Appendix 8

Biodiversity Development Assessment Report

prepared by

Ozark Environment and Heritage Management Pty Ltd

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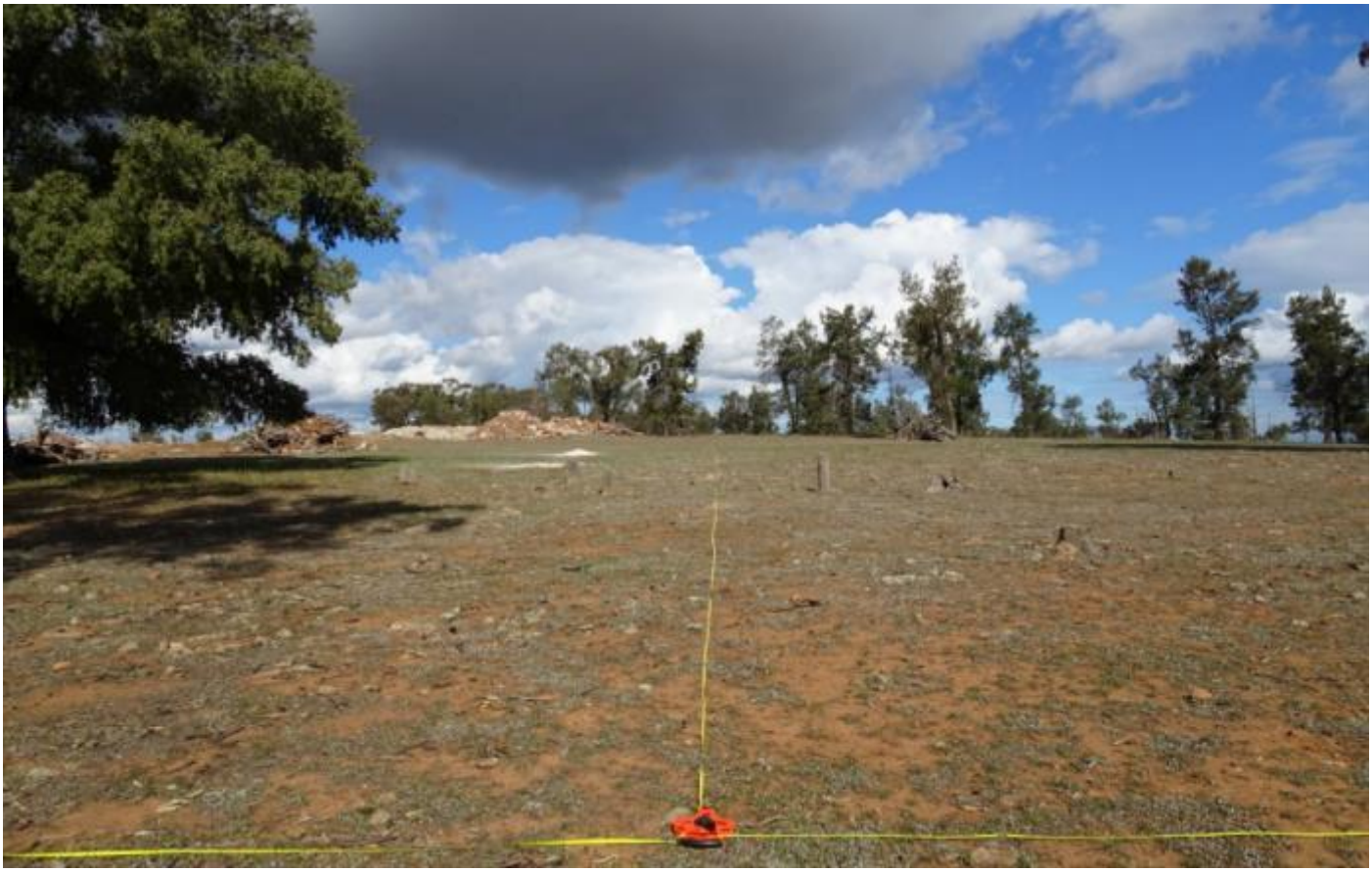
Strontian Quarry Extension, Milbrae Quarries Pty Ltd.



