N
Tree (TG)	*Eucalyptus camaldulensis (River Red Gum)*	1.5	2		N
	Schinus areira (Pepper Tree)	1	1		E
	Solanum nigrum (Black-berry Nightshade)	0.2	30		E
	Bidens subalternans (Greater Beggar's Ticks)	0.1	10		HTE
	Xanthium spinosum (Bathurst Burr)	0.2	15		HTE
	Modiola caroliniana (Red-flowered Mallow)	0.1	20		E
Grass & grasslike (GG)	*Cynodon dactylon (Common Couch)*	10	1000		N
	Amaranthus powellii (Powell's Amaranth)	1	50		E
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	4	100		N
	Chloris gayana (Rhodes Grass)	0.1	20		HTE
	Eragrostis cilianensis (Stinkgrass)	0.3	100		E
Grass & grasslike (GG)	*Paspalum distichum (Water Couch)*	2	500		N
	Alternanthera pungens (Khaki Weed)	0.5	50		HTE
Forb (FG)	*Portulaca oleracea (Pigweed)*	0.1	20		N
	Medicago sativa (Lucerne)	0.1	10		E
Grass & grasslike (GG)	*Enteropogon spp. (Windmill Grass)*	0.2	40		N
	Eleusine tristachya (Goose Grass)	0.1	1		E
	Setaria parviflora	0.1	10		E
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	5		E
Grass & grasslike (GG)	*Eragrostis parviflora (Weeping Lovegrass)*	1	50		N
Grass & grasslike (GG)	*Juncus subsecundus (Finger Rush)*	0.1	20		N
	Polycarpon tetraphyllum (Four-leaved Allseed)	0.1	20		E
	Cucumis myriocarpus subsp. leptodermis (Paddy Melon)	0.3	40		E
	Gomphrena celosioides (Gomphrena Weed)	0.1	10		E
Grass & grasslike (GG)	*Paspalidium aversum (Bent Summer Grass)*	0.1	100		N
Forb (FG)	*Alternanthera nana (Hairy Joyweed)*	0.2	50		N
	Trifolium repens (White Clover)	0.1	10		E
	Lepidium africanum (Common Peppercress)	0.1	1		E
Grass & grasslike (GG)	*Bothriochloa decipiens var. decipiens (Pitted Bluegrass)*	0.1	10		N
Grass & grasslike (GG)	*Aristida spp. (A Wiregrass)*	0.1	3		N

BAM Site – Field Survey Form

Plot ID:	Plot 20	**Date:**	12/04/22	**Project number:**	J210553	**Plot dimensions:**	20 x 50 m
Datum:	GDA94	**Easting:**	738,863	**Recorders:**	BS, EJ		
Zone:	55	**Northing:**	6,441,803	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	216
Plant Community Type:	281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion			**Condition class:**	Planted	**PCT confidence:**	high
Vegetation Class:	Western Slopes Grassy Woodlands			**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	1
	Grasses etc.:	7
	Forbs:	4
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	10
	Shrubs:	1
	Grasses etc.:	36.7
	Forbs:	0.5
	Ferns:	0
	Other:	0.1
High Threat Weed cover:		2.5

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	15
80 + cm:	1		
50 – 79 cm:	0		
30 – 49 cm:	3		
20 – 29 cm:	6	Tree hollow count	1
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	4		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	30	20	10	5	2
Average litter cover (%):	13.4				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Historical disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	BS, EJ	**Plot ID:**	Plot 20	**Date:**	12/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Angophora floribunda (Rough-barked Apple)*	10	8		N
Shrub (SG)	*Acacia irrorata (Green Wattle)*	1	2		N
Forb (FG)	*Einadia trigonos (Fishweed)*	0.1	5		N
Forb (FG)	*Polycarpaea arida*	0.1	5		N
Grass & grasslike (GG)	*Juncus continuus*	0.2	40		N
	Bromus catharticus (Praire Grass)	1	100		E
	Sonchus oleraceus (Common Sowthistle)	0.1	1		E
Grass & grasslike (GG)	*Carex appressa (Tall Sedge)*	0.2	3		N
	Gomphrena celosioides (Gomphrena Weed)	0.1	20		E
	Lepidium africanum (Common Peppercress)	0.1	20		E
	Verbena bonariensis (Purpletop)	0.1	10		E
Forb (FG)	*Alternanthera nana (Hairy Joyweed)*	0.2	50		N
Grass & grasslike (GG)	*Eragrostis alveiformis*	0.2	50		N
	Onopordum acanthium subsp. acanthium (Scotch Thistle)	0.1	4		E
	Bidens subalternans (Greater Beggar's Ticks)	0.1	10		HTE
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	10		E
	Alternanthera pungens (Khaki Weed)	0.2	50		HTE
	Chenopodium album (Fat Hen)	0.1	2		E
	Brassica nigra (Black Mustard)	0.1	3		E
Grass & grasslike (GG)	*Cynodon dactylon (Common Couch)*	3	100		N
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.1	1		N
	Echium plantagineum (Patterson's Curse)	0.1	2		E
	Solanum nigrum (Black-berry Nightshade)	0.2	20		E
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	30	1000		N
Grass & grasslike (GG)	*Paspalidium aversum (Bent Summer Grass)*	3	100		N
	Setaria parviflora	0.1	20		E
Other (OG)	*Glycine tabacina (Variable Glycine)*	0.1	50		N
	Xanthium spinosum (Bathurst Burr)	0.2	20		HTE
	Paspalum dilatatum (Paspalum)	2	50		HTE
Grass & grasslike (GG)	*Digitaria divaricatissima (Umbrella Grass)*	0.1	20		N

BAM Site – Field Survey Form

Plot ID:	Plot 21	**Date:**	12/04/22	**Project number:**	J210553	**Plot dimensions:**	20 x 50 m
Datum:	GDA94	**Easting:**	738,605	**Recorders:**	BS, EJ		
Zone:	55	**Northing:**	6,439,996	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	81
Plant Community Type:	80: Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion			**Condition class:**	Poor	**PCT confidence:**	high
Vegetation Class:	Floodplain Transition Woodlands			**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	1
	Grasses etc.:	3
	Forbs:	5
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	20
	Shrubs:	0.1
	Grasses etc.:	2.2
	Forbs:	2.8
	Ferns:	0
	Other:	0
High Threat Weed cover:		1.3

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	13
80 + cm:	1		
50 – 79 cm:	3		
30 – 49 cm:	1		
20 – 29 cm:	3	Tree hollow count	1
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	20	2	2	1
Average litter cover (%):	6				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Historical grazing

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	BS, EJ	**Plot ID:**	Plot 21	**Date:**	12/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus microcarpa (Western Grey Box)*	20	8		N
	Solanum nigrum (Black-berry Nightshade)	1	30		E
	Amaranthus powellii (Powell's Amaranth)	2	100		E
	Xanthium spinosum (Bathurst Burr)	1	50		HTE
	Bromus catharticus (Praire Grass)	5	200		E
	Brassica nigra (Black Mustard)	0.5	50		E
	Alternanthera pungens (Khaki Weed)	0.1	60		HTE
	Sonchus oleraceus (Common Sowthistle)	0.1	10		E
	Malva parviflora (Small-flowered Mallow)	0.3	100		E
Forb (FG)	*Dysphania pumilio (Small Crumbweed)*	0.5	100		N
Grass & grasslike (GG)	*Paspalidium aversum (Bent Summer Grass)*	1	100		N
Shrub (SG)	*Maireana microphylla (Small-leaf Bluebush)*	0.1	2		N
	Verbena bonariensis (Purpletop)	0.1	10		E
	Lepidium africanum (Common Peppercress)	0.2	100		E
	Echium plantagineum (Patterson's Curse)	0.1	5		E
	Setaria parviflora	0.1	50		E
	Bidens subalternans (Greater Beggar's Ticks)	0.1	5		HTE
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	10		E
Forb (FG)	*Brachyscome spp.*	2	100		N
	Paspalum dilatatum (Paspalum)	0.1	10		HTE
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.1	1		N
Grass & grasslike (GG)	*Eriochloa pseudoacrotricha (Early Spring Grass)*	1	100		N
	Polygonum aviculare (Wireweed)	0.1	50		E
	Modiola caroliniana (Red-flowered Mallow)	0.1	20		E
	Gomphrena celosioides (Gomphrena Weed)	0.1	20		E
Grass & grasslike (GG)	*Enteropogon acicularis (Curly Windmill Grass)*	0.2	100		N
Forb (FG)	*Oxalis spp.*	0.1	50		N
	Lolium rigidum (Wimmera Ryegrass)	0.1	5		E
	Trifolium repens (White Clover)	0.1	10		E
Forb (FG)	*Portulaca oleracea (Pigweed)*	0.1	1		N
	Echinochloa crus-galli (Barnyard Grass)	0.2	20		E

BAM Site – Field Survey Form

Plot ID:	Plot 22	**Date:**	12/04/22	**Project number:**	J210553	**Plot dimensions:**	100 x 10 m
Datum:	GDA94	**Easting:**	735,012	**Recorders:**	BS, EJ		
Zone:	55	**Northing:**	6,442,676	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	343
Plant Community Type:	281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion			**Condition class:**	Medium	**PCT confidence:**	high
Vegetation Class:	Western Slopes Grassy Woodlands			**EEC:**	no	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	2
	Grasses etc.:	7
	Forbs:	3
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	17.5
	Shrubs:	3.1
	Grasses etc.:	2.5
	Forbs:	0.3
	Ferns:	0
	Other:	0.1
High Threat Weed cover:		25.3

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	37
80 + cm:	3		
50 – 79 cm:	1		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	2
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	20	15	30	25	10
Average litter cover (%):	20				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Road side and creekline running through

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	BS, EJ	**Plot ID:**	Plot 22	**Date:**	12/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus blakelyi (Blakely's Red Gum)*	5	6		N
Tree (TG)	*Angophora floribunda (Rough-barked Apple)*	12	10		N
	Cenchrus clandestinus (Kikuyu Grass)	25	1000		HTE
	Conyza bonariensis (Flaxleaf Fleabane)	0.2	100		E
	Verbena bonariensis (Purpletop)	0.1	50		E
	Onopordum acanthium subsp. acanthium (Scotch Thistle)	0.1	10		E
Grass & grasslike (GG)	*Themeda triandra*	0.5	50		N
	Solanum nigrum (Black-berry Nightshade)	0.1	20		E
	Lepidium africanum (Common Peppercress)	0.1	50		E
	Bidens subalternans (Greater Beggar's Ticks)	0.1	10		HTE
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	0.2	100		N
Other (OG)	*Glycine tabacina (Variable Glycine)*	0.1	20		N
	Setaria pumila (Pale Pigeon Grass)	0.2	40		E
Forb (FG)	*Einadia trigonos (Fishweed)*	0.1	2		N
Forb (FG)	*Calotis lappulacea (Yellow Burr-daisy)*	0.1	5		N
Forb (FG)	*Oxalis spp.*	0.1	10		N
	Hypochaeris radicata (Catsear)	0.1	20		E
Grass & grasslike (GG)	*Eragrostis alveiformis*	0.1	20		N
Shrub (SG)	*Acacia implexa (Hickory Wattle)*	3	50		N
Grass & grasslike (GG)	*Carex appressa (Tall Sedge)*	0.5	8		N
Tree (TG)	*Brachychiton populneus (Kurrajong)*	0.5	1		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	1	200		N
Grass & grasslike (GG)	*Austrostipa spp. (A Speargrass)*	0.1	10		N
Shrub (SG)	*Acacia elongata (Swamp Wattle)*	0.1	6		N
Grass & grasslike (GG)	*Bromus spp. (A Brome)*	0.1	20		N
	Paspalum dilatatum (Paspalum)	0.1	10		HTE
	Hyparrhenia hirta (Coolatai Grass)	0.1	20		HTE

BAM Site – Field Survey Form

Plot ID:	Plot 23	**Date:**	13/04/22	**Project number:**	J210553	**Plot dimensions:**	20 x 50 m
Datum:	GDA94	**Easting:**	734,310	**Recorders:**	BS, EJ		
Zone:	55	**Northing:**	6,442,578	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	316
Plant Community Type:	281: Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion			**Condition class:**	High	**PCT confidence:**	high
Vegetation Class:	Western Slopes Grassy Woodlands			**EEC:**	yes	**EEC confidence:**	high

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	3
	Grasses etc.:	12
	Forbs:	9
	Ferns:	1
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	21
	Shrubs:	0.4
	Grasses etc.:	4.2
	Forbs:	13.6
	Ferns:	0.2
	Other:	0.2
High Threat Weed cover:		0.4

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	29
80 + cm:	1		
50 – 79 cm:	1		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	1
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	25	50	10	25	15
Average litter cover (%):	25				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Minimal grazing

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	BS, EJ	**Plot ID:**	Plot 23	**Date:**	13/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus blakelyi (Blakely's Red Gum)*	20	14		N
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	2	200		N
	Verbena bonariensis (Purpletop)	0.1	15		E
Grass & grasslike (GG)	*Digitaria divaricatissima (Umbrella Grass)*	0.5	50		N
Forb (FG)	*Calotis lappulacea (Yellow Burr-daisy)*	8	200		N
Forb (FG)	*Calotis cuneifolia (Purple Burr-Daisy)*	4	100		N
Grass & grasslike (GG)	*Aristida spp. (A Wiregrass)*	0.2	100		N
Tree (TG)	*Angophora floribunda (Rough-barked Apple)*	1	2		N
Grass & grasslike (GG)	*Austrostipa verticillata (Slender Bamboo Grass)*	0.1	5		N
Grass & grasslike (GG)	*Eragrostis alveiformis*	0.1	50		N
Grass & grasslike (GG)	*Digitaria brownii (Cotton Panic Grass)*	0.1	50		N
Shrub (SG)	*Maireana microphylla (Small-leaf Bluebush)*	0.1	2		N
Other (OG)	*Glycine clandestina (Twining glycine)*	0.1	50		N
Forb (FG)	*Lepidium spp. (A Peppercress)*	0.1	100		N
Grass & grasslike (GG)	*Eragrostis brownii (Brown's Lovegrass)*	0.1	10		N
Fern (EG)	*Cheilanthes sieberi (Rock Fern)*	0.2	80		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.1	30		N
Other (OG)	*Glycine tabacina (Variable Glycine)*	0.1	20		N
Forb (FG)	*Oxalis spp.*	0.1	20		N
Forb (FG)	*Einadia hastata (Berry Saltbush)*	1	200		N
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	3		E
	Cenchrus clandestinus (Kikuyu Grass)	0.1	50		HTE
	Marrubium vulgare (White Horehound)	0.3	100		E
	Bidens subalternans (Greater Beggar's Ticks)	0.1	2		HTE
	Alternanthera pungens (Khaki Weed)	0.1	20		HTE
Shrub (SG)	*Eremophila debilis (Amulla)*	0.2	50		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	0.2	50		N
	Solanum nigrum (Black-berry Nightshade)	0.1	10		E
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	30		N
Grass & grasslike (GG)	*Chloris ventricosa (Tall Chloris)*	0.5	50		N
Grass & grasslike (GG)	*Juncus subsecundus (Finger Rush)*	0.1	50		N
Forb (FG)	*Wahlenbergia communis (Tufted Bluebell)*	0.1	1		N
Forb (FG)	*Arthropodium spp.*	0.1	4		N
Grass & grasslike (GG)	*Eulalia aurea (Silky Browntop)*	0.1	20		N
	Hypericum perforatum (St. Johns Wort)	0.1	1		HTE
	Plantago lanceolata (Lamb's Tongues)	0.1	5		E
Shrub (SG)	*Cassinia sifton*	0.1	1		N
Grass & grasslike (GG)	*Themeda triandra*	0.2	10		N

BAM Site – Field Survey Form

Plot ID:	Plot 24	**Date:**	13/04/22	**Project number:**	J210553	**Plot dimensions:**	20 x 50 m
Datum:	GDA94	**Easting:**	740,537	**Recorders:**	BS, EJ		
Zone:	55	**Northing:**	6,440,500	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	214
Plant Community Type:		80: Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion		**Condition class:**	Pasture	**PCT confidence:**	high
Vegetation Class:		Floodplain Transition Woodlands		**EEC:**	no	**EEC confidence:**	medium

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	7
	Forbs:	3
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	71
	Forbs:	0.3
	Ferns:	0
	Other:	0
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	1	2	2	1	5
Average litter cover (%):	2.2				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	BS, EJ	**Plot ID:**	Plot 24	**Date:**	13/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Eragrostis brownii (Brown's Lovegrass)*	0.1	50		N
	Conyza bonariensis (Flaxleaf Fleabane)	0.2	100		E
	Verbena bonariensis (Purpletop)	0.1	50		E
	Brassica nigra (Black Mustard)	0.2	50		E
Grass & grasslike (GG)	*Bothriochloa decipiens var. decipiens (Pitted Bluegrass)*	50	1000		N
	Setaria pumila (Pale Pigeon Grass)	1	100		E
	Onopordum acanthium subsp. acanthium (Scotch Thistle)	0.1	5		E
Forb (FG)	*Oxalis perennans*	0.1	50		N
	Lysimachia arvensis (Scarlet Pimpernel)	0.1	30		E
	Trifolium campestre (Hop Clover)	0.3	100		E
	Polygonum aviculare (Wireweed)	0.1	50		E
Forb (FG)	*Euchiton sphaericus (Star Cudweed)*	0.1	10		N
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	20	1000		N
Grass & grasslike (GG)	*Paspalidium aversum (Bent Summer Grass)*	0.5	100		N
Grass & grasslike (GG)	*Digitaria divaricatissima (Umbrella Grass)*	0.2	50		N
Grass & grasslike (GG)	*Rytidosperma spp.*	0.1	50		N
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.1	10		N
	Sonchus asper (Prickly Sowthistle)	0.1	1		E
Grass & grasslike (GG)	*Aristida spp. (A Wiregrass)*	0.1	10		N
	Lepidium africanum (Common Peppercress)	0.1	20		E

BAM Site – Field Survey Form

Plot ID:	Plot 25	**Date:**	13/04/22	**Project number:**	J210553	**Plot dimensions:**	20 x 50 m
Datum:	GDA94	**Easting:**	740,283	**Recorders:**	BS, EJ		
Zone:	55	**Northing:**	6,440,286	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	179
Plant Community Type:	80: Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion			**Condition class:**	Pasture	**PCT confidence:**	high
Vegetation Class:	Floodplain Transition Woodlands			**EEC:**	no	**EEC confidence:**	medium

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	4
	Forbs:	1
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	80
	Forbs:	0.1
	Ferns:	0
	Other:	0
High Threat Weed cover:		0.3

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	2	3	5	2
Average litter cover (%):	3.4				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	BS, EJ	**Plot ID:**	Plot 25	**Date:**	13/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Eragrostis alveiformis*	5	500		N
Grass & grasslike (GG)	*Bothriochloa decipiens var. decipiens (Pitted Bluegrass)*	30	1000		N
	Verbena bonariensis (Purpletop)	0.1	10		E
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	40	1000		N
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	10		E
Grass & grasslike (GG)	*Paspalidium aversum (Bent Summer Grass)*	5	500		N
	Trifolium campestre (Hop Clover)	2	100		E
	Xanthium spinosum (Bathurst Burr)	0.1	3		HTE
	Oxalis thompsoniae	1	100		E
	Modiola caroliniana (Red-flowered Mallow)	0.1	2		E
	Paspalum dilatatum (Paspalum)	0.2	20		HTE
	Sonchus oleraceus (Common Sowthistle)	0.1	1		E
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.1	1		N