Biodiversity Development Assessment Report (BDAR)

Prepared for R. W. Corkery & Co Pty Limited on behalf of Milbrae Quarries PTY Ltd

March 2021

OzArk Environmental & Heritage Management Pty Limited

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DOCUMENT CONTROLS

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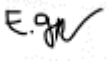
CERTIFICATION

I certify that I have reviewed and advised the contents of this BDAR and, to the best of my knowledge, it is in accordance with the NSW *Biodiversity Conservation Act 2016* and the Biodiversity Assessment Method (BAM). The information it contains is neither false nor misleading. It addresses, to the fullest extent possible, all matters affecting or likely to affect biodiversity as a result of the proposed activity. This BDAR has been prepared by a BAM Accredited Assessor.

BDAR prepared by	Emma Gray
Signed	
Date	15/03/2021
Organisation	OzArk Environment and Heritage
Position	Ecologist
Qualification	Doctor of Philosophy (Ecology)
Accreditation number	BAAS19069

EXECUTIVE SUMMARY

Milbrae Quarries Pty Ltd. (the proponent) proposes to extend an existing indurated sandstone quarry within Lots 133 DP726537 and 134 DP726537 Strontian Road, Narrandera, NSW. OzArk Environment & Heritage (OzArk) was engaged by R. W Corkery & Co Pty Ltd. (RWC), on behalf of the proponent, to prepare the biodiversity assessment for the proposal.

The proposal will clear up to 3.93 ha of native vegetation to extend the quarry site, which includes an extraction area, office and amenities area and operational disturbance area (safety bund, internal roads, erosion and sedimentation controls etc.).

As the proposal will clear 1 ha of native vegetation, a Biodiversity Development Assessment Report (BDAR) is required to assess the impacts of the proposal on biodiversity and the proponents offset obligations under the Biodiversity Offset Scheme (BOS).

The native vegetation consists of three Plant Community Types:

- PCT 70 - White Cypress Pine woodland on sandy loams in central NSW wheatbelt
- 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
- PCT 185 - Dwyer's Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion

PCT 80 is associated with the following Threatened Ecological Communities (TECs):

- EPBC Act listed, Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions
- BC Act listed, Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions
- BC Act listed, Mallee and Mallee-Broombush dominated woodland and shrubland, lacking Triodia, in the NSW South Western Slopes Bioregion

However, the listed TECs were determined not to be present on the subject land based on patch size and lack of defining structural characteristics, such as a mid-stratum layer. PCT 185 and 70 are not associated with any TECs.

In total, 29 ecosystem credit species and seven species credit species were assumed to be present or confirmed on the subject land after targeted searches were completed. The proponent intends to establish a biodiversity stewardship site to retire the required ecosystem credits. However, the proponent will need to pay into the Biodiversity Conservation Fund or buy and retire species credits from the open market.

The significance of the proposed impact to EPBC Listed threatened, migratory, wetland and marine species predicted to occur within a 10 km search area was assessed. No significant impact to a threatened, migratory, wetland or marine species likely to result in the extinction of a local population was identified. The residual ecological impacts of the proposal would be adequately mitigated using the management actions recommended. Therefore, a referral of the proposal to the Federal Department of Agriculture, Water and the Environment for these matters is not required.

This assessment covers the current form of the proposal. Any change to the scope of work may require re-assessment.

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1 Introduction

1.1 Background

Milbrae Quarries Pty Ltd. (the proponent) proposes to extend an existing sandstone quarry within Lots 133 DP726537 and 134 DP726537 Strontian Road, Narrandera, NSW. OzArk Environment & Heritage (OzArk) was engaged by R. W Corkery & Co Pty Ltd. (RWC), on behalf of the proponent, to prepare the biodiversity assessment for the proposal. A preliminary assessment identified the need for a Biodiversity Development Assessment Report (BDAR), due to the proposed clearing area of native vegetation exceeding the threshold for entry into the NSW Biodiversity Offset Scheme (BOS) under the NSW *Biodiversity Conservation Act 2016* (BC Act). This report documents the assessment, which has been completed in accordance with the Biodiversity Assessment Method (BAM), and details the proponent's biodiversity offset requirement (number of ecosystem and species credits).

1.2 The Proposal

The subject land is located on Lots 133 DP726537 and 134 DP726537 on Strontian Road, approximately 11 km southeast of Narrandera (See **Figure 1-1** and **1-2**). The proponent operates an existing quarry on the subject land, recovering indurated sandstone to produce a range of products including aggregates and road base used in construction and infrastructure projects. The Quarry is located on Crown Land, which is leased to the Applicant under an indefinite licence. The Quarry originally commenced operations in 2012 and is currently operating under Development Consent DA27/2011/12 issued by Narrandera Shire Council on 27 March 2012. The Quarry has approval to extract and process up to 150 tonnes per day (tpd) or 30 000 tonnes per annum (tpa) of indurated sandstone material and disturb a total area of no more than 2 hectares (ha). Extracted material is processed on a campaign basis using mobile crushing and screening equipment that is located within the existing extraction area. Quarry products are stockpiled within the extraction area prior to despatch.

The Applicant has identified a further 2.97 million tonnes of indurated sandstone material adjacent to and beneath the approved extraction area, which they propose to access. It is envisaged that the extraction area would be developed in three stages with benches developed at 176m AHD, 164m AHD and 152m AHD over the expanded area. All processing, product stockpiling and product despatch activities would be undertaken within the footprint of the extraction area. An office and amenities area (including light vehicle parking) and operational disturbance area (including safety bunds, internal roads, erosion and sedimentation controls etc.) will also be instated. Overall, the proposed activities would increase the total area of disturbance from approximately 2 ha to approximately 7.6 ha, of which 3.93 ha is remnant native vegetation (this being progressively cleared from the proposed extraction area). See **Appendix J** for the proposed Strontian Quarry layout.

In addition to the proposed extension of the extraction area, the proponent would increase the extraction rate by 95 000 tpa (from 30 000 tpa to 125 000 tpa). In order to accommodate this increase, Milbrae Quarries proposes to increase the number of laden truck movements from 5 per day to a maximum of 48 per day. It is noted that the proposed transport route would remain consistent with the existing approved transport route.

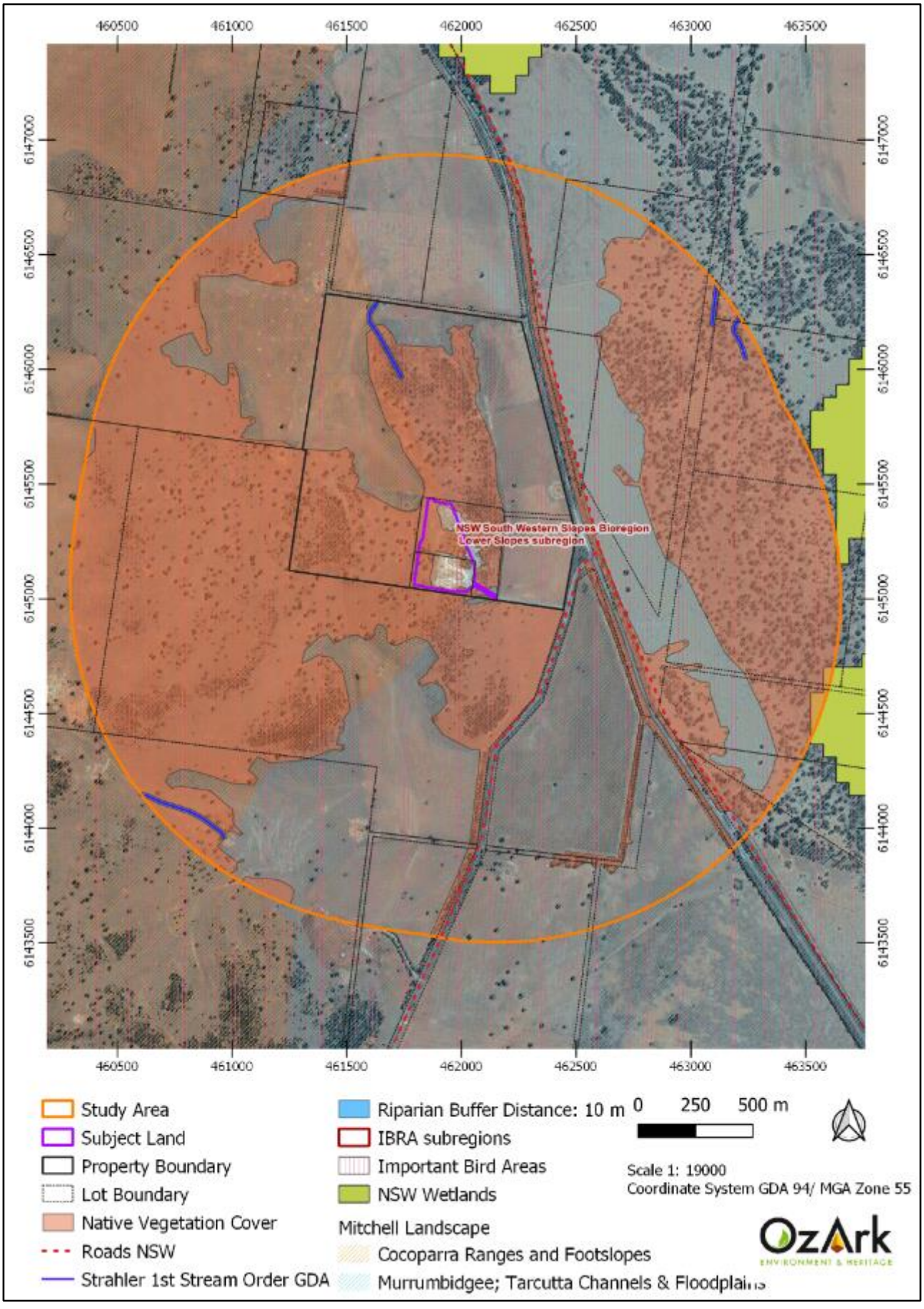

Figure 1-1 Location map showing the subject land, study area and key features.

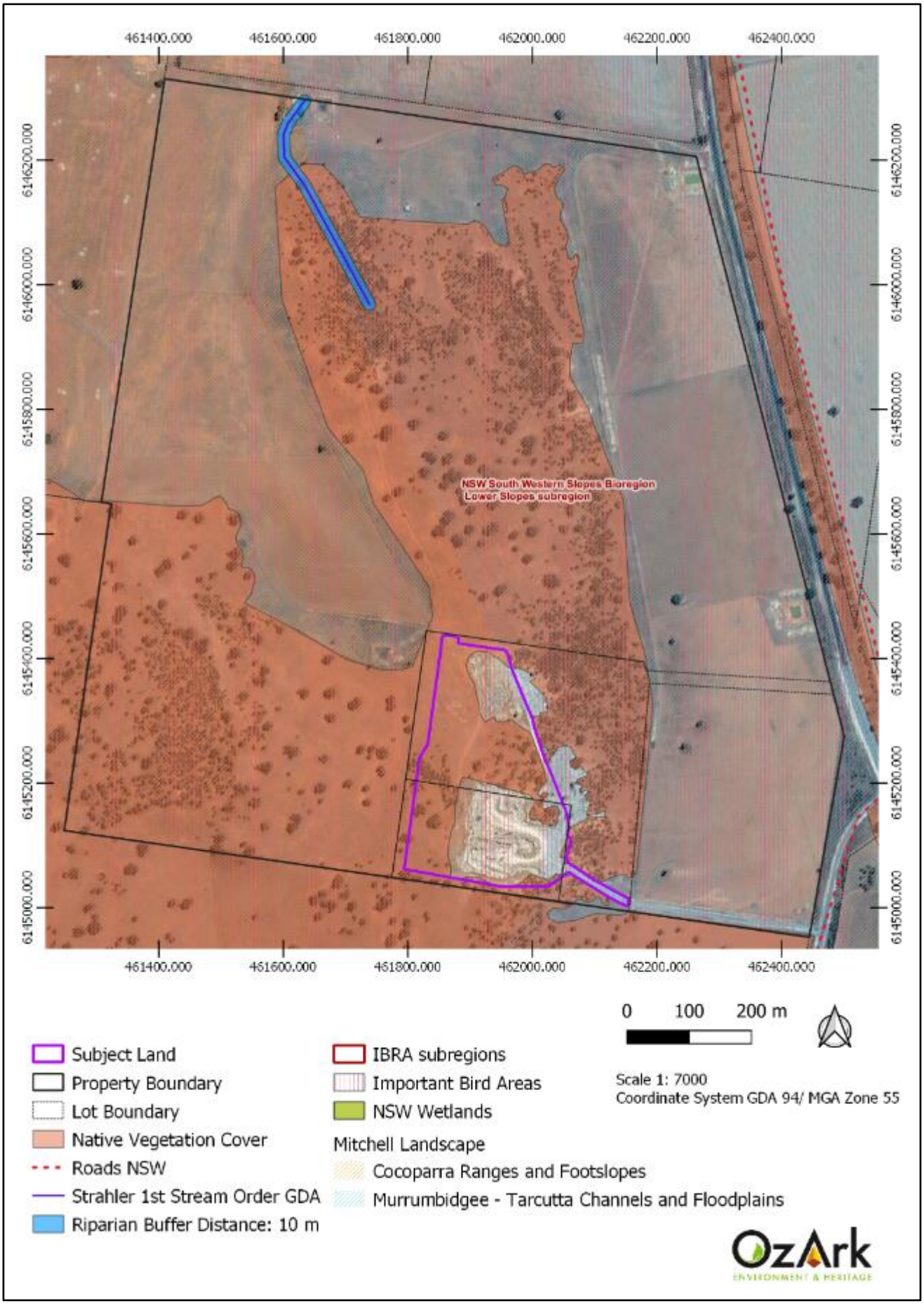

Figure 1-2 Site map showing subject land, existing access track and key features.