BAM Site – Field Survey Form

Plot ID:	Plot 26	**Date:**	13/04/22	**Project number:**	J210553	**Plot dimensions:**	20 x 50 m
Datum:	GDA94	**Easting:**	739,954	**Recorders:**	BS, EJ		
Zone:	55	**Northing:**	6,440,002	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	209
Plant Community Type:	80: Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion			**Condition class:**	Pasture	**PCT confidence:**	high
Vegetation Class:	Floodplain Transition Woodlands			**EEC:**	no	**EEC confidence:**	medium

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	5
	Forbs:	1
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	65.5
	Forbs:	0.1
	Ferns:	0
	Other:	0
High Threat Weed cover:		0.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	3	5	3	5	2
Average litter cover (%):	3.6				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	BS, EJ	**Plot ID:**	Plot 26	**Date:**	13/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Bothriochloa decipiens var. decipiens (Pitted Bluegrass)*	20	1000		N
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	20	1000		N
Grass & grasslike (GG)	*Eragrostis alveiformis*	20	1000		N
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	10		E
Grass & grasslike (GG)	*Paspalidium aversum (Bent Summer Grass)*	5	500		N
	Trifolium campestre (Hop Clover)	0.2	50		E
	Onopordum acanthium subsp. acanthium (Scotch Thistle)	0.1	20		E
	Hypericum perforatum (St. Johns Wort)	0.1	2		HTE
Grass & grasslike (GG)	*Eriochloa pseudoacrotricha (Early Spring Grass)*	0.5	100		N
	Juncus effusus	0.1	20		E
	Eragrostis cilianensis (Stinkgrass)	0.1	1		E
Forb (FG)	*Calotis lappulacea (Yellow Burr-daisy)*	0.1	20		N
	Verbena bonariensis (Purpletop)	0.1	1		E

BAM Site – Field Survey Form

Plot ID:	Plot 27	**Date:**	13/04/22	**Project number:**	J210553	**Plot dimensions:**	20 x 50 m
Datum:	GDA94	**Easting:**	739,668	**Recorders:**	BS, EJ		
Zone:	55	**Northing:**	6,440,271	**IBRA region:**	NSW South Western Slopes (Inland Slopes)	**Midline bearing:**	242
Plant Community Type:	80: Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion			**Condition class:**	Pasture	**PCT confidence:**	high
Vegetation Class:	Floodplain Transition Woodlands			**EEC:**	no	**EEC confidence:**	medium

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	7
	Forbs:	1
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	26.2
	Forbs:	0.1
	Ferns:	0
	Other:	0.2
High Threat Weed cover:		25.2

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	8	10	5	8
Average litter cover (%):	7.2				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	J210553				
Recorders:	BS, EJ	**Plot ID:**	Plot 27	**Date:**	13/04/22

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	10	500		N
	Verbena bonariensis (Purpletop)	2	200		E
Other (OG)	*Glycine clandestina (Twining glycine)*	0.2	50		N
Grass & grasslike (GG)	*Aristida ramosa (Purple Wiregrass)*	3	200		N
	Hypericum perforatum (St. Johns Wort)	25	300		HTE
Grass & grasslike (GG)	*Eragrostis alveiformis*	1	50		N
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	10		E
Grass & grasslike (GG)	*Digitaria divaricatissima (Umbrella Grass)*	1	50		N
Grass & grasslike (GG)	*Bothriochloa decipiens var. decipiens (Pitted Bluegrass)*	1	50		N
	Rumex crispus (Curled Dock)	0.1	5		E
Grass & grasslike (GG)	*Paspalidium aversum (Bent Summer Grass)*	10	500		N
Grass & grasslike (GG)	*Cynodon dactylon (Common Couch)*	0.2	50		N
	Onopordum acanthium subsp. acanthium (Scotch Thistle)	0.1	10		E
	Paspalum dilatatum (Paspalum)	0.2	50		HTE
	Modiola caroliniana (Red-flowered Mallow)	0.1	20		E
Forb (FG)	*Calotis lappulacea (Yellow Burr-daisy)*	0.1	1		N

Appendix 2

Vegetation integrity plot data

EMM
creating opportunities

2.1 Vegetation integrity plot data

plot	pct	area	patchsize	conditionclass	zone	easting	northing	bearing	compTree	compShrub	compGrass	compForbs	compFerns	compOther	strucTree	strucShrub	strucGrass	strucForbs	strucFerns	strucOther	funLargeTrees	funHollowtrees	funLitterCover	funLenFallenLogs	funTreeStem5to9	funTreeStem10to19	funTreeStem20to29	funTreeStem30to49	funTreeStem50to79	funTreeRegen	funHighThreatExotic
Plot 12	80	1.00	100	High	55	734659	6445751	299	1	4	12	12	1	2	30.0	25.3	57.3	22.9	0.1	0.6	7	3	53.0	58.0	1	0	1	0	1	1	0.0
Plot 7	80	1.00	100	High	55	734311	6443809	230	1	3	10	15	1	2	35.0	1.2	68.5	22.3	0.1	0.6	2	2	78.0	4.0	1	1	1	1	0	1	0.0
Plot 9	80	1.00	100	High	55	734626	6444579	72	1	3	8	17	1	2	35.0	1.3	20.6	64.5	0.5	1.2	3	2	85.0	28.0	1	1	1	1	1	1	1.0
Plot 13	80	1.00	100	Pasture	55	739938	6439825	130	0	0	12	6	0	2	0.0	0.0	102.9	1.0	0.0	0.2	0	0	4.8	0.0	0	0	0	0	0	0	5.1
Plot 24	80	1.00	100	Pasture	55	740537	6440500	214	0	0	7	3	0	0	0.0	0.0	71.0	0.3	0.0	0.0	0	0	2.2	0.0	0	0	0	0	0	0	0.0
Plot 25	80	1.00	100	Pasture	55	740283	6440286	179	0	0	4	1	0	0	0.0	0.0	80.0	0.1	0.0	0.0	0	0	3.4	0.0	0	0	0	0	0	0	0.3
Plot 26	80	1.00	100	Pasture	55	739954	6440002	209	0	0	5	1	0	0	0.0	0.0	65.5	0.1	0.0	0.0	0	0	3.6	0.0	0	0	0	0	0	0	0.1
Plot 27	80	1.00	100	Pasture	55	739668	6440271	242	0	0	7	1	0	1	0.0	0.0	26.2	0.1	0.0	0.2	0	0	7.2	0.0	0	0	0	0	0	0	25.2
Plot 21	80	1.00	100	Poor	55	738605	6439996	81	1	1	3	5	0	0	20.0	0.1	2.2	2.8	0.0	0.0	4	1	6.0	13.0	0	0	1	1	1	0	1.3
Plot 10	281	1.00	100	High	55	734653	6444949	24	3	3	12	12	1	1	17.0	0.7	75.0	8.2	0.1	1.0	7	5	64.0	78.0	1	1	1	1	1	1	0.1
Plot 11	281	1.00	100	High	55	734703	6445341	7	3	2	13	11	1	2	39.0	0.7	62.7	38.4	0.1	0.4	5	3	76.0	68.0	1	1	1	1	1	1	1.1
Plot 23	281	1.00	100	High	55	734310	6442578	316	2	3	12	9	1	2	21.0	0.4	4.2	13.6	0.2	0.2	2	1	25.0	29.0	1	1	1	1	1	1	0.4
Plot 8	281	1.00	100	High	55	734481	6444171	26	3	3	8	18	1	2	35.0	0.8	38.1	11.1	0.1	2.5	5	0	75.0	26.0	1	1	1	1	1	1	0.1
Plot 22	281	1.00	100	Medium	55	735012	6442676	343	3	2	7	3	0	1	17.5	3.1	2.5	0.3	0.0	0.1	4	2	20.0	37.0	1	1	1	1	1	1	25.3
Plot 1	281	1.00	100	Pasture	55	734804	6443167	165	0	0	3	6	0	0	0.0	0.0	22.1	0.7	0.0	0.0	0	0	1.4	0.0	0	0	0	0	0	0	7.0
Plot 18	281	1.00	100	Pasture	55	736284	6441872	282	0	0	6	1	0	0	0.0	0.0	71.1	0.1	0.0	0.0	0	0	2.6	0.0	0	0	0	0	0	0	0.0
Plot 2	281	1.00	100	Pasture	55	734516	6442500	94	0	0	3	7	0	0	0.0	0.0	10.5	3.0	0.0	0.0	0	0	2.0	0.0	0	0	0	0	0	0	30.0
Plot 3	281	1.00	100	Pasture	55	737929	6442220	246	0	0	2	7	1	0	0.0	0.0	10.5	1.6	0.1	0.0	0	0	0.2	0.0	0	0	0	0	0	0	1.5
Plot 4	281	1.00	100	Pasture	55	735459	6441870	232	0	0	3	8	0	0	0.0	0.0	46.0	2.7	0.0	0.0	0	0	0.4	0.0	0	0	0	0	0	0	0.3
Plot 5	281	1.00	100	Pasture	55	736043	6444223	81	0	0	5	5	0	0	0.0	0.0	32.2	6.7	0.0	0.0	0	0	2.6	0.0	0	0	0	0	0	0	0.4
Plot 6	281	1.00	100	Pasture	55	736360	6444702	237	0	0	2	6	0	0	0.0	0.0	0.2	1.1	0.0	0.0	0	0	1.0	0.0	0	0	0	0	0	0	40.0
Plot 20	281	1.00	100	Planted	55	738863	6441803	216	1	1	7	4	0	1	10.0	1.0	36.7	0.5	0.0	0.1	1	1	13.4	15.0	1	1	1	1	0	1	2.5
Plot 19	281	1.00	100	Planted	55	737008	6442438	271	2	0	9	2	0	0	5.5	0.0	17.6	0.3	0.0	0.0	1	0	3.2	20.0	0	0	1	1	1	0	0.9
Plot 15	281	1.00	100	Poor	55	735172	6443738	193	3	0	6	3	0	0	10.1	0.0	8.8	0.7	0.0	0.0	6	2	3.4	35.0	0	1	1	1	1	0	0.7
Plot 16	281	1.00	100	Poor	55	735125	6443554	331	2	0	11	3	0	1	7.0	0.0	2.8	0.3	0.0	0.1	5	1	7.0	25.0	0	1	1	1	1	0	0.6
Plot 17	281	1.00	100	Poor	55	735023	6442727	341	1	0	8	0	0	0	10.0	0.0	6.3	0.0	0.0	0.0	5	4	17.0	16.0	0	0	0	0	1	0	50.3

Appendix 3
Hollow bearing tree data

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Table A.3.1 Hollow bearing trees within or adjacent to the subject land

Tree species	DBH (cm)	Number of small hollows (<5cm)	Number of medium hollows (5–20cm)	Number of large hollows (>20cm)	Notes	Within subject land?
Angophora floribunda	110	1	1	0		No
Angophora floribunda stag	130	1	1	0		No
Angophora floribunda	-	1	1	0		No
Angophora floribunda	-	0	1	0		Yes
Stag	-	0	1	0		No
Angophora floribunda	-	0	1	0		No
Eucalyptus blakelyi	120	1	2	0	Not suitable for GB cockatoo or owls	No
Eucalyptus blakelyi	200	2	2	1	Large hollow, low slit not suitable for owls	No
Angophora floribunda	-	0	1	1	Potential suboptimal owl sized 20 cm hollow. 5 m high.	No
Eucalyptus blakelyi	80	0	0	1	Potential owl sized hollow 30 cm. High up.	No
Stag	-	3	2	0		No
-	-	1	2	0		No
Angophora floribunda	90	0	1	0	Galah nesting	No
Eucalyptus blakelyi	100	1	1	0		No
Eucalyptus blakelyi	-	2	1	0		No
Eucalyptus blakelyi	-	3	2	1		No
Eucalyptus blakelyi	105	3	1	0		No
-	-	1	0	0	Potential for superb	No
-	-	0	1	0		No
Stag	-	3	0	0		No
Angophora floribunda	-	1	1	0		No
Angophora floribunda	-	0	1	0		No
Eucalyptus blakelyi	-	0	1	0		No
Stag	-	1	2	0		No
Eucalyptus melliodora	-	1	1	0		No
Eucalyptus melliodora	50	0	1	0		No
Eucalyptus melliodora	70	0	1	0		No

Table A.3.1 Hollow bearing trees within or adjacent to the subject land

Tree species	DBH (cm)	Number of small hollows (<5cm)	Number of medium hollows (5–20cm)	Number of large hollows (>20cm)	Notes	Within subject land?
Eucalyptus melliodora	-	0	1	0		No
Eucalyptus melliodora	-	1	1	0		No
Eucalyptus melliodora	115	3	0	1		No
Angophora floribunda	90	4	2	0		No
Eucalyptus melliodora	-	1	2	2		No
Eucalyptus melliodora	120	4	2	1		No
Angophora floribunda	75	0	1	0		No
Eucalyptus melliodora	130	1	1	0		No
Eucalyptus blakelyi	110	1	1	1	Potential for owl nesting	No
Eucalyptus melliodora	-	0	1	1	Potential owl hollow about 20 cm, 8 m up	No
Eucalyptus blakelyi	125	2	1	1	Potential owl hollow present	No
Eucalyptus blakelyi	-	0	0	1	Potential owl hollow	Yes
Eucalyptus blakelyi	-	0	0	1	Potential owl hollow	No
Eucalyptus blakelyi	90	0	1	0	Potential owl. Suboptimal at approx. 20 cm	No
Eucalyptus blakelyi	100	0	0	1	Potential owl hollow	No
Eucalyptus blakelyi	90	0	0	1	Potential owl hollow	No
Eucalyptus microcarpa	81	0	1	0	Approx. 20 cm, 10m off ground	No
Stag	70	0	1	0	Suitable for owls	No
Eucalyptus polyanthemos	81	0	1	0	12 m off ground	No

Appendix 4
Protected Matters Search Results

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Department of Agriculture, Water and the Environment

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: 25-May-2022

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	5
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	7
Listed Threatened Species:	39
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:	2
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	13
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	2
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	800 - 900km upstream from Ramsar site	In feature area
Hunter estuary wetlands	150 - 200km upstream from Ramsar site	In buffer area only
Riverland	700 - 800km upstream from Ramsar site	In feature area
The coorong, and lakes alexandrina and albert wetland	900 - 1000km upstream from Ramsar site	In feature area
The macquarie marshes	150 - 200km 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
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	Community may occur within area	In buffer area only
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community may occur within area	In buffer area only
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area	In feature area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community may occur within area	In buffer area only
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community may occur within area	In buffer area only

Community Name	Threatened Category	Presence Text	Buffer Status
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

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
BIRD			
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	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	In feature area
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat known to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Numenius madagascariensis](#)			
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
[Polytelis swainsonii](#)			
Superb Parrot [738]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Pycnoptilus floccosus](#)			
Pilotbird [525]	Vulnerable	Species or species habitat known to occur within area	In feature area
[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 may 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 likely to occur within area	In buffer area only
[Macquaria australasica](#)			
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area	In feature area
MAMMAL			
[Chalinolobus dwyeri](#)			
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Dasyurus maculatus maculatus (SE mainland population)](#)			
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area	In feature area
[Nyctophilus corbeni](#)			
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Petauroides volans			
Greater Glider [254]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Petrogale penicillata			
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area	In buffer area only
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 known to occur within area	In feature area
Pseudomys novaehollandiae			
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
PLANT			
Androcalva procumbens			
[87153]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Dichanthium setosum			
bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Euphrasia arguta			
[4325]	Critically Endangered	Species or species habitat may occur within area	In feature area
Homoranthus darwinioides			
[12974]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Lepidium aschersonii			
Spiny Pepper-cress [10976]	Vulnerable	Species or species habitat may occur within area	In feature area
Lepidium monoplocoides			
Winged Pepper-cress [9190]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Prasophyllum petilum			
Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within area	In feature area
Prasophyllum sp. Wybong (C.Phelps ORG 5269)			
a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area	In feature area
Swainsona recta			
Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat may occur within area	In feature area
Thesium australe			
Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area	In feature area
Vincetoxicum forsteri listed as Tylophora linearis			
[92384]	Endangered	Species or species habitat likely to occur within area	In feature area
Zieria ingramii			
Ingram's Zieria [56734]	Endangered	Species or species habitat known to 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 likely to occur within area	In feature area

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 known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
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 known to occur within area	In feature area
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
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 known 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
Commonwealth Trading Bank of Australia		

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Commonwealth Trading Bank of Australia [13274]	NSW	In buffer area only
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian Telecommunications Commission [13260]	NSW	In buffer area only
Commonwealth Land - Telstra Corporation Limited [14491]	NSW	In buffer area only
Commonwealth Land - Telstra Corporation Limited [14490]	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
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 known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
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 may 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 known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
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
Goodiman	CCA Zone 3 State Conservation Area	NSW	In buffer area only
Yarrobil	CCA Zone 1 National Park	NSW	In buffer area only

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Continued Mining Operations and Construction of Associated Infrastructure	2009/5252	Controlled Action	Post-Approval	In buffer area only
Moolarben Coal Mine Project	2007/3297	Controlled Action	Post-Approval	In buffer area only
Narrabri to Wellington gas transmission pipeline	2011/5913	Controlled Action	Completed	In feature area
Open cut coal mine & associated infrastructure	2011/6158	Controlled Action	Post-Approval	In buffer area only
Ulan West Extension, Near Mudgee NSW	2015/7511	Controlled Action	Post-Approval	In buffer area only
Valley of the Winds wind farm	2020/8668	Controlled Action	Assessment Approach	In feature area
Wollar to Wellington 330kV Transmission Line Project	2005/2202	Controlled Action	Post-Approval	In buffer area only
Not controlled action				
Dubbo - Tamworth Natural Gas Pipeline	2000/32	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

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Modification 4 Longwall Optimisation Project	2018/8337	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
Aerial baiting for wild dog control	2006/2713	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Referral decision				
Proposed large-scale solar farm project	2022/9171	Referral Decision	Referral Publication	In buffer area only
Stubbo Solar Farm	2022/9180	Referral Decision	Referral Publication	In buffer area only

Bioregional Assessments

SubRegion	BioRegion	Website	Buffer Status
Central West	Northern Inland Catchments	BA website	In feature area
Hunter	Northern Sydney Basin	BA website	In buffer area only

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
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

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

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

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Appendix 5
Likelihood of occurrence table

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Family	Scientific name	Common name	BC Act status	EPBC Act status	FM Act	Habitat association	BCS 2022	DAWE 2022	DPI 2022	TBCD 2022	Number of records	Most recent record	Likelihood of occurrence	Justification
Actinopterygii	Galaxias rostratus	Flathead Galaxias	-	CE	CE	Flathead Galaxias is known from the southern part of the Murray Darling Basin. They have been recorded in the Macquarie, Lachlan, Murrumbidgee and Murray Rivers in NSW. Flathead Galaxias are found in still or slow moving water bodies such as wetlands and lowland streams. The species has been recorded forming shoals. They have been associated with a range of habitats including rock and sandy bottoms and aquatic vegetation.		Y					Negligible	The streams within the subject land are highly disturbed and lack aquatic and riparian vegetation. The streams occur as ephemeral waterways in periods of high rainfall. No suitable habitat occurs within the subject land. No previous records within the locality.
Actinopterygii	Maccullochella macquariensis	Trout Cod	-	E	E	The single naturally occurring population is restricted to a small (approximately 120 km) stretch of the Murray River from below Yarrawonga Weir to Strathmerton (Douglas et al. 1994; NSW Fisheries 2001; Rimmer 1987), but is occasionally taken downstream as far as the Barmah State Forest (McKinnon 1993) and further downstream to Gunbower (Douglas et al. 2012). Unconfirmed records have also been made further downstream from near Murrabit, Swan Hill and near Tooleybuc. Trout Cod occupy stream positions characterised by a high abundance of large woody debris (or 'snags') in water that is comparatively deep and close to riverbanks. However, midstream snags are also an important habitat component		Y					Low	The waterways within the subject land occur upstream of the Murray River and do not provide suitable habitat such as deep pools or an abundance of overhanging riparian vegetation.
Actinopterygii	Maccullochella peelii	Murray Cod	-	V	-	The Murray Cod was historically distributed throughout the Murray-Darling Basin. The Murray Cod utilises a diverse range of habitats from clear rocky streams, such as those found in the upper western slopes of NSW (including the ACT), to slow-flowing, turbid lowland rivers and billabongs (McDowall 1996). Murray Cod are frequently found in the main channels of rivers and larger tributaries. The species is, therefore, considered a main-channel specialist. Murray Cod tend to occur in floodplain channels and anabranches when they are inundated (Koehn 1997, 2006; Koehn & Harrington 2005 cited in National Murray Cod Recovery Team 2010), but the species' use of these floodplain habitats appears limited. Preferred microhabitat consists of complex structural features in streams such as large rocks, snags (pieces of large submerged woody debris), overhanging stream banks and vegetation, tree stumps, logs, branches and other woody structures. Such structures reduce or influence stream flows and provide Murray Cod with shelter from fast-flowing water		Y					Low	The waterways within the subject land do not provide suitable microclimates for the species to occur. No submerged rocks or an abundance of woody debris and snags occurs. The waterways within the sujbject are shallow and slow-flowing and occurs approximately 4.5km from the Talbragar River. As the species is a main channel specialist, the species is unlikely to occur within the subject land.
Actinopterygii	Macquaria australasica	Macquarie Perch	-	E	E	The species is now restricted to a small number of fragmented populations mostly in cool, rocky, fast flowing streams in relatively undisturbed upland catchments.		Y					Negligible	The streams within the subject land are highly disturbed. The streams occur as ephemeral waterways in periods of high rainfall. No suitable habitat occurs within the subject land. No previous records within the locality.
Actinopterygii	Mogurnda adspersa	Purple Spotted Gudgeon	-	-	E	The Southern Purple Spotted Gudgeon occurs in the Murray-Darling basin as well as parts of coastal northern NSW and Queensland. The western population of the Southern Purple Spotted Gudgeon was previously widespread in the Murray, Murrumbidgee and Lachlan River systems and tributaries of the Darling, but has experienced a significant decline in recent times. They are now considered to be rare in inland NSW. The species can be found in a variety of habitats such as rivers, creeks, streams and billabongs with slow-flowing or still waters. Cover in the form of aquatic vegetation, overhanging vegetation from river banks, leaf litter, rocks or snags are important for the species.			Y				Low	The waterways within the subject land are highly turbid. Many of these waterways have been altered to include man-made dams and road crossings/culverts which are likely to block fish passage. The waterways within the subject land lack overhanging vegetation, rocks and snags.
Actinopterygii	Tandanus tandanus	Eel-Tailed Catfish in the Murray-Darling Basin	-	-	EP	Eel Tailed Catfish are naturally distributed throughout the Murray-Darling Basin and in the Eastern drainages NSW north of Newcastle. Eel Tailed Catfish numbers in the Murray-Darling Basin have declined due to a range of impacts including invasive species, habitat degradation, cold water pollution and fishing pressures and are now virtually absent from the Murray, Murrumbidgee and Lachlan catchments. The Eel tailed catfish is a non-migratory, benthic (bottom dwelling) species. It is relatively sedentary and adults typically only move within a 5 km range. They are generally more active at night compared with during the day. They can be found in a diverse range of freshwater environments including rivers, creeks, lakes, billabongs and lagoons. They prefer clear, sluggish or still waters, but can also be found in flowing streams with turbid waters. Substrates range from mud to gravel and rock.			Y				Low	The waterways within the subject land are highly turbid. Many of these waterways have been altered to include man-made dams and road crossings/culverts which are likely to block fish passage. Eel-tailed Catfish is not mapped within the subject land, however is associated with Talbragar River which occurs approximately 4.4 km from the subject land.
Amphibia	Crinia sloanei	Sloane's Froglet	V	E	-	Sloane's Froglet has been 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. The species is typically associated with periodically inundated areas in grassland, woodland and disturbed habitats.				Y			Low	Birriwa occurs on the edge of the species north-eastern range. The subject land, whilst highly disturbed, supports online dams only, with ephemeral streams occurring between. No previous records within the locality.
Amphibia	Litoria booroolongensis	Booroolong Frog	E	E	-	The Booroolong Frog is restricted to NSW and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range. It has disappeared from much of the Northern Tablelands, however several populations have recently been recorded in the Namoi catchment. The species is rare throughout most of the remainder of its range. Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock structures within stream margins. Shelter under rocks or amongst vegetation near the ground on the stream edge. Sometimes bask in the sun on exposed rocks near flowing water during summer.				Y			Negligible	The creeks within the subject land are ephemeral. No suitable permanent habitat. These streams lack cobble banks and established riparian vegetation. No previous records within locality.
Aves	Actitis hypoleucos	Common Sandpiper	-	Mi	-	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The population when in Australia is concentrated in northern and western Australia. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags. Generally the species forages in shallow water and on bare soft mud at the edges of wetlands; often where obstacles project from substrate, e.g. rocks or mangrove roots. Birds sometimes venture into grassy areas adjoining wetlands. Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves. The species is known to perch on posts, jetties, moored boats and other artificial structures, and to sometimes rest on mud or 'loaf' on rocks.		Y					Low	There is no wetland or estuarine habitat within the subject land. No previous records within the locality.
Aves	Anthochaera phrygia	Regent Honeyeater	CE	CE	-	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak.These birds are also found in drier coastal woodlands and forests in some years. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany (Eucalyptus robusta) and Spotted Gum (Corymbia maculata) forests, particularly on the central coast and occasionally on the upper north coast. Birds are occasionally seen on the south coast.	Y	Y		Y	2	2012	Moderate	Subject land occurs in known range and provides suitable habitat for foraging. Low number of previous records within the locality and is associated with the PCT within the subject land, however no mistletoe was recorded within the subject land.
Aves	Apus pacificus	Fork-tailed Swift	-	Mi	-	In NSW, the Fork-tailed Swift is recorded in all regions. Many records occur east of the Great Divide, however, a few populations have been found west of the Great Divide. These are widespread but scattered further west of the line joining Bourke and Dareton. Sightings have been recorded at Milparinka, the Bulloo River and Thurloo Downs. The Fork-tailed Swift is almost exclusively aerial, flying from less then 1 m to at least 300 m above ground and probably much higher. In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. They sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines. They forage aerially, up to hundreds of metres above ground, but also less then 1 m above open areas or over water. They often occur in areas of updraughts, especially around cliffs.		Y					Low	Species is greatly associated with coastal landscapes and vegetation. Within this locality, the species may occur as a vagrant to forage over the native pasture within the subject land.
Aves	Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	-	The species occurs throughout most of NSW, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range. The most common habitat for this species is in woodlands and dry open sclerophyll forests, usually dominated by eucalyptus, including mallee associations. The species has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests. Understorey is typically open with sparse Eucalyptus saplings, Acacia and other shrubs, including heath. The ground cover may consist of grasses, sedges or open ground, often with coarse woody debris (OEH 2018).	Y			Y	14	2020		
Aves	Botaurus poiciloptilus	Australasian Bittern	E	E	-	The Australasian Bittern is widespread and found over most of NSW except for far north-west. Preferred habitat is comprised of wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds or cutting grass (Gahnia sp.) growing over a muddy or peaty substrate (OEH 2018).		Y					Low	There is no wetland habitat within the subject land. No previous records within the locality.
Aves	Burhinus grallarius	Bush Stone-curlew	E	-	-	The Bush Stone-curlew has previously been recorded in all but the most arid parts of mainland Australia. Today the species is scarce or largely absent in many parts of its former range south and east of the Great Dividing Range. It inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. The curlew likes to roost and nest in grassy woodlands of Bull Oak, gum or box with low, sparse grassy or herb understorey. Nests are usually beside a fallen log, which probably makes it harder for foxes to find. Curlews prefer a sparse understorey so they can see predators while foraging for insects (OEH 2018).				Y				
Aves	Calidris acuminata	Sharp-tailed Sandpiper	-	Mi	-	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves.	Y	Y			1	2011	Low	There is no wetland habitat within the subject land. Only one previous record within the locality.
Aves	Calidris ferruginea	Curlew Sandpiper	E	CE, Mi	-	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. Occasionally they are recorded around floodwaters.		Y					Low	There is no wetland habitat within the subject land. No previous records within the locality.
Aves	Calidris melanotos	Pectoral Sandpiper	-	Mi	-	In New South Wales (NSW), the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands.		Y					Low	There is no wetland or estuarine habitat within the subject land. No previous records within the locality.
Aves	Callocephalon fimbriatum	Gang-gang Cockatoo	V	E	-	In summer, the Gang-gang Cockatoo is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, they may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas.		Y		Y			Moderate	Suitable habitat and hollows within the subject land. Subject land is located on edge of species range. Suitable for foraging and roosting habitat only. Species breeds in higher altitudes associated with tall mountain forests.
Aves	Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	-	The Glossy Black Cockatoo inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of She-oak species, particularly Black She-oak (Allocasuarina littoralis), Forest She-oak (A. torulosa) or Drooping She-oak (A. verticillata) occur.	Y			Y	60	2020		
Aves	Certhionyx variegatus	Pied Honeyeater	V	-	-	Widespread throughout acacia, mallee and spinifex scrubs of arid and semi-arid Australia. Occasionally occurs further east, on the slopes and plains and the Hunter Valley, typically during periods of drought. Inhabits wattle shrub, primarily Mulga (Acacia aneura), mallee, spinifex and eucalypt woodlands, usually when shrubs are flowering; feeds on nectar, predominantly from various species of emu-bushes (Eremophila spp.); also from mistletoes and various other shrubs (e.g. Grevillea spp.); also eats saltbush fruit, berries, seed, flowers and insects. Highly nomadic, following the erratic flowering of shrubs; can be locally common at times.				Y				
Aves	Chthonicola sagittata	Speckled Warbler	V	-	-	The Speckled Warbler has a patchy distribution, occurring within the eastern half of NSW and most frequently reported from the hills and tablelands of the Great Dividing Range. The species lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Nests are located in a slight hollow in the ground or the base of a low dense plant, often among fallen branches and other litter (OEH 2018).	Y			Y	43	2020		

Aves	Circus assimilis	Spotted Harrier	V	-	-	The Spotted Harrier occurs widely in NSW, mainly within grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. The species also occurs in agricultural land, foraging over open woodlands (OEH 2018).	Y			Y	1	2004		
Aves	Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	-	-	The Brown Treecreeper is found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range. The Brown Treecreeper mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey. Fallen timber is an important habitat component for foraging.	Y			Y	34	2020		
Aves	Daphoenositta chrysoptera	Varied Sittella	V	-	-	The Varied Sittella inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. This species feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.	Y			Y	11	2018		
Aves	Falco hypoleucos	Grey Falcon	E	V	-	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The species is 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. Also occurs near wetlands where surface water attracts prey (OEH 2018).		Y					Low	Habitat within the subject land does not contain substantial watercourses for the species to occur. Species may be associated with the Talbragar River north of the subject land where it is more likely to forage. No previous records within the locality. No nests observed during site surveys.
Aves	Falco subniger	Black Falcon	V	-	-	The Black Falcon is found along tree-lined watercourses and in isolated woodlands, mainly in arid and semi-arid areas. Black Falcons nest along tree-lined creeks and rivers of inland drainage systems.	Y			Y	1	2007		
Aves	Gallinago hardwickii	Latham's Snipe	-	Mi	-	Latham's Snipe is a non-breeding visitor to south-eastern Australia, and is a passage migrant through northern Australia. The range extends inland over the eastern tablelands in south-eastern Queensland (and occasionally from Rockhampton in the north), and to west of the Great Dividing Range in New South Wales. 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		Y					Low	There is no wetland or estuarine habitat within the subject land. No previous records within the locality.
Aves	Glossopsitta pusilla	Little Lorikeet	V	-	-	The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. It forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used by this species, due to higher soil fertility and hence greater productivity.	Y			Y	10	2017		
Aves	Grantiella picta	Painted Honeyeater	V	V	-	The species is sparsely distributed from south-eastern Australia to north-western Queensland, with its greatest concentrations and breeding locations occurring on the inland slopes of the Great Dividing Range in NSW. It inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands of Black Box (E. largiflorens) and River Red Gum (E. camaldulensis), Box-Ironbark-Yellow Gum woodlands, Acacia-dominated woodlands, Paperbarks, Casuarina, Callitris, and trees on farmland or gardens. The species prefers woodlands which contain a higher number of mature trees, as these host more mistletoes. It is more common in wider blocks of remnant woodland than in narrower strips although it breeds in quite narrow roadside strips if ample mistletoe fruit is available (OEH 2018).	Y	Y		Y	37	2020	Moderate	The subject land contain suitable Box- Yellow Gum woodland, however it occurs as fragmented pockets as opposed to the preferred wider patches of woodland. Mistletoe was not observed during surveys.
Aves	Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-	-	The White-bellied Sea-Eagle is found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water (larger rivers, swamps, lakes and the sea).	Y			Y	1	2019		
Aves	Hieraaetus morphnoides	Little Eagle	V	-	-	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. This species occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	Y			Y	2	2016		
Aves	Hirundapus caudacutus	White-throated Needletail	-	V; Mi	-	The White-throated Needletail is widespread in eastern and south-eastern Australia. In NSW this species extends inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland (DoEE 2018).	Y	Y		Y	3	2018	Moderate	The species may utilise the subject land to forage. Low number of records within the locality. The species is associated with the PCTs within the subject land.
Aves	Lathamus discolor	Swift Parrot	E	CE	-	This species migrates in the autumn and winter months to south-eastern Australia. In NSW, it mostly occurs on the coast and south-west slopes in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations (OEH 2018). Favoured feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood (C. gummifera), Mugga Ironbark and White Box. Commonly used lerp infested trees include Inland Grey Box, Grey Box (E. moluccana) and Blackbutt (E. pilularis).	Y	Y		Y	4	2007	Low	The subject land does not contain the described associated winter flowering species. Inland Grey Box does occur, however this is not a winter flowering species. The species may occur as a vagrant.
Aves	Leipoa ocellata	Malleefowl	E	V	-	Malleefowl predominantly inhabit mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300 – 450 mm mean annual rainfall) areas. The species utilises mallee with a spinifex understorey, but usually at lower densities than in areas with a shrub understorey. The species is less frequently found in other eucalypt woodlands, such as Inland Grey Box, Ironbark or Bimble Box Woodlands with thick understorey. Prefers areas of light sandy to sandy loam soils and habitats with a dense but discontinuous canopy and dense and diverse shrub and herb layers (OEH 2018).		Y					Negligible	The subject land does not contain suitable mallee habitat for the species to occur.
Aves	Lophochroa leadbeateri	Major Mitchell's Cockatoo	V	-	-	Found across the arid and semi-arid inland, from south-western Queensland south to north-west Victoria, through most of South Australia, north into the south-west Northern Territory and across to the west coast between Shark Bay and about Jurien. In NSW it is found regularly as far east as about Bourke and Griffith, and sporadically further east than that. Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines. Nesting, in tree hollows, occurs throughout the second half of the year; nests are at least 1 km apart, with no more than one pair every 30 square kilometres.				Y				
Aves	Lophoictinia isura	Square-tailed Kite	V	-	-	Within NSW the Square-tailed Kite is a regular resident in the north, north-east and along major flowing river systems and migrates to the south-east for breeding. The species is found in a variety of timbered habitats including dry woodlands and open forests, showing a particular preference for timbered watercourses. The species is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage The species appears to occupy large hunting ranges of more than 100km2. Nest sites are generally located along or near watercourses, in a fork or on large horizontal limbs (OEH 2018).				Y				
Aves	Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V	-	-	The Hooded Robin is widespread across Australia and found throughout much of inland NSW. The species prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. This species requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. Dead stumps and fallen timber or low-hanging branches will often be used to perch on for hunting. The species nest is a small, neat cup of bark and grasses bound with webs, in a tree fork or crevice, from less than 1 m to 5 m above the ground (OEH 2018).	Y			Y	5	2017		
Aves	Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	-	The Black-chinned Honeyeater is widespread within NSW ranging from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. The species is found in the upper levels of open eucalypt forests and woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark, White Box, Inland Grey Box, Yellow Box, Blakely's Red Gum and Forest Red Gum (E. tereticornis). It is also commonly found along waterways, especially in arid and semi-arid areas; as well as occasionally seen in gardens and street trees. The species moves quickly from tree to tree, foraging rapidly along outer twigs, underside of branches and trunks, probing for insects. Nectar is taken from flowers, and honeydew is gleaned from foliage (OEH 2018).	Y			Y	3	2014		
Aves	Motacilla flava	Yellow Wagtail	-	Mi	-	This species occupies a range of damp or wet habitats with low dense vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra (Birdlife International 2017). Imporant habitat is considered to be mostly wellwatered open grasslands and the fringes of wetlands. Roosts in mangroves and other dense vegetation.		Y					Low	The subject land contains ephemeral creeks and dams, however these lack dense riparian vegeation preferred by the species and do not provide permanent, reliable habitat for the species. Mangroves do not occur in the subject land or locality. No previous records within the locality.
Aves	Myiagra cyanoleuca	Satin Flycatcher	-	Mi	-	The Satin Flycatcher is widespread in eastern Australia and vagrant to New Zealand (Blakers et al. 1984; Coates 1990). Satin Flycatchers inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.		Y					Negligible	No heavily vegetated forest or gullies within the subject land. No previous records within locality.
Aves	Neophema pulchella	Turquoise Parrot	V	-	-	Inhabiting the steep, rocky ridges and gullies, hills, river-flats, valleys and nearby plains of the Great Dividing Range, the Turquoise Parrot is found in open forest and eucalyptus woodlands with a low shrub understorey and grassy ground-cover. Generally, distribution of the species is patchy, determined by areas of suitable habitat and ranges from north-eastern Victoria through NSW to south-eastern Queensland. Individuals generally breed from August to January, usually nesting less than two metres above the ground. Nests may be located in hollows of small trees, dead eucalyptus or in holes or stumps, fence posts or even logs lying on the ground.	Y			Y	1	2020		
Aves	Ninox connivens	Barking Owl	V	-	-	The Barking Owl inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. This species roosts in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as Acacia and Casuarina species.	Y			Y	3	2017		
Aves	Ninox strenua	Powerful Owl	V	-	-	In NSW, the Powerful Owl is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered, mostly historical records on the western slopes and plains. This species roosts by day in dense vegetation comprising species such as Turpentine (Syncarpia glomulifera), Black She-oak (Allocasuarina littoralis), Blackwood (Acacia melanoxylon), Rough-barked Apple (Angophora floribunda), Cherry Ballart (Exocarpus cupressiformis) and a number of eucalypt species.	Y			Y	5	2010		
Aves	Numenius madagascariensis	Eastern Curlew	-	CE; Mi	-	During non-breeding this species 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 Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes within the mangroves. The birds are also found in coastal saltworks and sewage farms.		Y					Low	There is no wetland or estuarine habitat within the subject land. No previous records within the locality.
Aves	Pachycephala inornata	Gilbert's Whistler	V	-	-	The Gilbert's Whistler is sparsely distributed over much of the arid and semi-arid zone of inland southern Australia, extending to the western slopes of NSW. The species usually inhabits semi-arid Mallee or Box–ironbark Eucalypt, Acacia, Cypress-pine or Belah shrublands and woodlands (or mixed assemblages of these), usually with a dense, continuous or patchy understorey of shrubs. They also inhabit thickets of paperbarks and sometimes occur in taller eucalypt woodlands or forests. The species forages on or near the ground in shrub thickets and in tops of small trees (OEH 2018, Birdlife 2018d).				Y				
Aves	Petroica boodang	Scarlet Robin	V	-	-	In NSW, the Scarlet Robin occurs from the coast to the inland slopes. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat.	Y			Y	7	2015		
Aves	Petroica phoenicea	Flame Robin	V	-	-	Within NSW the Flame Robin breeds in upland areas and during winter many birds move to the inland slopes and plains. The species breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. In winter, birds migrate to drier more open habitats in the lowlands (i.e. valleys below the ranges, and to the western slopes and plains). Here, the species lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees (OEH 2018).	Y			Y	2	2020		
Aves	Polytelis swainsonii	Superb Parrot	V	V	-	The Superb Parrot is found throughout eastern inland NSW. This species inhabits forests and woodlands dominated by eucalypts, especially River Red Gums and box eucalypts such as Yellow Box or Inland Grey Box. Superb Parrots breed in either River Red Gum forests and woodlands or box woodlands (DoEE 2018).		Y		Y			Low	Small areas of foraging habitat occurs within high condition woodland. Targeted surveys of these high condition woodlands did not find the species within the subject land. No previous records within the locality.
Aves	Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-	-	In NSW, the eastern subspecies occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. This species inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains, as well as woodlands on fertile soils in coastal regions. The species favours inland plains with an open shrub layer, little ground cover and plenty of fallen timber and leaf litter. The species may also be seen along roadsides and around farms (OEH 2018 & Birdlife 2018).	Y			Y	44	2020		
Aves	Pycnoptilus floccosus	Pilotbird	-	V	-	Pilotbirds are endemic to south-east Australia. Upland Pilotbirds occur above 600 m in the Brindabella Ranges in the Australian Capital Territory, and in the Snowy Mountains in New South Wales and north-east Victoria (Higgins & Peter 2002; Loyn et al. 2021). Lowland Pilotbirds occur in forests from the Blue Mountains west of Newcastle, around the wetter forests of eastern Australia, to Dandenong near Melbourne (Higgins & Peter 2002; Loyn et al. 2021). Pilotbirds are strictly terrestrial, living on the ground in dense forests with heavy undergrowth (Higgins & Peter 2002).		Y					Negligible	The subject land lacks the dense vegetation structure required for the species. The closest record of the species was approximately 15km west of the site in 2003 (ALA).
Aves	Rhipidura rufifrons	Rufous Fantail	-	Mi	-	In east and south-east Australia, the Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as Tallow-wood (Eucalyptus microcorys), Mountain Grey Gum (E. cypellocarpa), Narrow-leaved Peppermint (E. radiata), Mountain Ash (E. regnans), Alpine Ash (E. delegatensis), Blackbutt (E. pilularis) or Red Mahogany (E. resinifera); usually with a dense shrubby understorey often including ferns.		Y					Negligible	No wet sclerophyll forest or gullies within the subject land. No previous records within locality.
Aves	Rostratula australis	Australian Painted Snipe	E	E	-	The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. The species also uses inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains (OEH 2018).		Y					Low	There is no wetland or estuarine habitat within the subject land. No previous records within the locality.

Aves	Stagonopleura guttata	Diamond Firetail	V	-	-	The Diamond Firetail is endemic to south-eastern Australia and widely distributed in NSW. This species is found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum (Eucalyptus pauciflora) Woodlands. Also occurring in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. The species are often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. The species feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Nests are globular structures built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests (OEH 2018).	Y			Y	5	2020		
Aves	Tyto novaehollandiae	Masked Owl	V	-	-	Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. Often hunts along the edges of forests, including roadsides. Pairs have a large home-range of 500 to 1000 hectares. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	Y			Y	1	2005		
Flora	Acacia ausfeldii	Ausfeld's Wattle	V	-	-	Found to the east of Dubbo in the Mudgee-Ulan-Gulgong area of the NSW South Western Slopes bioregion, with some records in the adjoining Brigalow Belt South, South Eastern Highlands and the Sydney Basin bioregions. Populations are recorded from Yarrobil National Park, Goodiman State Conservation Area and there is a 1963 record from Munghorn Gap Nature Reserve. A large population is also known from Tuckland State Forest to the northwest of Gulgong. Associated species include Eucalyptus albens, E. blakelyi and Callitris spp., with an understorey dominated by Cassinia spp. and grasses.	Y			Y	69	2021		
Flora	Androcalva procumbens	-	V	V	-	This species is endemic to NSW and mainly confined to the Dubbo-Mendooran-Gilgandra region, but also in the Pilliga and Nymagee areas. The species grows in sandy sites, often along roadsides. It has been recorded in Eucalyptus dealbata and Eucalyptus sideroxylon communities, Broombush (Melaleuca uncinata) scrub, under mallee eucalypts with a Calytrix tetragona understorey, and in a recently burnt Ironbark and Callitris area. Other associated species include Acacia triptera, Callitris endlicheri, Yellow Box, Allocasuarina diminuta, Philotheca salsolifolia, Xanthorrhoea species, Exocarpos cupressiformis, Leptospermum parvifolium and Kunzea parvifolia (OEH 2018).		Y					Low	The subject land occurs outside of the species mapped range. No associated species occur within the subject land. No previous records within the locality. The PCTs within the subject land are not associated with this species.
Flora	Austrostipa wakoolica	A spear-grass	E	E	-	This species is confined to the floodplains of the Murray River tributaries of central-western and south-western NSW. This species grows in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine forest on low sandy range; and a low, rocky rise. Flowering occurs between October to December (OEH 2018).		Y		Y			Low	The subject land is located outside of the species known and predicted ranges. Grassland habitats within the subject land are subject to historical and current farming practices which have degraded any potential suitable habiat which may have occurred. No previous records within the locality.
Flora	Caladenia arenaria	Sand-hill Spider Orchid	E	E	-	Caladenia arenaria is found mostly on the south west plains and western south west slopes. The original description is of a plant from Nangus, west of Gundagai (1865) and there is a report of the species from Adelong near Tumut. A record near Cootamundra needs verifying. 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 dominated by White Cypress Pine (Callitris glaucophylla).		Y		Y			Low	Callitris dominated vegetation communities do not occur within the subject land. No previous records within the locality. The subject land is not located in the species known or predicted range
Flora	Dichanthium setosum	Bluegrass	V	V	-	Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, extending to northern Queensland. It occurs widely on private property, including in the Inverell, Guyra, Armidale and Glen Innes areas. Associated with heavy basaltic black soils and red-brown loams with clay subsoil. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. Associated species include Eucalyptus albens, Eucalyptus melanophloia, Eucalyptus melliodora, Eucalyptus viminalis, Myoporum debile, Aristida ramosa, Themeda triandra, Poa sieberiana, Bothriochloa ambigua, Medicago minima, Leptorhynchos squamatus, Lomandra aff. longifolia, Ajuga australis, Calotis hispidula and Austrodanthonia, Dichopogon, Brachyscome, Vittadinia, Wahlenbergia and Psoralea species.		Y		Y			Low	Suitable habitat within the subject land is limited to intact roadside vegetation in high condition. The grassland within the subject land is subject to historical and continual disturbance for grazing and is considered too degraded for the species to occur. Targeted surveys in high condition vegetation did not find the species. No previous records within the locality.
Flora	Diuris tricolor	Pine Donkey Orchid	V	-	-	Sporadically distributed on the western slopes of NSW, extending from south of Narrandera all the way to the north of NSW. Localities in the south include Red Hill north of Narrandera, Coolamon, and several sites west of Wagga Wagga. Condobolin-Nymagee road, Wattamondara towards Cowra, Eugowra, Girilambone, Dubbo and Cooyal, in the Central West. Pilliga SCA, Pilliga National Park and Bibblewindi State Forest in the north (and extending into Queensland) and Muswellbrook in the east. The Pine Donkey Orchid grows in sclerophyll forest among grass, often with native Cypress Pine (Callitris spp.). It is found in sandy soils, either on flats or small rises. Also recorded from a red earth soil in a Bimble Box community in western NSW. Associated species include Callitris glaucophylla, Eucalyptus populnea, Eucalyptus intertexta, Ironbark and Acacia shrubland. The understorey is often grassy with herbaceous plants such as Bulbine species.				Y				
Flora	Euphrasia arguta	-	CE	CE	-	Euphrasia arguta was rediscovered in the Nundle area of the NSW north western slopes and tablelands in 2008. Prior to this, it had not been collected for 100 years. Historically, Euphrasia arguta has only been recorded from relatively few places within an area extending from Sydney to Bathurst and north to Walcha. The Royal Botanic Gardens Specimen Register records an additional location reported and vouchered in 2002 from near the Hastings River; and Euphrasia arguta was also recorded from the Barrington Tops in 2012. Historic records of the species noted the following habitats: 'in the open forest country around Bathurst in sub humid places', 'on the grassy country near Bathurst', and 'in meadows near rivers'. Plants from the Nundle area have been reported from eucalypt forest with a mixed grass and shrub understorey; here, plants were most dense in an open disturbed area and along the roadside, indicating the species had regenerated following disturbance.		Y		Y			Low	Targeted surveys did not find the species within the subject land. No previous records within the locality.
Flora	Goodenia macbarronii	Narrow Goodenia	-	-	-	Narrow Goodenia grows on the western slopes of the Great Dividing Range in NSW, south from the Guyra and Inverell districts. It is widely distributed throughout the tablelands, western slopes and western plains. The species also occurs in north-eastern Victoria and the Darling Downs in Queensland. In NSW it has been recorded at Tingha, Guyra, the Warrumbungle Ranges, east of Rylstone, the Pilliga and Denobollie State Forests, the Narrabri, Coonabarabran, Torrington and Tocumwal districts, Grenfell, Weddin Mountain, Gungal, the Milthorpe district, and Holbrook (the Type locality). Narrow Goodenia is an annual which appears seasonally and opportunistically in ephemerally damp or wet sites and is often common at sites after good winter-rainfall periods. It favours moist, shaded, sandy sites, soils with impeded drainage, damp muddy areas of winter inundation, spring-fed paddocks and open areas where water is more available. Often found in sites with some form of recent disturbance, such as depressions and clearings made by grading and excavation along roadsides, open grazing land and paddocks inundated by weed species and areas previously cleared and grazed by cattle. Associated species at Goobang National Park sites include Eucalyptus blakelyi, Eucalyptus sideroxylon, Eucalyptus bridgesiana, Eucalyptus melliodora, Acacia vestita, Acacia deanei subsp. paucijuga, Acacia penninervis, Acacia mollifolia, Acacia implexa, Callitris endlicheri, Leptospermum divaricatum, Exocarpos strictus, Allocasuarina diminuta subsp. diminuta, Pultenaea foliosa, Hibbertia obtusifolia, Hibbertia riparia, Baeckea cunninghamii and Lomandra longifolia.				Y				
Flora	Homoranthus darwinioides	Fairy Bells	V	V	-	Rare in the central tablelands and western slopes of NSW, occurring from Putty to the Dubbo district. It is found west of Muswellbrook between Merriwa and Bylong, and north of Muswellbrook to Goonoo SCA. The species has been collected from Lee's Pinch, but not relocated at its original locality north of Mt Coricudgy above the headwaters of Widden Brook. Grows in various woodland habitats with shrubby understoreys, usually in gravely sandy soils. Landforms the species has been recorded growing on include flat sunny ridge tops with scrubby woodland, sloping ridges, gentle south-facing slopes, and a slight depression on a roadside with loamy sand. Associated species include Callitris endlicheri, Eucalyptus crebra, E. fibrosa, C. trachyphloia, E. beyeri subsp. illaquens, E. dwyeri, E. rossii, Leptospermum divaricatum, Melaleuca uncinata, Calytrix tetragona, Allocasuarina spp. and Micromyrtus spp.	Y	Y			1	1996	Low	No associated species or suitable habitat occurs within the subject land. Subject land is highly disturbed.
Flora	Lepidium aschersonii	Spiny Peppercress	V	V	-	Not widespread, occurring in the marginal central-western slopes and north-western plains regions of NSW (and potentially the south western plains). In the north of the State recent surveys have recorded a number of new sites including Brigalow Nature Reserve, Brigalow State Conservation Area, Leard State Conservation Area and Bobbiwaa State Conservation Area. Also known from the West Wyalong in the south of the State. Records from Barmedman and Temora areas are likely to be no longer present. Approximately 50% of the total Lepidium aschersonii recorded for Australia occurs in NSW. Found on ridges of gilgai clays dominated by Brigalow (Acacia harpophylla), Belah (Casuarina cristata), Buloke (Allocasuarina luehmanii) and Grey Box (Eucalyptus microcarpa). In the south has been recorded growing in Bull Mallee (Eucalyptus behriana). Often the understorey is dominated by introduced plants. The species grows as a a component of the ground flora, in grey loamy clays. Vegetation structure varies from open to dense, with sparse grassy understorey and occasional heavy litter.		Y					Low	The subject land does not contain suitable microhabitats for the species to occur. The subject land lacks ridges or gilgai clays, in addition to lacking most associated species with the exception of Grey Box.
Flora	Lepidium monoplocoides	Winged Peppercress	E	E	-	Widespread in the semi-arid western plains regions of NSW. Collected from widely scattered localities, with large numbers of historical records but few recent collections. There is a single collection from Broken Hill and only two collections since 1915, the most recent being 1950. Also previously recorded from Bourke, Cobar, Urana, Lake Cargelligo, Balranald, Wanganella and Deniliquin. Recorded more recently from the Hay Plain, south-eastern Riverina, and from near Pooncarie. 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 Allocasuarina luehmannii (Bulloak) and/or eucalypts, particularly Eucalyptus largiflorens (Black Box) or Eucalyptus populnea (Poplar Box). The field layer of the surrounding woodland is dominated by tussock grasses. Recorded in a wetland-grassland community comprising Eragrostis australasicus, Agrostis avenacea, Austrodanthonia duttoniana, Homopholis proluta, Myriophyllum crispatum, Utricularia dichotoma and Pycnosorus globosus, on waterlogged grey-brown clay. Also recorded from a Maireana pyramidata shrubland.		Y					Negligible	Subject land is not located within the species known are predicted range. No previous records within the locality. No associated species occur within the subject land.
Flora	Prasophyllum petilum	Tarengo Leek Orchid	E	E	-	Natural populations are known from a total of five sites in NSW. These are near Boorowa, Queanbeyan area, Ilford, Delegate and a newly recognised population c.10 km west of Muswellbrook. It also occurs at Hall in the Australian Capital Territory. This species has also been recorded at Bowning Cemetery where it was experimentally introduced, though it is not known whether this population has persisted. Grows in open sites within Natural Temperate Grassland at the Boorowa and Delegate sites. Also grows in grassy woodland in association with River Tussock (Poa labillardieri), Black Gum (Eucalyptus aggregata) and tea-trees Leptospermum spp. near Queanbeyan 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 (near Queanbeyan, Ilford and Hall).		Y	Y				Low	Suitable habitat for this species occurs in high condition vegetation zones and along roadsides. The grassland within the subject land is subject to historical and continual disturbance for grazing and is considered too degraded for the species to occur. Targeted surveys within the high condition vegetation did not find the species within the subject land. No previous records within the locality.
Flora	Prasophyllum sp. Wybong	-	-	CE	-	Endemic to NSW, it is known from near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell, Tenterfield, Currabubula and the Pilliga area. Most populations are small, although the Wybong population contains by far the largest number of individuals. A perennial orchid, appearing as a single leaf over winter and spring. Flowers in spring and dies back to a dormant tuber over summer and autumn. Known to occur in open eucalypt woodland and grassland.		Y		Y			Low	Suitable habitat for this species occurs in high condition vegetation zones and along roadsides. The grassland within the subject land is subject to historical and continual disturbance for grazing and is considered too degraded for the species to occur. Targeted surveys within the high condition vegetation did not find the species within the subject land. No previous records within the locality.
Flora	Swainsona recta	Small Purple-pea	E	E	-	Small Purple-pea was recorded historically from places such as Carcoar, Culcairn and Wagga Wagga where it is probably now extinct. Populations still exist in the Queanbeyan and Wellington-Mudgee areas. Over 80% of the southern population grows on a railway easement. It is also known from the ACT and a single population of four plants near Chiltern in Victoria. Before European settlement Small Purple-pea occurred in the grassy understorey of woodlands and open-forests dominated by Blakely's Red Gum (Eucalyptus blakelyi), Yellow Box (E. melliodora), Candlebark Gum (E. rubida) and Long-leaf Box (E. goniocalyx). Grows in association with understorey dominants that include Kangaroo Grass (Themeda australis), poa tussocks Poa spp. and spear-grasses Austrostipa spp.		Y					Low	Suitable habitat for this species occurs in high condition vegetation zones. The grassland within the subject land is subject to historical and continual disturbance for grazing and is considered too degraded for the species to occur. Targeted surveys did not find the species within the subject land. No previous records within the locality.
Flora	Swainsona sericea	Silky Swainson-pea	V	-	-	The Silky Swainson-pea is a prostrate or erect perennial, growing to 10 cm tall. Silky Swainson-pea has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. Found in Natural Temperate Grassland and Snow Gum Eucalyptus pauciflora Woodland on the Monaro. The species is found in Box-Gum Woodland in the Southern Tablelands and South West Slopes. Sometimes it is found in association with cypress-pines Callitris spp. Its habitat on plains unknown. The species regenerates from seed after fire.		Y		Y				
Flora	Thesium australe	Austral Toadflax	V	V	-	Occurs on the coast, tablelands and western slopes in shrubland, grassland or woodland, often on damp sites.		Y					Low	Suitable habitat for this species occurs in high condition vegetation zones. The grassland within the subject land is subject to historical and continual disturbance for grazing and is considered too degraded for the species to occur. Targeted surveys did not find the species within the subject land. No previous records within the locality.

Flora	Tylophora linearis	-	V	E	-	Occurs from southern Queensland into central NSW, as far south near Temora with the majority of records occurring in the central western region. Records from Goonoo, Pillaga West, Pillaga East, Bibblewindi, Cumbil and Eura State Forests, Coolbaggie NR, Goobang NP and Beni SCA. Also has been recorded Hiawatha State Forest near West Wyalong in the south and there are old records as far north as Crow Mountain near Barraba and near Glenmorgan in the western Darling Downs. Grows in dry scrub and open forest. Recorded from low-altitude sedimentary flats in dry woodlands of Eucalyptus fibrosa, Eucalyptus sideroxylon, Eucalyptus albens, Callitris endlicheri, Callitris glaucophylla and Allocasuarina luehmannii. Also grows in association with Acacia hakeoides, Acacia lineata, Melaleuca uncinata, Myoporum species and Casuarina species.		Y					Low	No associated species or suitable habitat occurs within the subject land. Subject land is highly disturbed.
Flora	Zieria ingramii	Keith's Zieria	E	E	-	Known predominately from Goonoo and Cobbora SCA, about 40 km north-east of Dubbo. Also known to occur west of Tuckland State Forest. An old record exists from a locality east of Mogriguy on the Mendooran Road, however searches of the area have not relocated the species. One record also occurs within Kings Plains National Park, 48 km south of Inverell. Grows in dry sclerophyll forest on light sandy soils. All known populations have been recorded in Eucalyptus-Callitris woodland or open forest with a shrubby to heathy understorey. Eucalyptus dwyeri appears to be a key predictor of Z. ingramii distribution. Mostly from gentle slopes in red-brown and yellow-brown sandy loams, often with a rocky surface. Associated and understorey species include Eucalyptus crebra, E. fibrosa, E. dwyeri, E. beyeriana, E. microcarpa, Callitris endlicheri, Allocasuarina diminuta and more.	Y	Y			2	2010	Low	No associated species or suitable habitat occurs within the subject land.
Mammalia	Cercartetus nanus	Eastern Pygmy-possum	V	-	-	Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (Pseudocheirus peregrinus) dreys or thickets of vegetation, (e.g. grass-tree skirts). Agile climbers, but can be caught on the ground in traps, pitfalls or postholes; generally nocturnal.				Y			Low	Despite suitable habitat within the study area, targeted surveys did not find the species. No previous records within the locality.
Mammalia	Chalinolobus dwyeri	Large-eared Pied Bat	V	V	-	In NSW this species has been recorded from a large range of vegetation types including: dry and wet sclerophyll forest; Cyprus Pine (Callitris glauca) dominated forest; tall open eucalypt forest with a rainforest sub-canopy; sub-alpine woodland; and sandstone outcrop country. The species requires a combination of sandstone cliff/escarpment to provide roosting habitat that is adjacent to higher fertility sites, particularly box gum woodlands or river/rainforest corridors which are used for foraging. Roosting has also been observed in disused mine shafts, caves, overhangs and disused Fairy Martin (Hirundo ariel) nests.	Y	Y		Y	62	2020	Moderate	The subject land does not support caves, cliffs or rocky overhangs, however the locality does provide breeding habitat, particularly to the south of the subject land. The species may utilise the wooded vegetation within the subject land as foraging habitat.
Mammalia	Chalinolobus picatus	Little Pied Bat	V	-	-	The Little-Pied Bat is found in inland NSW (including Western Plains and slopes). This species occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress pine forest and mallee and Bimbil box woodlands. Roosting occurs within caves, rocky outcrops, mine shafts, tunnels, tree hollows and buildings (OEH 2018).	Y			Y	2	2009	Moderate	The subject land and study area does not support caves, cliffs or rocky overhangs, however it does contain a number of hollows potentially suitable for the species. A low number of records in the locality.
Mammalia	Dasyurus maculatus	Spotted-tailed Quoll	V	E	-	This species has been recorded from a wide range of habitats, including: coastal heathlands, open and closed eucalypt woodlands, wet sclerophyll and lowland forests (OEH 2018). Unlogged forest or forest that has been less disturbed by timber harvesting is preferable. Habitat requirements include suitable den sites such as hollow logs, tree hollows, rock outcrops or caves. Individuals require an abundance of food, such as birds and small mammals, and large areas of relatively intact vegetation through which to forage. Home ranges are estimated to be 620–2,560 ha for males and 90–650 ha for females (DoEE 2018).		Y		Y			Low	The subject land contains highly fragmented vegetation and is unlikely to support the species. No previous records within the locality.
Mammalia	Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	-	Eastern Bentwing-bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Breeding or roosting colonies can number from 100 to 150,000 individuals. Hunt in forested areas.	Y			Y	34	2020	Low	The subject land does not support caves, cliffs or rocky overhangs. Low number of records in the locality- likely for foraging.
Mammalia	Nyctophilus corbeni	Corben's Long-eared Bat	-	V	-	Inhabits a variety of vegetation types, including mallee, Bull Oak 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. Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Roosts in tree hollows, crevices, and under loose bark. A slow flying agile bat, utilising the understorey to hunt non-flying prey - especially caterpillars and beetles - and will even hunt on the ground (OEH 2018). The species is more abundant in extensive stands of vegetation in comparison to smaller woodland patches (Turbill and Ellis 2006 in TSSC 2015), suggesting its home range is probably large (Lumsden et al., 2008 in TSSC 2015). The species has also been found to be much more abundant in habitats that have a distinct tree canopy and a dense, cluttered understorey layer (Turbill and Ellis 2006 in TSSC 2015).		Y		Y			Low	The subject land and study area contains a number of hollows potentially suitable for the species. These occur within a fragmented landscape however with sparse canopy cover and a lack of mid- and ground-stratum vegetation. No previous records within the locality.
Mammalia	Petauroides volans	Greater Glider	-	V	-	Largely restricted to eucalypt forests and woodlands. It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.		Y					Negligible	Vegetation within the subject land is typical of woodland landforms as opposed to tall forest trees. The vegetation also does not occur as wet sclerophyll forests. No previous records within the locality.
Mammalia	Petaurus norfolcensis	Squirrel Glider	V	-	-	Inhabits dry sclerophyll forest and woodland where it is absent from the dense coastal ranges. Forages on pollen and nectar and the gum that acacias produce. Also eats sap from gums and the green seeds of the Golden Wattle. Associated with dry hardwood forest and woodlands. Habitats typically include gum-barked and high nectar-producing species, including winter flower specie. The presence of hollow-bearing eucalypts is a critical habitat value. The Squirrel Glider is sparsely distributed along the east coast and immediate inland districts from western Victoria to north Queensland.	Y			Y	10	2009	Low	Despite suitable habitat within the study area, targeted surveys did not find the species. A low number previous records within the locality.
Mammalia	Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	-	In NSW the Brush-tailed Rock Wallaby occurs from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. This species occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. The Brush-tailed Rock Wallaby browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees.		Y		Y			Negligible	The subject land does not contain rocky escarpments, outcrops or cliffs.
Mammalia	Phascogale tapoatafa	Brush-tailed Phascogale	V	-	-	The Brush-tailed Phascogale has a patchy distribution around the coast of Australia. In NSW it is mainly found east of the Great Dividing Range although there are occasional records west of the divide. Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest. Agile climber foraging preferentially in rough barked trees of 25 cm DBH or greater.				Y			Low	Despite suitable habitat within the study area, targeted surveys did not find the species. No previous records within the locality.
Mammalia	Phascolarctos cinereus	Koala	E	E	-	The Koala inhabits eucalypt woodlands and forests and feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species (OEH 2018). Large populations of koalas occur on the western slopes and plains, in particular the Pilliga region (Kavanagh and Barrott 2001) and in Gunnedah (Smith 1992) and Walgett LGAs (J. Callaghan, Australian Koala Foundation, pers. comm.). Primary feed trees within the Western Slopes and Plains Koala Management Area (KMA) are River Red Gum (E. camalduensis) and Coolabah (E. coolabah).	Y	Y		Y	3	2014	Known	Scats recorded during within subject land targeted surveys
Mammalia	Pseudomys novaehollandiae	New Holland Mouse	-	V	-	Found from coastal areas and up to100 km inland on sandstone country. Known to inhabit a range of habitats including open heathland, open woodland with a heathland understory and vegetated sand dunes. Soil type may be an important indicator of suitability of habitat with deeper top soils and softer substrates being preferred for digging burrows. Other factors such as slope, geology and the amount of sun received in an area may also influence site selection.		Y					Negligible	Birriwa is located 230 km from the coast and is on the edge of the species range. Despite being potential suitable sandy substrate, species is unlikely to occur based on its range. No previous records within the locality.
Mammalia	Pteropus poliocephalus	Grey-headed Flying-fox	V	V	-	Grey-headed Flying foxes 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 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Y	Y		Y	1	2022	Low	No camps were observed within the subject land. The closest camp is located in Wellington, approxiamtley 60km south-west. Only one previous record in the locality.
Mammalia	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	-	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows.	Y			Y	10	2020	Moderate	The subject land and study area contain a number of hollows potentially suitable for the species. A low number of records in the locality.
Mammalia	Vespadelus troughtoni	Eastern Cave Bat	V	-	-	The Eastern Cave Bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT. Very little is known about the biology of this uncommon species. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest.	Y				8	2006	Low	The subject land does not support caves, cliffs or rocky overhangs. Low number of records in the locality- likely for foraging.
Reptilia	Aprasia parapulchella	Pink-tailed Legless Lizard	V	V	-	The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands, and the South Western Slopes. The species inhabits sloping, open woodland areas with predominantly native grassy ground layers, particularly those dominated by Kangaroo Grass (Themeda australis). The species occurs in woodland with sandstone outcrops preferring ridges, buffs and slopes with a north west aspect. Thermally suitable microhabitat may be a limiting resource for the species (DoEE 2018). Sites are typically well-drained, with rocky sandstone outcrops or scattered, partially-buried rocks. The species is 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 (OEH 2018). The species has not been recorded within the locality.		Y		Y			Low	Subject land does not contain suitable rocky habitat. No previous records in locality.
Reptilia	Delma impar	Striped Legless Lizard	V	V	-	The Striped Legless Lizard occurs in the Southern Tablelands, the South West Slopes, the Upper Hunter and possibly on the Riverina. Populations are known in the Goulburn, Yass, Queanbeyan, Cooma, Muswellbrook 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 Temperate Grassland and occasionally in open Box-Gum Woodland. Habitat is where grassland is dominated by perennial, tussock-forming grasses such as Kangaroo Grass (Themeda australis), spear-grasses (Austrostipa spp.) and poa tussocks (Poa spp.), and occasionally wallaby grasses (Austrodanthonia spp.). Sometimes present in modified grasslands with a significant content of exotic grasses. Sometimes found in grasslands with significant amounts of surface rocks, which are used for shelter. Sometimes utilises dried cowpats for shelter.		Y					Low	The subject land is out of the range of natural temperate grasslands. No previous records in locality.
Reptilia	Varanus rosenbergi	Rosenberg's Goanna	V	-	-	Rosenberg's Goanna occurs on the Sydney Sandstone in Wollemi National Park to the north-west of Sydney, in the Goulburn and ACT regions and near Cooma in the south. There are records from the South West Slopes near Khancoban and Tooma River. Also occurs in South Australia and Western Australia. Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens.				Y			Low	Subject land does not contain suitable termite nests or rocky habitat. No previous records in locality.
Threatened ecological community	Aquatic ecological community in the natural drainage system of the lower Murray River catchment	-	-	-	E	Included in the recommendation are all natural creeks, rivers, and associated lagoons, billabongs and lakes of the regulated portions of the Murray River (also known as the River Murray) downstream of Hume Weir, the Murrumbidgee River downstream of Burrinjuck Dam, the Tumut River downstream of Blowering Dam and all their tributaries anabranches and effluents including Billabong Creek, Yanco Creek, Colombo Creek, and their tributaries, the Edward River and the Wakool River and their tributaries, anabranches and effluents, Frenchmans Creek, the Rufus River and Lake Victoria. Excluded from this recommendation are the Lachlan River and the Darling River and their tributaries, and man made/artificial canals, water distribution and drainage works, farm dams and off-stream reservoirs.			Y				Negligible	The subject land is not located within proximity to the described rivers and associated tributaries.
Threatened ecological community	Aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River	-	-	-	E	The area covered by this recommendation includes all natural creeks, rivers, streams and associated lagoons, billabongs, lakes, flow diversions to anabranches, the anabranches, and the floodplains of the Darling River within the State of New South Wales, and including Menindee Lakes and the Barwon River. This area includes the north-western slope rivers including the following: the Gwydir River from Copeton Dam downstream; the Namoi River from the junction of the Manilla River at Manilla (including Mehi River channel west of Moree) downstream; the Manilla River from Split Rock Dam downstream; the Peel River from Chaffey Dam downstream; the Macquarie River from Burrendong Dam downstream; the Cudgegong River from Windamere Dam downstream; the Castlereagh River from below Binnaway downstream; and the Bogan River from below Peak Hill downstream.			Y				Low	The waterways within the subject land are not located within the described locations of this aquatic TEC. The waterways within the subject land lack treed riparian vegetation,snags and have been highly disturbed due to historical and current farming practices.
Threatened ecological community	Central Hunter Valley eucalypt forest and woodland	Central Hunter Valley eucalypt forest and woodland	E	CE	-	The ecological community occurs in the Hunter Valley region (primarily in the Central Hunter). The Hunter Valley region is mostly in the north east of the Sydney Basin IBRA1 Bioregion (SYB). The Hunter Valley region and the ecological community both continue to the north east, into the NSW North Coast IBRA Bioregion. The canopy of the ecological community is dominated by one or more of the following four eucalypt species: Eucalyptus crebra (narrow-leaved ironbark), Corymbia maculata (syn. E. maculata) (spotted gum), E. dawsonii (slaty gum) and E. moluccana (grey box).		Y					Negligible	Subject land has undergone vegetation mapping. This TEC does not occur within the subject land.
Threatened ecological community	Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	E	E	-	Coolibah – Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions. Eucalyptus coolabah (Coolibah) is typically the dominant or subdominant tree species. and it may occur with or without Acacia stenophylla (River Cooba), Acacia salicina (Cooba), Casuarina cristata (Belah), Eremophila bignoniiflora (Eurah), Eucalyptus largiflorens (Black Box), Eucalyptus camaldulensis (River Red Gum) and Eucalyptus populnea subsp. bimbil (Bimble Box).		Y					Negligible	Subject land has undergone vegetation mapping. This TEC does not occur within the subject land.

Threatened ecological community	Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	E	E	-	The Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia ecological community occupies a position in the landscape that is transitional between the temperate woodlands and forests of the lower slopes and tablelands of south-eastern Australia, and the semi-arid communities further inland. A tree canopy dominated by Eucalyptus microcarpa (Grey Box) is typically present.		Y					Known	Subject land contains the TEC.
Threatened ecological community	Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	-	CE	-	The Natural Grasslands on basalt and fine-textured alluvial plains of northern NSW and southern Queensland ecological community may be recognised by a distribution mainly in the Darling Downs of southern Queensland and the Liverpool Plains and Moree Plains of northern NSW. Occurrence is mainly associated with fine textured, often cracking clay soils derived from either basalt or alluvium. Occurrence on landforms that are typically flat to very low slopes (less than 5 percent/1 degree). Natural grasslands on basalt and fine-textured alluvial plains of northern NSW and southern Qld. Tree canopy usually absent to sparse, comprising less than 10% projective crown cover. The ground layer is typically dominated by perennial native grasses.		Y					Negligible	Subject land has undergone vegetation mapping. This TEC does not occur within the subject land.
Threatened ecological community	Poplar Box Grassy Woodland on Alluvial Plains	Poplar Box Grassy Woodland on Alluvial Plains	-	E	-	The ecological community occurs within the Brigalow Belt North, Brigalow Belt South, Southeast Queensland, Cobar Peneplain, Darling Riverine Plains, NSW South Western Slopes and Riverina IBRA bioregions. The ecological community typically occurs on palaeo and recent depositional soils in flat terrain and occasionally along watercourses in undulating country. The canopy of the Poplar Box Grassy Woodland is dominated by Eucalyptus populnea		Y					Negligible	Subject land has undergone vegetation mapping. This TEC does not occur within the subject land.
Threatened ecological community	Weeping Myall Woodlands	Weeping Myall Woodlands	E	E	-	Weeping Myall Woodlands occur in a range of forms from open woodlands to woodlands, in which weeping myall (Acacia pendula) trees are the sole or dominant overstorey species. The Weeping Myall Woodlands occurs on the inland alluvial plains west of the Great Dividing Range in NSW and QLD. It occurs in the Riverina, NSW South Western Slopes, Darling Riverine Plains, Brigalow Belt South, Murray-Darling Depression, Nandewar and Cobar Peneplain Interim Biogeographic Regionalisation for Australia (IBRA) bioregions.		Y					Negligible	No Weeping Myall Woodland occurs within the subject land.
Threatened ecological community	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CE	CE	-	Box – Gum Grassy Woodlands and Derived Grasslands are characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of White Box, Yellow Box or Blakely's Red Gum trees. Also occurs as a grassland.		Y					Known	Subject land contains theTEC.

Appendix 6

Significant impact assessments – EPBC Act

EMM
creating opportunities

A.6.1.1 Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia EEC

EPBC Act – endangered

The Commonwealth Conservation Advice for Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (DEWHA 2010) describes the conservation status, distribution, biology/ecology and threats to the survival of the EEC.

Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia characteristically occurs on the drier edge of the temperate grassy eucalypt woodland belt. It ranges from the Narrabri district in central NSW through northern Victoria into South Australia. Patches that are disjunct from the main grey box woodland belt occur in the Victorian Volcanic Plain to the west of Melbourne, and also in the Flinders and Mount Lofty Ranges near Adelaide in South Australia (DEWHA 2010).

The tree canopy is dominated by Grey Box (*Eucalyptus microcarpa*) whilst the mid- and understorey comprises a sparse shrub layer and a species-rich ground layer of grasses and herbs. Chenopods are often present, particularly in drier parts of the range. The ecological community includes patches of derived grassland where a tree canopy of Grey Box was known to have been present but has been removed, and the native ground layer remains largely intact (DEWHA 2010b).

The main threats associated with the TEC include clearing, fragmentation, inappropriate land management practices, a low level of protection in reserves, weed invasion and climate change (NSW TSSC 2010).

Approximately 1.01 ha of vegetation within the subject land conforms with the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia listing under the EPBC Act.

i Local occurrence justification

Calculation of the local occurrence of the TEC with context to the subject land has been defined as continuous patches of the TEC which are connected to the subject land. A patch is defined to reflect patch size definition according to the BAM (DPIE 2020) which is 'an area of native vegetation that occurs on the development site and includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems)'.

Regional mapping was used to estimate local occurrence and requires some interpretation as to which plant community types (PCTs) may conform to the TEC (DPIE 2015). The NSW Vegetation Classification system (DPIE 2022) was used to identify potentially conforming PCTs. The PCTs identified within the regional mapping which are considered to have potential to conform to Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia EEC include PCTs 76, 81, 511 and 796. PCTs 511 and 796 are considered to be derived native grasslands and require further consideration when identifying potential TECs.

Derived grassland mapping in the regional context has been completed at a broad scale and it is expected that some variation is to occur when on-ground. A key observation about potential grassland TEC conformation was made during site surveys within the subject land. Five vegetation integrity plots were placed within Grey Box derived grassland, which resulted in one conforming to the EPBC listing (Figure 4.1). Based on the location of this plot and ecological principles, it was determined that the plot closest to the tree line was likely to conform due to the microclimate provided and expected increase in native diversity. The condition of derived native grassland improves as it approaches the woodland. A distance of 140 metres from the tree line was used to delineate between grassland which does and does not conform. This distance was determined based on the average distance between the conforming plot and non-conforming plots.

This same principle has been applied to assess potential grassland which may conform to both the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia EEC and the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (see below). A distance of 140 metres from conforming woodland patches has been used to determine potential grassland conforming patches.

The total predicted local occurrence of Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia is 175 ha.

Table A.6.1 Assessment of significance for Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

Criteria	Discussion
1. Reduce the extent.	The proposed works will result in the removal of up to 1.01 ha of the Grey Box EEC, representing approximately 0.6% of the predicted local occurrence of the community. The development footprint has been designed to avoid 4.9 ha of the Grey Box EEC grassland condition (Figure 4.1 and Section 6.3). The access road design has also been considered to avoid impact to the high condition EEC where possible, utilising the existing Barney's Reef Road, which occurs as a dirt road through the subject land. The road design has been created as such, to minimise the increased width required for the proposed works and therefore minimise impact to the EEC. Although steps have been taken to avoid higher quality areas of the EEC, the project will result in a reduction of the extent of this community.
2. Fragment or increase fragmentation.	The occurrence of the Grey Box EEC within the subject land is highly connected to native vegetation along a road corridor. Roadsides, travelling stock routes or reserves or localised patches of grassland that are part of a larger remnant with trees, as may occur under power easements, rail easements or fire breaks are considered to primarily be the areas where this EEC occurs in high and intact condition (NSW TSSC 2010; Prober and Thiele 2005). The road corridor introduces existing fragmentation to the EEC, and an increase in the width of the road by approximately eight metres, is unlikely to further fragment the occurrence of the EEC. Pollinators of the flora species which make up the EEC are likely to be insects, which are unlikely to be inhibited from traversing the subject land and its locality. The EEC will also remain connected to native vegetation within the locality in a north-south direction, allowing for habitat connectivity for pollinators and fauna species which may utilise the EEC habitat. Given the existing access road within the site boundary and the areas of higher quality vegetation to be avoided, it is unlikely the project will result in a significant increase in fragmentation of the vegetation community.
3. Adversely affect habitat critical to survival.	The proposed works will result in the removal of up to 1.01 ha of the Grey Box EEC, representing approximately 0.6% of the predicted local occurrence of the community. Habitat critical to the survival of the Grey Box EEC has not been defined in the listing advice or conservation advice. The occurrence of the EEC within the subject land is likely to be necessary for the long-term maintenance of the EEC and maintaining genetic diversity as listed in the assessment criteria for critically endangered and endangered ecological communities (DE 2013). For this reason, the occurrence of the Grey Box EEC within the subject land is also considered to be habitat critical to the survival of the Grey Box EEC. Therefore, the proposed works will result in the removal of 1.01 ha of habitat critical to survival of the Grey Box EEC.

Table A.6.1 Assessment of significance for Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

Criteria	Discussion
4. Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.	The proposed work which will impact the Grey-Box Woodland EEC involves the construction of an access road for the proposed solar farm. Construction and operation of an access road has the potential to indirectly impact the EEC due to increased surface water runoff or fuel and chemical spills during construction. The EEC already occurs next to Barney's Reef Rd, which although it is a dirt road, is the cause of the same potential indirect impacts. The road design includes a sealed road which may increase the surface water runoff into the adjacent EEC, however a table drain installed parallel to the road will minimise these indirect impacts. As the EEC is already influenced by the existing road, construction and operation of the access road is unlikely to modify surface water levels to the point of significantly impacting the EEC. The proposed works are unlikely to directly impact groundwater flow through the subject land, as proposed works include the construction of an access road and installation of solar panels. There will be no reduction or draw-down of groundwater levels associated with the project; therefore, the project is not expected to impact on groundwater.
5. Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species.	The Grey Box EEC is located within a road corridor along Barney's Reef Road, which is also subject to existing impacts such as weed encroachment. This EEC already has a moderate weed diversity particularly in the ground stratum which is likely attributed to the existing access road. The project has the potential to exacerbate these indirect impacts such as introduction and/or increase in weed species from construction and operation. The following mitigation measures will be implemented to ensure the project does not result in indirect impacts to the EEC: • appropriate identification, disposal and management of weed species during clearing works; and • wash down of all vehicles and equipment prior to entry to site. Therefore, it is considered unlikely that the project will result in the introduction of new weeds or increase of existing weed species within the EEC, further resulting in the decline of functionally important species.
6. Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: assisting invasive species, that are harmful to the listed ecological community, to become established; or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.	The project has the potential to result in indirect impacts such as introduction and/or increase in weed species, introduction of pathogens and fuel or chemical spills during construction. The following mitigation measures will be implemented to ensure the project does not result in indirect impacts to the EEC: • appropriate identification, disposal and management of weed species during clearing works; • wash down of all vehicles and equipment prior to entry to site; • chemicals and fuel will be managed in accordance with Safe Work Australia guidelines (eg employ use of barriers, inspecting tanks and containers, etc); and • use of appropriate spill containment materials (or spill kits) to clean-up spills if they occur. With the above mitigation measures implemented it is unlikely the project will result in the introduction of weeds and/or pathogens to the area or fuel/chemical spills which may indirectly impact the EEC. For the above reasons, it is unlikely that the quality or integrity of the ecological community outside the direct impact area will be impacted as a result of the project.

Table A.6.1 Assessment of significance for Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

Criteria	Discussion
7. Interfere with recovery.	There is no recovery plan for the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia EEC. Some recovery actions listed in the conservation advice (TSSC 2010) relevant to the proposed works include: • investigate management agreements to ensure that remnants currently within the Travelling Stock Route estate are managed with regard to the long-term protection of their biodiversity and conservation values, in conjunction with sustainably managed production; • ensure chemicals or other mechanisms used to manage weeds do not have significant adverse non-target impacts on remnants of the Grey Box (*E. microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia; and • manage sites to prevent introduction or further spread of new invasive exotic weeds, and targeted control of existing key weeds which threaten the Grey Box (*E. microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia, using appropriate methods. The project will result in a reduction of extent of the Grey Box EEC by 1.01 ha. Through detailed design the disturbance footprint has been developed to avoid high quality areas of the EEC containing intact and connected vegetation. The disturbance footprint is located on an existing access road which introduces the EEC to existing indirect impacts. Due to existing weed encroachment within the EEC, recovery potential is moderate, however the widening of Barney's Reef Road by eight metres is unlikely to exacerbate introduction or spread of weed encroachment. Given the above, the proposed works are unlikely to interfere with the recovery of the EEC.
Conclusion	The proposed works have been considered to minimise the impact to Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia EEC. The assessment of significance has resulted in: • the disturbance footprint has been designed to avoid clearing of woodland areas and higher quality grassland areas; • 0.06% of the Grey Box EEC within the local occurrence is likely to be removed as part of the considered design; • the areas to be cleared occur along Barney's Reef Road and are already subject to indirect impacts such as weed encroachment; • mitigation measures will be implemented to ensure the project does not result in the spread or introduction of weed species or fuel/chemicals; • the works are unlikely to impact on abiotic factors that the community requires for survival; and • areas of higher quality vegetation within the impact area will be left undisturbed and maintain connectivity for the community through the impact area. As a result, the project is unlikely to have a significant impact on the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia EEC given the minimal EEC removal when compared to the extent within the locality, measures to avoid, minimise and mitigate potential indirect impacts as part of the proposed works and the connectivity to native vegetation to remain within the locality.

A.6.1.2 White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

EPBC Act – critically endangered

The Commonwealth Conservation Advice for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (TSSC 2006) describes the conservation status, distribution, biology/ecology and threats to the survival of the CEEC.

White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland is a TEC characterised by a species-rich understorey consisting of native tussock grasses, herbs and scattered shrubs, with the canopy dominated by White Box, Yellow Box or Blakely's Red Gum trees. Co-dominate trees include Grey Box, Fuzzy Box (*E. conica*), Apple Box (*E. bridgesiana*), Red Box (*E. polyanthemos*), Red Stringybark (*E. macrorhyncha*), White Cypress Pine (*Callitris glaucophylla*), Black Cypress Pine (*C. enderlicheri*), Long-leaved Box (*E. gonicalyx*), New England Stringybark (*E. calignosa*), Brittle Gum (*E. mannifera*), Candlebark (*E. rubida*), Argyle Apple (*E. cinerea*), Kurrajong (*Brachychiton populneus*) and Drooping She-oak (*Allocasuarina verticillata*) (TSSC 2006).

The TEC is known to occur in an arc along the western slopes and tablelands of the Great Dividing Range from Southern Queensland through NSW to central Victoria (TSSC 2006).

The main threats associated with the TEC include clearing associated with agricultural, horticultural, urban development and mining, grazing pressures, firewood collection, changed fire regimes, use of chemicals, mowing or slashing regimes, weed invasion, climate change and animal pests (DECCW 2011).

Approximately 0.35 ha of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland which conforms under the EPBC Act was mapped within the subject land.

Regional mapping was used to estimate local occurrence and requires some interpretation as to which plant community types (PCTs) may conform to the TEC (DPIE 2015). The NSW Vegetation Classification system (DPIE 2022) was used to identify potentially conforming PCTs. The PCTs identified within the regional mapping which are considered to have potential to conform to White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland include PCTs 266, 267, 276, 277, 280, 281, 347, 381, 401, 403, 433, 435, 437, 483, 511, 599 and 796.

The total predicted local occurrence of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland is 58 ha.

Table A.6.2 Assessment of significance for Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

Criteria	Discussion
1. Reduce the extent.	The proposed works will result in the removal of up to 0.35 ha of the Box-Gum CEEC, representing approximately 0.6% of the predicted local occurrence of the community. The access road design has also been considered to avoid impact to the high condition CEEC where possible, utilising the existing Barney's Reef Road, which occurs as a dirt road through the subject land. The road design has been created as such, to minimise the increased width required for the proposed works and therefore minimise impact to the CEEC. Although steps have been taken to avoid higher quality areas of CEEC, the project will result in a reduction of the extent of this community.
2. Fragment or increase fragmentation.	The occurrence of the Box-Gum CEEC within the subject land is highly connected to native vegetation along a road corridor. Roadsides, travelling stock routes or reserves or localised patches of grassland that are part of a larger remnant with trees, as may occur under power easements, rail easements or fire breaks are considered to primarily be the areas where this CEEC occurs in high and intact condition (NSW TSSC 2010; Prober and Thiele 2005). The road corridor introduces existing fragmentation to the CEEC, and an increase in the width of the road by approximately eight metres, is unlikely to further fragment the occurrence of the CEEC. Pollinators of the flora species which make up the CEEC are likely to be insects, which are unlikely to be inhibited from traversing the subject land and its locality. The CEEC will also remain connected to native vegetation within the locality in a north-south direction, allowing for habitat connectivity for pollinators and fauna species which may utilise the CEEC habitat. Given the existing access road within the site boundary and the areas of higher quality vegetation to be avoided, it is unlikely the project will result in a significant increase in fragmentation of the vegetation community.
3. Adversely affect habitat critical to survival.	The proposed works will result in the removal of up to 0.35 ha of the Box Gum CEEC, representing approximately 0.6% of the predicted local occurrence of the community. Habitat critical to the survival of the Box-Gum CEEC is defined as areas on moderate to highly fertile soils of the western slopes of NSW and Queensland, the northern slopes of Victoria, and the tablelands of the Great Dividing Range (DECCW 2011). Given the level of fragmentation and degradation of this community within NSW, all areas of the Box-Gum CEEC that meet the minimum criteria for the EPBC listing as outlined in the recovery plan should be considered critical to the survival of the community. According to these criteria, all areas mapped as Box-Gum CEEC within the subject land is classified as critical. Therefore, the proposed works will result in the removal of 0.35 ha of habitat critical to survival of the Box-Gum CEEC.
4. Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.	The proposed work which will impact the Box-Gum CEEC involves the construction of an access road for the proposed solar farm. Construction and operation of an access road has the potential to indirectly impact the CEEC due to increased surface water runoff or fuel and chemical spills during construction. The CEEC already occurs next to Barney's Reef Rd, which although it is a dirt road, is the cause of the same potential indirect impacts. The road design includes a sealed road which may increase the surface water runoff into the adjacent CEEC, however a table drain installed parallel to the road will minimise these indirect impacts. As the CEEC is already influenced by the existing road, construction and operation of the access road is unlikely to modify surface water levels to the point of significantly impacting the CEEC. The proposed works are unlikely to directly impact groundwater flow through the subject land, as proposed works include the construction of an access road and installation of solar panels. There will be no reduction or draw-down of groundwater levels associated with the project; therefore, the project is not expected to impact on groundwater.

Table A.6.2 Assessment of significance for Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

Criteria	Discussion
5. Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species.	The Box-Gum CEEC is located within a road corridor along Barney's Reef Road, which is also subject to existing impacts such as weed encroachment. This CEEC already has a moderate weed diversity particularly in the ground stratum which is likely attributed to the existing access road. The project has the potential to exacerbate these indirect impacts such as introduction and/or increase in weed species from construction and operation. The following mitigation measures will be implemented to ensure the project does not result in indirect impacts to the CEEC: • appropriate identification, disposal and management of weed species during clearing works; and • wash down of all vehicles and equipment prior to entry to site. Therefore, it is considered unlikely that the project will result in the introduction of new weeds or increase of existing weed species within the CEEC, further resulting in the decline of functionally important species.
6. Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: • **assisting invasive species, that are harmful to the listed ecological community, to become established; or** • **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.**	The project has the potential to result in indirect impacts such as introduction and/or increase in weed species, introduction of pathogens and fuel or chemical spills during construction. The following mitigation measures will be implemented to ensure the project does not result in indirect impacts to the CEEC: • appropriate identification, disposal and management of weed species during clearing works; • wash down of all vehicles and equipment prior to entry to site; • chemicals and fuel will be managed in accordance with Safe Work Australia guidelines (e.g. employ use of barriers, inspecting tanks and containers, etc); • use of appropriate spill containment materials (or spill kits) to clean-up spills if they occur. With the above mitigation measures implemented it is unlikely the project will result in the introduction of weeds and/or pathogens to the area or fuel/chemical spills which may indirectly impact the CEEC. For the above reasons, it is unlikely that the quality or integrity of the ecological community outside the direct impact area will be impacted as a result of the project.
7. Interfere with recovery.	The national recovery plan for the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (DECCW 2011) identifies the following objectives for the recovery of the Box-Gum CEEC: • achieving no net loss in extent and condition of the ecological community throughout its distribution; • increasing protection of sites with high recovery potential; • increasing landscape functionality of the ecological community through management and restoration of degraded sites; • increasing transitional areas around remnants and linkages between remnants; and • changes in land management attitudes and practices to increase extent, integrity and function of Box-Gum Grassy Woodland. The project will result in a reduction of extent of the Box-Gum CEEC by 0.35 ha. Through detailed design the disturbance footprint has been developed to avoid high quality areas of the CEEC containing intact and connected vegetation. The disturbance footprint is located on an existing access road which introduces the CEEC to existing indirect impacts. Due to existing weed encroachment within the CEEC, recovery potential is moderate, however the widening of Barney's Reef Road by eight metres is unlikely to exacerbate introduction or spread of weed encroachment. Given the above, the proposed works are unlikely to interfere with the recovery of the CEEC.

Table A.6.2 Assessment of significance for Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

Criteria	Discussion
Conclusion	The proposed works have been considered to minimise the impact to White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC. The assessment of significance has resulted in: • the disturbance footprint has been designed to avoid clearing of woodland areas and higher quality grassland areas; • 0.6% of the Box-Gum CEEC within the local occurrence is likely to be removed as part of the considered design; • the areas to be cleared occur along Barney's Reef Road and are already subject to indirect impacts such as weed encroachment; • mitigation measures will be implemented to ensure the project does not result in the spread or introduction of weed species or fuel/chemicals; • the works are unlikely to impact on abiotic factors that the community requires for survival; and • areas of higher quality vegetation within the impact area will be left undisturbed and maintain connectivity for the community through the impact area. As a result, the project is unlikely to have a significant impact on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC given the minimal CEEC removal when compared to the extent within the locality, measures to avoid, minimise and mitigate potential indirect impacts as part of the proposed works and the connectivity to native vegetation to remain within the locality.

A.6.1.3 Koala

EPBC Act – endangered

The range of the combined population of Koalas (EPBC Act – endangered) in QLD, NSW and ACT extends from the latitude of Cairns to the New South Wales-Victoria border and includes some island populations. The Koala's distribution is not continuous across this range, with some populations isolated by cleared land or unsuitable habitat (DAWE 2022b). Koalas inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by species from the genus *Eucalyptus* spp. The distribution of Koalas is also affected by altitude (generally limited to <800 m asl), temperature, and at the western end of their range, leaf moisture (DAWE 2022a).

Two locations within the subject land were recorded where Koala scat were identified by Koala detection dogs. These locations occur within the roadside of Barney's Reef Road (Figure 5.1). These locations occur in highly connected vegetation, which occur adjacent to Barney's Reef Road, from the Castlereagh Highway in the north and the ridgelines and slopes which occur in the south. Suitable habitat associated with the Koala within the subject land has been assessed as all woodland vegetation zones within the subject land (PCTs 281 and 80) (Figure 6.2). PCTs 281 and 80 are likely to provide key feed species for the Koala to forage.

Approximately 8.62 ha of Koala habitat occurs in the subject land. The availability of habitat within the locality is estimated to be 1784 ha, of which the subject land comprises 0.48%.

Table A.6.3 Assessment of significance for Koala

Criteria	Discussion
1. Lead to a long-term decrease in size of a population.	Although the proposed works will reduce the extent of Koala habitat by 8.62 ha, this removal extends a linear length of approximately 2.5 km and will not fragment potential habitat. Highly suitable habitat occurs adjacent to Barneys Reef Road, where 1.36 ha of the total 8.62 ha within the subject land occurs, which is highly connected to native vegetation in the north and south. The population which occurs within this area is likely to be relatively mobile, and traverse throughout the suitable habitat along Barney's Reef Road. The greatest width of clearance as a result of the proposed works will be 8 m, which still allows for the connected habitat to provide refuge for the Koala. Isolated patches of potential habitat also occur within the subject land, however, are surrounded by grassland landscapes which make the habitat sub-optimal for the species. Vehicles strikes are a known threat to the Koala (DAWE 2022a) and the proposed activity is likely to increase traffic on Barneys Reef Rd as a result of construction and operation of the solar farm. There are three previous records of the Koala in the locality (BCD 2022), one of which notes a deceased Koala on the road west of Dunedoo. Mitigation measures such as preclearance surveys will be conducted prior to tree removal to avoid direct impacts to any Koala which may occur within the subject land. Work site speed limits are also likely to be enforced during construction and are therefore unlikely to increase to Koala mortality due to vehicle strike. Due to the linear nature of the proposed works within suitable Koala habitat and mitigation measures to avoid direct impact to the species, the proposed works are unlikely to lead to a long-term decrease in the size of a Koala population.
2. Reduce the area of occupancy for the species.	The proposed works will result in the removal of up to 8.62 ha of suitable habitat for the Koala. This is equivalent to 0.48% of available habitat in the locality.
3. Fragment an existing population into two or more populations.	Although the proposed works will reduce the extent of Koala habitat by 8.62 ha, this removal extends a linear length of approximately 2.5 km and will not fragment potential habitat. Suitable habitat occurs adjacent to Barneys Reef Road, which is highly connected to native vegetation in the north and south. The population which occurs within this area is likely to be relatively mobile, and traverse throughout the suitable habitat along Barney's Reef Road. The greatest width of clearance as a result of the proposed works will be 8 m, adjacent to the existing Barneys Reef Road, which still allows for the connected habitat to provide refuge for the Koala. Removal of the already isolated and fragmented patches within the subject land is unlikely to further fragment the sub-optimal habitat which surrounds the subject land. The proposed activity is unlikely to fragment the existing Koala population into two or more populations.

Table A.6.3 Assessment of significance for Koala

Criteria	Discussion
4. Adversely affect habitat critical to survival of a species.	Habitat critical to the survival of the Koala has been defined by the approved conservation advice (DAWE 2022a) as: 'the areas that the species relies on to avoid or halt decline and promote the recovery of the species. Under the EPBC Act, the following factors and any other relevant factors may be considered when identifying habitat that is critical to the survival of a species: • whether the habitat is used during periods of stress (examples: flood, drought or fire); • whether the habitat is used to meet essential life cycle requirements (examples: foraging, breeding, nesting, roosting, social behaviour patterns or seed dispersal processes); • the extent to which the habitat is used by important populations; • whether the habitat is necessary to maintain genetic diversity and long-term evolutionary development; • whether the habitat is necessary for use as corridors to allow the species to move freely between sites used to meet essential life cycle requirements; • whether the habitat is necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation; and • any other way in which habitat may be critical to the survival of a listed threatened species or a listed threatened ecological community. Such areas, if identified, would be expected to include habitat occupied and habitat currently unoccupied, areas necessary for population processes and maintenance of genetic diversity and evolutionary potential, and areas required to accommodate future population increase, recolonisation, reintroduction, or as climate refugia.' Given the known records of scats within the study area and highly connected nature of habitat within the locality, the habitat which occurs within the subject land is likely to be habitat critical to the survival of the species. The proposed works will result in the removal of up to 8.62 ha of critical habitat for the Koala. This is equivalent to 0.48% of available habitat in the locality.
5. Disrupt breeding cycle of a population.	The habitat within the subject land is suitable for foraging and breeding for the Koala. The breeding season of the Koala can be difficult to predict, as a number of factors such as population density, food quality and availability, soil type and climate, and health of the Koala effect breeding (DAWE 2022a and references therein). Koala reproduction is also heavily influenced by seasonality. It is likely that any noise and vibrations which occur as a result of the proposed works will encourage the Koala to move further away from the subject land; this may cause stress to the individual. Mitigation measures such as pre-clearance surveys to ensure the Koala is not present within the subject land prior to vegetation removal will be in place in order to avoid direct impacts to the Koala, potentially during the breeding season.
6. Modify, destroy, remove, isolate or degrade habitat to the extent that the species is likely to decline.	The proposed works will result in the removal of up to 8.62 ha of critical habitat for the Koala. This is equivalent to 0.48% of available habitat in the locality. No Koala habitat is likely to be isolated as a result of the proposed activity. The proposed activity has the potential to modify Koala habitat outside of the subject land, with indirect impacts such as weed encroachment. The following mitigation measures will be implemented to ensure the project does not result in indirect impacts to Koala habitat: • appropriate identification, disposal and management of weed species during clearing works; and • wash down of all vehicles and equipment prior to entry to site.

Table A.6.3 Assessment of significance for Koala

Criteria	Discussion
7. Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.	Domestic dogs (*Canis familiaris*) are a known threat to Koalas; however the proposed works will not introduce domestic dogs to the area (DAWE 2022b). Invasion by weeds and pathogens is also a known threat to the species, where weed encroachment and pathogen introduction can alter suitable habitat. The Koala habitat within the subject land is located within a road corridor along Barney's Reef Road, which is also subject to existing impacts of weed encroachment. This habitat has a moderate weed diversity primarily within the ground stratum. Despite the existing weed encroachment, the Koala is still known to occur. The following mitigation measures will be implemented to ensure the project does not result in indirect impacts to Koala habitat: • appropriate identification, disposal and management of weed species during clearing works; and • wash down of all vehicles and equipment prior to entry to site. Therefore, it is considered unlikely that the proposed works will result in invasive species that would adversely affect Koala habitat.
8. Introduce disease that may cause the species to decline	Koalas are susceptible to Chlamydia, a sexually transmitted disease. In general, disease outbreaks occur when animals are stressed due to environmental or climatic stressors (DAWE 2022b). The proposed works has the potential to increase stress levels to the Koala, as potential stressors such as noise and vibration levels within the subject land in addition to clearing vegetation may cause stress if the Koala was to occur in within the subject land. Mitigation measures such as pre-clearance surveys to ensure the Koala is not present within the subject land prior to vegetation removal will be in place in order to avoid potential stress factors for the Koala.
9. Interfere with the recovery of the species	Current recovery actions for the Koala include the establishment and implementation of a National Koala Monitoring Program, initiatives aimed at health programs and research, creation of Koala sighting programs and support for the wildlife rehabilitation sector (DAWE 2022b). Additional recovery actions include (DAWE 2022a): • build and share knowledge; • strong community engagement and partnerships; • increase habitat protection; • koala conservation is integrated into policy, and statutory and land-use plans; • strategic habitat restoration; and • active metapopulation management. The proposed works are likely to interfere with the recovery action of increase habitat protection and restoration, as the removal of 8.62 ha within the subject land is likely to inhibit the ability of the existing habitat to be protected or restored. Despite this, efforts to minimise direct impacts to suitable habitat on Barneys Reef Road have been made during design of the proposed works. The access road design utilises the existing Barney's Reef Road, which occurs as a dirt road through the subject land. The road design has been created as such, to minimise the increased width required for the proposed works and therefore minimise impact to Koala habitat.
Conclusion	The project is unlikely to have a significant impact on the Koala as: • direct impacts will occur to 8.62 ha of suitable habitat, which occurs as 0.48% within the locality; • suitable habitat is likely to be fragmented or isolated as a result of the proposed works; • mitigation measures in place to reduce potential direct and indirect impacts such as pre-clearance surveys and weed hygiene measures; and • the works are not likely to have a significant impact on populations size, area or increase isolation of these species.

A.6.1.4 Regent Honeyeater and Gang-gang Cockatoo

i Regent Honeyeater

EPBC Act – critically endangered

The Commonwealth Conservation Advice for Regent Honeyeater (DE 2015a) describes the conservation status, distribution, biology/ecology and threats to the survival of the species.

The Regent Honeyeater is a medium size bird predominantly black and yellow. The head, neck and throat are black, with warty pink or yellow skin around the eyes. The wings and tail feathers are edged with bright yellow (DE 2015a).

The Regent Honeyeater is endemic to mainland south-eastern Australia; extending from south-east Queensland, through NSW and the ACT to central Victoria (DE 2015a). There are only three known breeding regions remaining within Victoria and NSW. Within NSW the species is known to breed at Capertee Valley and the Bundarra-Barraba region (OEH 2022a). The species movement patterns are largely influenced by glowering of certain eucalypt species.

The species is most commonly associated with box-ironbark eucalypt woodland and dry sclerophyll forest. It is also known to occur within riparian vegetation such as *Casuarina* spp. where it feeds on mistletoe. The Regent Honeyeater uses a range of other habitats including remnant patches within farmland and urban areas, and roadside reserves. The species nests in the canopy of mature trees with rough bark. Breeding occurs between spring and summer (August to January) (DE 2015a).

The main threats to the Regent Honeyeater include clearing, fragmentation, degradation of habitat, competition from other birds, egg and nest predation by native birds and mammals and loss of key foraging resources as a result of inappropriate fire regimes (OEH 2022a).

While this species was not observed during field surveys, it is associated with PCTs 281 and 80. The subject land contains suitable foraging habitat for the species within mapped woodland areas.

ii Gang-gang Cockatoo

EPBC Act – endangered

The Commonwealth Conservation Advice for Gang-gang Cockatoo (DAWE 2022c) describes the conservation status, distribution, biology/ecology and threats to the survival of the species.

The Gang-gang Cockatoo is a small, primarily grey cockatoo with broad wings and short tails. Adult males are characterised by their scarlet-coloured head and a filamentous, forward-curling crest and occasionally a pale-yellow abdomen (DAWE 2022c). Adult females are entirely grey, with feathers fringed with yellow, particularly on the abdomen and undertails (DAWE 2022c).

The Gang-gang Cockatoo is endemic to south-eastern Australia and is more common at higher elevations and more southern latitudes (DAWE 2022c). In NSW, the species has been recorded in the Greater Blue Mountains Heritage Area and the Mid to Lower Central Coast, with isolated records as far north as Coffs Harbour (DAWE 2022c). The species also occurs throughout the ACT and is widespread throughout Victoria (DAWE 2022c).

The Gang-gang Cockatoo predominantly inhabits temperate eucalypt forests and woodlands, with the species commonly occurring in eucalypt-dominated forests with dense, shrubby understories in summer (DAWE 2022c). In winter, the species inhabits open eucalypt woodlands and, occasionally groups of river red gum, heathlands and dense coastal thickets of *Leptospermus* and *Casuarina* (DAWE 2022c).

The species has a broad diet, feeding on flower buds, seed pods, blossoms, leaf buds and fruits, but relies primarily on eucalypts and acacia for foraging (DAWE 2022c). The species relies on stands of large, hollow-bearing trees for breeding, generally near water. Breeding primarily occurs between October and January (DAWE 2022c).

The main threats to the Gang-gang Cockatoo include habitat loss due to wildfire and clearing, particularly in mature forests with old hollow-bearing trees, and the resulting competition with other birds and arboreal species for suitable nesting hollows (DAWE 2022c).

While this species was not observed during field surveys, it is associated with PCTs 281 and 80. The subject land contains suitable foraging habitat for the species within mapped woodland areas.

Table A.6.4 Assessment of significance for Regent Honeyeater and Gang-gang Cockatoo

Criteria	Discussion
1. Lead to a long-term decrease in size of a population.	The Regent Honeyeater and Gang-gang Cockatoo are known to occur throughout eastern NSW, with existing records for the Regent Honeyeater occurring within the locality. The species are considered to have potential to utilise foraging habitat within the subject land. These species are likely to utilise the woodland habitat only and are unlikely to be associated with the grasslands within the subject land. The proposed works will result in the removal of up to 8.62 ha of foraging habitat for the Regent Honeyeater and Gang-gang Cockatoo. The subject land is situated within a primarily agricultural landscape, however highly connected patches of woodland occur within the subject land in addition to isolated patches and individual trees. It is not predicted that the impact to 8.62 ha of foraging habitat will lead to a long-term decrease in the size of a population of these two woodland birds, given the extent of high quality and connected woodland within the locality.
2. Reduce the area of occupancy for the species.	The proposed works will result in the removal of up to 8.62 ha of foraging habitat for the Regent Honeyeater and Gang-gang Cockatoo. The subject land is situated within a primarily agricultural landscape, however highly connected patches of woodland occur within the subject land in addition to isolated patches and individual trees. Given the remaining foraging habitat within the locality, it is unlikely the project will result in a significant reduction of foraging habitat for the Regent Honeyeater or the Gang-gang Cockatoo.
3. Fragment an existing population into two or more populations.	The subject land is located within a fragmented landscape with historical clearing and existing agricultural land uses and is also connected to larger extents of native vegetation in the south. The project will include the construction of solar panels and access road. Given both species can fly across the subject land, the proposed works are unlikely to result in significant fragmentation of species habitat.
4. Adversely affect habitat critical to survival of a species.	Habitat critical to the survival of the Regent Honeyeater has been defined by the recovery plan (DE 2016) as: • any breeding or foraging habitat in areas where the species is likely to occur (as defined by distribution maps in the recovery plan); and • any newly discovered breeding or foraging locations. The subject land lies within the species distribution as mapped within the recovery plan (DE 2016). Habitat critical to the survival of the Gang-gang Cockatoo has been defined as 'all foraging habitat during both the breeding and non-breeding season' (DAWE 2022c). As such, habitat within the subject land contains critical habitat for both species. The proposed works will result in the removal of up to 8.62 ha of critical habitat for the Regent Honeyeater and Gang-gang Cockatoo. High quality connected habitat occurs within the locality and is also likely to be considered critical habitat.
5. Disrupt breeding cycle of a population.	The subject land is located outside of the known breeding areas of these species. The closest key breeding area for the Regent Honeyeater is the Mudgee-Wollar area, approximately 50 km south-east of the subject land (DoE 2016). Breeding for the Gang-gang Cockatoo usually occurs between October and January (Summer) where they primarily inhabit mature, wet sclerophyll forests at higher altitudes (DAWE 2022c). The proposed works are unlikely to directly disrupt the breeding cycle of these species.

Table A.6.4 Assessment of significance for Regent Honeyeater and Gang-gang Cockatoo

Criteria	Discussion
6. Modify, destroy, remove, isolate or degrade habitat to the extent that the species is likely to decline.	The proposed activity will remove up to 8.62 ha of foraging habitat for these species. The subject land is outside the known breeding areas for both species. Given the proposed activity will remove foraging habitat only, it is unlikely this will result in a substantial reduction of the species.
7. Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.	Weeds are considered to contribute to habitat degradation for both species. Soil disturbance for the proposed works has potential to result in the spread of invasive weeds to retained areas of vegetation and potential habitat. The foraging habitat within the subject land for these species is located within a road corridor along Barney's Reef Road, which is also subject to existing impacts of weed encroachment. This habitat has a moderate weed diversity primarily within the ground stratum. The following mitigation measures will be implemented to ensure the project does not result in indirect impacts to Regent Honeyeater and Gang-gang Cockatoo habitat: • appropriate identification, disposal and management of weed species during clearing works; and • wash down of all vehicles and equipment prior to entry to site. Therefore, it is considered unlikely that the proposed works will result in invasive species that would adversely affect foraging habitat for these species.
8. Introduce disease that may cause the species to decline	There are no known diseases that pose a threat to the Regent Honeyeater. Psittacine beak and feather disease (PBFD) is a common and potentially deadly disease that is widespread in wild populations of many Australian parrots and cockatoos (DEH 2004), including the Gang-gang Cockatoo (DAWE 2022c). The potential impacts of the disease depend on environmental conditions and the general health of populations. The disease has the potential to impact Gang-gang Cockatoo populations if their health declines due to competition for food resources. It is not predicted that the proposed works would impact on the levels of PBFD directly as it already exists in wild populations, or indirectly, as the relatively small area of foraging habitat to be cleared will not cause significant stress to Gang-gang Cockatoo populations.
9. Interfere with the recovery of the species	Whilst there is no recovery plan for the Gang-gang Cockatoo, the approved conservation advice outlines a number of recovery actions relevant to the proposed works including (DAWE 2022c): • cease all land clearing of habitat critical to the survival of Gang-gang Cockatoo. Additional recovery actions include conservation strategies, stakeholder engagement and survey and monitoring priorities. The proposed activity will interfere with the recovery action listed above, due to the removal of up to 8.62 ha of foraging habitat, which is also considered critical habitat. The extent of clearance is minimal and linear in nature, where no fragmentation of highly connected habitat will occur. The interference with this recovery action is unlikely to be significant. Recovery actions for the Regent Honeyeater include (DE 2016): • improve the extent and quality of the Regent Honeyeater habitat; • bolster the wild population with captive-bred birds until the wild population becomes self-sustaining; • increase understanding of the size, structure, trajectory and viability of the wild population; and • maintain and increase community awareness, understanding and involvement in the recovery program. As recovery actions are focused on increasing knowledge of the species and maintaining and restoring high quality habitat the project will not interfere with recovery. The project will interfere with the quality and extent of potential habitat for the species; however this is unlikely to be substantial, removing 8.62 ha.

Table A.6.4 Assessment of significance for Regent Honeyeater and Gang-gang Cockatoo

Criteria	Discussion
Conclusion	The proposed works are unlikely to have a significant impact on the Regent Honeyeater or Gang-gang Cockatoo as: • direct impacts will occur to 8.62 ha of foraging habitat; • the habitat to be cleared is unlikely to be fragmented due to the nature of the works and the high mobility of these bird species; • the subject land is located outside of the known breeding areas of these species; and • the works are not likely to have a significant impact on populations size, area or increase isolation of these species.

A.6.1.5 Painted Honeyeater and White-throated Needletail

i Painted Honeyeater

EPBC Act – vulnerable

The Commonwealth Conservation Advice for Painted Honeyeater (DE 2015b) describes the conservation status, distribution, biology/ecology and threats to the survival of the species.

The Painted Honeyeater is a small size bird with a distinct black head and black and white underparts. It has black spots on its flanks and yellow edges on the wings and tail feathers. The distinct bill is pink, and the eyes are red (DE 2015b).

The Painted Honeyeater is known to occur from south-eastern Australia to north-western Queensland and eastern Northern Territory (DE 2015b). The species is most commonly known from the inland slopes of the Great Dividing Rage in NSW, VIC and southern QLD where majority of the breeding occurs (OEH 2022b).

The Painted Honeyeater is the most specialised of Australia's honeyeaters, with a diet consisting of mistletoe fruits, nectar and arthropods. The species is known to occur within eucalypt forests/woodlands with an abundance of mistletoes. It inhabits a range of habitats including riparian woodlands of black box and river red gum box ironbark yellow gum woodlands, acacia-dominated woodlands, paperbarks, casuarinas, Callitris, and trees on farmland or gardens. The species create nests out of mistletoe and nest within the foliage of trees. The species breeds between October to March when mistletoe fruits are in abundance (DE 2015b).

The main threats to the Painted Honeyeater are habitat loss and degradation, habitat infestation by weeds, heavy grazing, removal of key feed species such as mistletoes, inappropriate fire regimes and competition with Noisy Miner (Manorina melanocephala).

While this species was not observed during field surveys, it is associated with PCTs 281 and 80. The subject land contains suitable foraging habitat for the species within mapped woodland areas.

ii White-throated Needletail

EPBC Act – vulnerable, migratory

The Commonwealth Conservation Advice for the White-throated Needletail (TSSC 2019) describes the conservation status, distribution, biology/ecology and threats to the survival of the species.

The White-throated Needletail is a large swift with long curved pointed wings and white markings. Adults have a dark-olive head and neck, with juveniles similar in appearance (TSSC 2019). Their tail is short and square, with a white undertail. The underwing is black, brown with glossy grey-brown flight feathers and the bill is black (TSSC 2019).

The White-throated Needletail is widespread in eastern and south-eastern Australia, and only occurring as vagrants in the Northern Territory and Western Australia. The species breeds in Asia and is recorded passing through eastern China, the Korean Peninsula and Japan. Most White-throated Needletails are known to spend the non-breeding season in Australasia (TSSC 2019).

Within Australia, the White-throated Needletail is almost exclusively aerial. Although they occur over most types of habitats, they are most often recorded over wooded areas and in coastal areas they are sometimes seen flying over sandy beaches or mudflats (TSSC 2019). The species almost always forages aerially within Australia, at heights up to 'cloud level'. The species has been recorded roosting in dense foliage or hollows of trees within forests and woodland (TSSC 2019). The White-throated Needletail does not breed in Australia (TSSC 2019).

There are few known threats associated with the White-throated Needletail in Australia. Collision with overhead wires, windows and lighthouses only affects a few individuals and is not known as a threat to the species overall (TSSC 2019).

While this species was not observed during field surveys, it is associated with PCTs 281 and 80. The subject land contains suitable roosting habitat for this species within mapped woodland areas.

Table A.6.5 Assessment of significance for Painted Honeyeater and White-throated Needletail

Criteria	Discussion
1. Lead to a long-term decrease in the size of an important population.	Recovery plans have not been developed for the White-throated Needletail or Painted Honeyeater; therefore, important populations have not been defined. As described in the significant impact guidelines (DE 2013) an important population can include: • key source populations either for breeding or dispersal; • populations that are necessary for maintain genetic diversity; and • populations that are near the limit of the species range. The White-throated Needletail is known to breed in the northern hemisphere and return to Australia in the non-breeding season and is primarily exclusively aerial (TSSC 2019). The Painted Honeyeater's breeding season is known to be associated with the fruiting of mistletoes and the species exhibits seasonal north-south movement as a result (DE 2015b). The species breeds in large remnant mature woodland with an abundance of mistletoe. The subject land does not contain mistletoes and occurs as a linear extent within the landscape. For this reason, the subject land is not considered to support key source populations for breeding or dispersal. There are two recognised subspecies of the White-throated Needletail (TSSC 2019): • subspecies *caudacutus* occurs in central and eastern Siberia, northern Mongolia, northern China and the Korean Peninsula, Sakhalin and Japan, and migrates to spend the non-breeding season in Australasia; and • subspecies *nudipes*, which breeds in the Himalayas from northern Pakistan to Assam and south-western China and is largely resident and does not occur in Australasia. One of these sub-populations (*caudacutus*) occur within Australia. The species is almost exclusively aerial and may utilise the subject land to forage. As only one population occurs within Australia, it is unlikely that any occurrence of the species within the subject land is likely to impact genetic diversity of the species. The Painted Honeyeater occurs as one population with no separate sub-populations likely (DE 2015b). It is unlikely that the subject land supports populations that are necessary for maintain genetic diversity. The subject land is located within the known distribution ranges of the White-throated Needletail and the Painted Honeyeater and does not occur within the limit of their respective ranges. It is unlikely that any individuals present in the subject land would be part of an important population of these species.

Table A.6.5 Assessment of significance for Painted Honeyeater and White-throated Needletail

Criteria	Discussion
2. Reduce the area of occupancy area of an important population.	As per above, important populations have not been defined for these species, and it is unlikely that individuals in the subject land would form part of an important population. The proposed works will result in the removal of 8.62 ha of foraging and roosting habitat for both species. These species are highly mobile. High quality connective habitat remains to the south of the subject land. Given this it is unlikely the proposed works will result in a significant reduction of habitat for the Painted Honeyeater or White-throated Needletail.
3. Fragment an existing important population into two or more populations.	As per above, important populations have not been defined for these species, and it is unlikely that individuals in the subject land would form part of an important population. The subject land is located within a fragmented landscape with historical clearing and existing agricultural land uses and is also connected to larger extents of native vegetation in the south. The project will include the construction of solar panels and access road. Given both species are highly mobile and can fly across the subject land, the proposed works are unlikely to result in significant fragmentation of species habitat.
4. Adversely affect habitat critical to the survival of a species.	Habitat critical to the survival of the White-throated Needletail and Painted Honeyeater have not been described. The White-throated Needletail is almost entirely aerial in Australia, although has been recorded roosting in woodland habitat. The subject land contains roosting habitat suitable for the species. The woodland habitat within the impact area provides potential foraging and roosting habitat for the Painted Honeyeater. Habitat critical to the survival of a species can be defined as 'habitat for activities such as foraging, breeding, roosting or dispersal' (DE 2013). Despite the subject land being suitable foraging and roosting habitat for these species, it is unlikely to be critical due to the extent of suitable high quality connected vegetation south of the subject land and the highly mobile nature of these species. Given the extent of remaining habitat within the locality and the removal of 8.62 ha as a result of the proposed works, it is unlikely the proposed works will result in adverse effects to habitat critical to the survival of these species.
5. Disrupt the breeding cycle of an important population.	As per above, important populations have not been defined for these species, and it is unlikely that individuals in the impact area would form part of an important population. The White-throated Needletail breeds in Siberia, China and Japan, after which it migrates to Australia during the non-breeding season. Therefore, the project will not disrupt the breeding cycle of the White-throated Needletail. The Painted Honeyeater breeds in large remnant mature woodland with an abundance of mistletoe. The subject land is unlikely to provide breeding habitat for the Painted Honeyeater, as it does not contain mistletoes and occurs as a linear extent within the landscape. Given the extent of connected high quality habitat south of the subject land, it is unlikely the project will have a significant impact on the species breeding cycle.
6. Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The project will remove up to 8.62 ha of potential habitat for the White-throated Needletail and the Painted Honeyeater. The subject land contains roosting habitat for the largely aerial White-throated Needletail and foraging habitat for the Painted Honeyeater. Given both species have a widespread distribution across the east of Australia, the removal of habitat within the subject land will not substantially reduce the national extent of these species.

Table A.6.5 Assessment of significance for Painted Honeyeater and White-throated Needletail

Criteria	Discussion
7. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Known threats to the Painted Honeyeater include habitat infestation by weeds such as African boxthorn, Gazania and invasive grasses. Invasive species are not known threats to the White-throated Needletail (OEH 2022b). The foraging and roosting habitat within the subject land for these species is located within a road corridor along Barney's Reef Road, which is also subject to existing impacts of weed encroachment. The grasslands within the subject land are also likely to provide foraging habitat for the White-throated Needletail. The habitat along Barney's Reef Road has a moderate weed diversity primarily within the ground stratum. This also occurs within the grasslands with a varied abundance of exotic grasses and herbaceous species observed at differing seasons. The following mitigation measures will be implemented to ensure the project does not result in indirect impacts to Painted Honeyeater and White throated Needletail habitat: • appropriate identification, disposal and management of weed species during clearing works; and • wash down of all vehicles and equipment prior to entry to site. Therefore, it is considered unlikely that the proposed works will result in invasive species that would adversely affect foraging habitat for these species.
8. Introduce disease that may cause the species to decline	There are no known diseases are associated with these species. Hygiene protocols such as washdown of all vehicles, machinery and equipment can be implemented to minimise the potential for introduction or spread of pathogens.
9. Interfere substantially with the recovery of the species.	There are no specific recovery plans for these species; however, the Approved Conservation Advice (DE 2015b; TSSC 2019) describes key priority actions and mitigation measures against threats to enable recovery of these species. Those that are relevant to the proposed works for the Painted Honeyeater include (DE 2015b): • no further clearance of suitable habitat; and • protect all woodland from clearing in which painted honeyeaters have been regularly sighted, including remnant roadside vegetation and regrowth. Priorities include identifying and protecting important habitats, specifically protecting and encouraging adequate numbers of mature trees and mistletoe populations for the Painted Honeyeater. Priorities for the White-throated Needletail list protecting important habitats, increased stakeholder engagement and monitoring and research priorities (TSSC 2019). The proposed activity will interfere with the recovery actions listed above, due to the removal of up to 8.62 ha of foraging and roosting habitat. The extent of clearance is minimal and linear in nature, where no fragmentation of highly connected habitat will occur. The interference with this recovery action is unlikely to be significant.
Conclusion	The proposed works are unlikely to have a significant impact on the White-throated Needletail or the Painted Honeyeater as: • direct impacts will occur to 8.62 ha of foraging habitat; • the habitat to be cleared is unlikely to be fragmented due to the nature of the works and the high mobility of these bird species; • important populations are unlikely to be adversely affected; and • the works are not likely to have a significant impact on populations size, area or increase isolation of these species.

Table A.6.6 Assessment of significance for White-throated Needletail (migratory)

Criteria	Discussion
1. Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	Important habitat for the White-throated Needletail has been defined as non-breeding habitat only, where it is found across a range of habitats (TSSC 2019). The species appears to occur more often over wooded areas, where it is almost exclusively aerial. Large tracts of native vegetation, particularly forest, may be a key habitat requirement for species. The White-throated Needletail is found to roost in tree hollows in tall trees on ridge-tops, on bark or rock faces (TSSC 2019). The project will remove up to 8.62 ha of potential habitat for the White-throated Needletail. The subject land contains roosting habitat for the largely aerial White-throated Needletail. Given that the White-throated Needletail has a widespread distribution across the east of Australia, the removal of habitat within the subject land is unlikely to substantially modify, destroy or isolate an area of important habitat for this species.
2. Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	Invasive species harmful to the White-throated Needletail are not known (TSSC 2019) The foraging and roosting habitat within the subject land for this species is located within a road corridor along Barney's Reef Road, which is also subject to existing impacts of weed encroachment. The grasslands within the subject land are also likely to provide foraging habitat for the White-throated Needletail. The habitat along Barney's Reef Road has a moderate weed diversity primarily within the ground stratum. This also occurs within the grasslands with a varied abundance of exotic grasses and herbaceous species observed at differing seasons. The following mitigation measures will be implemented to ensure the project does not result in indirect impacts to White throated Needletail habitat: • appropriate identification, disposal and management of weed species during clearing works; and • wash down of all vehicles and equipment prior to entry to site. Therefore, it is considered unlikely that the proposed works will result in invasive species that would adversely affect foraging or roosting habitat for this species.
3. Seriously disrupt the lifecycle (breeding, feeding, migration, or resting behaviour) of an ecologically significant proportion of the population of a migratory species	The described ecologically significant proportion of the population of the White-throated Needletail is dependent on the number if individuals which may occur across the subject land. The White-throated Needletail can occur in flocks, and less regularly are seen occurring as solo individuals (DAWE 2022d). For instances where the population occurs in flocks, 1% of the population (100 individuals) are considered internationally important (TSSC 2019). Where it does not occur in flocks, 0.1% of the population (10 individuals) are considered nationally important. As the White-throated Needletail is almost exclusively aerial within Australia, the chances of the species utilising the subject land for roosting is low. The species also does not breed in Australia. The project will remove up to 8.62 ha of potential habitat for the White-throated Needletail. This small amount to be removed when compared to the locality, is unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the population of the White-throated Needletail.
Conclusion	The proposed works are unlikely to have a significant impact on the White-throated Needletail as: • the removal of 8.62 ha of habitat within the subject land will not substantially modify, destroy or isolate an area of important habitat for this species; • it is considered unlikely that the proposed works will result in invasive species that would adversely affect foraging or roosting habitat; and • the proposed works are unlikely to seriously disrupt the lifecycle of an ecologically significant proportion of the population of the White-throated Needletail.

A.6.1.6 Large-eared Pied Bat

EPBC Act – vulnerable

The Commonwealth Conservation Advice for the Large-eared Pied Bat (DAWE 2021) describes the conservation status, distribution, biology/ecology, and threats to the survival of the Large-eared Pied Bat. Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. Within NSW, based on available records, the largest concentration of populations appears to be in the sandstone escarpments of the Sydney basin and northwest slopes of NSW.

Several facets of the known behaviour and ecology of the large-eared pied bat make it vulnerable to threats affecting other cave-roosting bat species. Individuals congregate to roost and raise young. This can place a reasonable proportion of a local population at a single locality. Most cave roosts observed are in shallow caves or in the outer reaches of deeper mines or caves. The Large-eared Pied Bat is dependent on the presence of diurnal roosts for shelter. Roosts are also used at night when bats are not feeding, as well as used for raising young. The species is known to roost in caves, overhangs, disused mine shafts, and abandoned *Petrochelidon ariel* (Fairy Martin) nests (DAWE 2021). The majority of species records are from wooded habitat which suggests the species is sensitive to clearing and has a preference for connected riparian strips of vegetation (DERM 2011).

The main known cause of decline in the species is the destruction of, and interference with maternity and other roosts. Information presented in the recovery plan (DERM 2011) identifies other probable threats as:

- mining of roosts;
- mine induced subsidence of clifflines;
- disturbance from human recreational activities;
- habitat disturbance by introduced animals, including livestock;
- predation by introduced pests; vegetation clearing in the proximity of roosts;
- and fire in the proximity of roosts.

The subject land is considered to have suitable foraging habitat only for this species and is not likely to have breeding habitat within the subject land due to the specific requirements of breeding habitat for this species. The subject land does not contain disused mine shafts, caves, overhangs which are suitable breeding habitats. As the species is likely to avoid cleared areas, the wooded vegetation associated with Barney's Reef Road is considered to be suitable foraging habitat for the species in addition to the isolated patches of woodland within the pasture areas.

Table A.6.7 Assessment of significance for Large-eared Pied Bat

Criteria	Discussion
1. Lead to a long-term decrease in the size of an important population.	A definition for an important population of the species have not been provided, however the species recovery plan discusses that the largest concentrations of populations in NSW occurs in the sandstone escarpments of the Sydney basin and northwest slopes of NSW, much of which occurs within state reserves (DERM 2011). Important populations are also defined as populations that are near the limit of their range (DE 2013). The subject land occurs on the edge of the species western range. As such, any occurrence of the species within the subject land, is considered to be an important population. The subject land contains 8.62 ha of foraging habitat for the Large-eared Pied Bat. The subject land is situated within a primarily agricultural landscape, however highly connected patches of woodland occur within the subject land. It is not predicted that the impact to 8.62 ha of foraging habitat will lead to a long-term decrease in the size of an important population of this species, given the extent of high quality and connected woodland within the locality.
2. Reduce the area of occupancy area of an important population.	The proposed works will result in the removal of up to 8.62 ha of foraging habitat for the Large-eared Pied Bat. The subject land is situated within a primarily agricultural landscape, however highly connected patches of woodland occur within the subject land. Given the remaining foraging habitat within the locality, it is unlikely the project will result in a significant reduction of foraging habitat for the Large-eared Pied Bat.
3. Fragment an existing important population into two or more populations.	The subject land is located within a fragmented landscape with historical clearing and existing agricultural land uses and is also connected to larger extents of native vegetation in the south. The project will include the construction of solar panels and access road. Given that the species can fly across the subject land, the proposed works are unlikely to result in significant fragmentation of an existing important population.
4. Adversely affect habitat critical to the survival of a species.	Habitat critical to the survival of the species is discussed within the species national recovery plan (DERM 2011). The recovery plan states that diurnal roosts for shelter, such as disused mine shafts, caves, overhangs and abandoned fairy martin (*Hirundo ariel*) nests may offer habitat critical to the survival of the species. Sandstone cliffs and fertile wooded valley habitat within close proximity of each other should be considered habitat critical to the survival of the Large-eared Pied Bat. The subject land does not contain habitat critical to the survival of the species. The proposed works do not contain sandstone cliffs or wooded valleys, nor does in contain caves, mine shafts or rock overhangs. Foraging habitat only, has been assessed to occur within the subject land. The proposed works will result in the removal of 8.62 ha of foraging habitat for the species.
5. Disrupt the breeding cycle of an important population.	The subject land is located outside of the known breeding habitat of the Large-eared Pied Bat. Foraging habitat only is considered to occur. The proposed works are unlikely to directly disrupt the breeding cycle of these species.
6. Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	The proposed works will remove 8.62 ha of potential foraging habitat for the Large-eared Pied Bat. The clearance of this suitable habitat is linear and will not isolate potential habitat. The proposed activity has the potential to modify Large-eared Pied Bat habitat outside of the subject land, with indirect impacts such as weed encroachment. The following mitigation measures will be implemented to ensure the project does not result in indirect impacts to Large-eared Pied Bat habitat: • appropriate identification, disposal and management of weed species during clearing works; and • wash down of all vehicles and equipment prior to entry to site.

Table A.6.7 Assessment of significance for Large-eared Pied Bat

Criteria	Discussion
7. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.	Predation by introduced predators such as cats and foxes are a known threat to the species (DERM 2011), however the proposed works is unlikely to exacerbate this threat if these predatory species were to occur within the area. The proposed works include an access road, which includes the widening of Barney's Reef Road. Barney's Reef Road is likely to allow these species to currently traverse the subject land. This is similar for the grasslands in the subject land, predatory species such as cats and foxes and likely to already be able to traverse these areas. The widening of Barney's Reef Road and the installation of solar panels within the subject land are unlikely to exacerbate these threats. Soil disturbance for the proposed works has potential to result in the spread of invasive weeds to retained areas of vegetation and potential foraging habitat leading to habitat alteration. The foraging habitat within the subject land for this species is located within a road corridor along Barney's Reef Road, which is also subject to existing impacts of weed encroachment. This habitat has a moderate weed diversity primarily within the ground stratum. The following mitigation measures will be implemented to ensure the project does not result in indirect impacts to Large–eared Pied Bat habitat: • appropriate identification, disposal and management of weed species during clearing works; and • wash down of all vehicles and equipment prior to entry to site. Therefore, it is considered unlikely that the proposed works will result in invasive species that would adversely affect foraging habitat for these species.
8. Introduce disease that may cause the species to decline	Bats are known to carry the Australian bat lyssavirus which has the potential to spread through populations. The clearance of potential foraging habitat is unlikely to cause significant stress such that a disease outbreak would occur.
9. Interfere substantially with the recovery of the species	Recovery actions for the Large-eared Pied Bat include (DERM 2011): • identify priority roost and maternity sites for protection; • implement conservation and management strategies for priority sites; • educate the community and industry to understand and participate in the conservation of the Large-eared Pied Bat; • research the Large-eared Pied Bat to augment biological and ecological data to enable conservation management; and • determine the metapopulation dynamics throughout the distribution of the Large-eared Pied Bat. The proposed works are unlikely to interfere with these recovery objectives.
Conclusion	The project is unlikely to have a significant impact on the Large-eared Pied Bat as: • direct impacts will occur to 8.62 ha of suitable foraging habitat only, which is highly connected to high quality habitat outside of the subject land; • there will be no direct impacts to breeding habitat, due to lack of suitable habitat within eh subject land; • suitable foraging habitat is unlikely to be fragmented or isolated as a result of the proposed works; • mitigation measures will be in place to reduce indirect impacts such as weed hygiene measures; and • the works are not likely to have a significant impact on population size, area or recovery of this species.

Appendix 7
Biodiversity credit report

EMM
creating opportunities

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00028605/BAAS17009/21/00028606

Proposal Name
J210553 Birriwa Solar Farm

BAM data last updated *
16/06/2022

Assessor Name
Erin Lowe

Assessor Number
BAAS18135

BAM Data version *
54

Proponent Names

Report Created
12/09/2022

BAM Case Status
Finalised

Assessment Revision
7

Assessment Type
Major Projects

Date Finalised
12/09/2022

* 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	281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion

Species
Chalinolobus dwyeri / Large-eared Pied Bat

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
Varanus rosenbergi / Rosenberg's Goanna

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
80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	76.8	51	0	51
281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South 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	291.9	230	0	230

80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

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 Peneplain, Nandewar and Brigalow Belt South Bioregions This includes PCT's: 76, 80, 81, 82, 101, 110, 237, 248	-	80_High	Yes	48	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. 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 Peneplain, Nandewar and Brigalow Belt South Bioregions This includes PCT's: 76, 80, 81, 82, 101, 110, 237, 248	-	80_Pasture	No	0	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. 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 Peneplain, Nandewar and Brigalow Belt South Bioregions This includes PCT's: 76, 80, 81, 82, 101, 110, 237, 248	-	80_Poor	Yes	3	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

281-Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South 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 This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654,	-	281_High	Yes	22	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698					
	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 This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421,	-	281_Medium	Yes	20	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698					
	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 This includes PCT's: 74, 75, 83, 250, 266, 267,	-	281_Pasture	No	0	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698					
	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New	-	281_Planted	Yes	90	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi.

	England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698					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 This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099,	-	281_Poor	Yes	98	Inland Slopes, Bogan-Macquarie, Bondo, Capertee Uplands, Capertee Valley, Crookwell, Hill End, Kerrabee, Lower Slopes, Murray Fans, Murrumbateman, Orange, Pilliga, Talbragar Valley and Wollemi. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698					

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Chalinolobus dwyeri / Large-eared Pied Bat	**80_Poor, 281_Planted, 281_Poor**	0.5	17.00
Ninox connivens / Barking Owl	**80_High, 281_High, 281_Pasture**	3.9	33.00
Ninox strenua / Powerful Owl	**80_High, 281_High, 281_Pasture**	3.9	33.00
Phascolarctos cinereus / Koala	**80_High, 80_Poor, 281_High, 281_Medium, 281_Planted, 281_Poor**	8.6	234.00
Tyto novaehollandiae / Masked Owl	**80_High, 281_High, 281_Pasture**	3.9	33.00

Credit Retirement Options

Like-for-like credit retirement options

Chalinolobus dwyeri / Large-eared Pied Bat	Spp	IBRA subregion

	Chalinolobus dwyeri / Large-eared Pied Bat	Any in NSW
Ninox connivens / Barking Owl	Spp	IBRA subregion
	Ninox connivens / Barking Owl	Any in NSW
Ninox strenua / Powerful Owl	Spp	IBRA subregion
	Ninox strenua / Powerful Owl	Any in NSW
Phascolarctos cinereus / Koala	Spp	IBRA subregion
	Phascolarctos cinereus / Koala	Any in NSW
Tyto novaehollandiae / Masked Owl	Spp	IBRA subregion
	Tyto novaehollandiae / Masked Owl	Any in NSW

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