1.3 Relevant Terms

The following terms and definitions are used to describe the land assessed in this study.

Subject land and **development footprint.** The area of land that is directly impacted by the proposed development, including the extraction area, office and amenities area and operational disturbance area.

Property boundary. Lots 133 DP726537 and 134 DP726537, within which the subject land occurs.

Study area. The study area refers to an area of land within a 1500 m buffer from the outside edge of the subject land. The study area is the area assessed for the purpose of establishing landscape context including native vegetation cover.

10 km search area. The area within a 10 km radius of the subject land. This 10 km buffer has been used to search information sources, including the Protected Matters Search Tool (PMST) (Department of Agriculture, Water and the Environment 2020) and BioNet Atlas (DPIE, 2020) species sightings search.

1.4 Site Identification

The site is identified under the *Narrandera Local Environment Plan* 2013 (Narrandera LEP) and on the NSW Planning Portal as follows.

- **Lot/Section/Plan No:** Lots 133 DP726537 and 134 DP726537
- **Land Zoning:** RU1 Primary Production.
- **Minimum Lot Size:** 400 ha
- **Terrestrial Biodiversity:** Biodiversity Value (Narrandera LEP)

The location of the proposal is shown on the location map (**Figure 1-1**) and the site map (**Figure 1-2**). The subject land is part of the Murrumbidgee Red Gums Important Bird Area (**Figure 1-1**). The subject land is ~5.2 km east of Gillenbah State Forest and ~6 km south of Murrumbidgee Valley Nature Reserve. Floodplain wetlands also occur around the Murrumbidgee River, ~1.5 km east of the subject land.

The current proposal is to progressively clear up to 3.93 ha of native vegetation for the quarry extension. Vegetation removal will involve clearing of all stratum layers of vegetation; upper, mid and ground.

Because the final project design was not available at the time of survey, a wider area of the property was assessed. As a result, some BAM plots are now outside the subject land. However, these have been retained in the BDAR, as they occur immediately adjacent to the subject land within connected vegetation.

Regulatory Context

The Proposal will be assessed under Part 4 (Regional Development) of the EP&A Act. The BC Act requires all Regional Developments to be assessed in relation to the BOS, if entry is triggered by the location and/or size of the development. The *Biodiversity Conservation Regulation 2017* sets out the thresholds for entry into the BOS, which are as follows.

- If the amount of native vegetation proposed to be cleared exceeds the threshold area for the lot size for the LEP zone[1].
- When the development is located on land identified in the Biodiversity Value Map (https://www.lmbc.nsw.gov.au/Maps/), as defined by Clause 7.3 of the Regulation.
- If, in the absence of the above thresholds, the Proposal is likely to be a significant impact to threatened species, ecological communities or their habitat[2].

This assessment was conducted under the BAM 2017, which has since been updated to the BAM 2020. The BAM 2020 updates were effective as of October 2020 allowing for a transitional period of up to 6 months from this date for BDAR finalisation. Due to the transitional arrangements allowing previous projects to proceed without reassessment, updates to Serious and Irreversible Impacts (SAII) in accordance with the BAM 2020 have not been made. Therefore, the SAII assessment of the Oakland Diuris, (see **Section 6.5**) has been conducted under the BAM 2017 guidelines.

1.5 Purpose

The purpose of the BDAR is to determine the biodiversity assets, including flora, fauna, threatened species, threatened communities and habitat values, of the subject land.

The BDAR also identifies any constraints on the proposal according to relevant Federal and NSW environmental legislations and includes the calculation of ecosystem and/or species credits requiring offset.

1.6 Legislation

1.6.1 International legislation

- Japan-Australia Migratory Bird Agreement (JAMBA)
- China-Australia Migratory Bird Agreement (CAMBA)
- Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)
- Ramsar Convention on Wetlands (Ramsar).

1.6.2 Commonwealth legislation

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), including EPBC Act Environmental Offsets Policy and Significant Impact Guidelines Version 1.1, 2013.

[1] The area threshold applies to all proposed native vegetation clearing (and other biodiversity impacts associated with a proposal), regardless of whether this clearing is across multiple lots. In the case of a subdivision, the proposed clearing must include all future clearing likely to be required for the intended use of the land after it is subdivided. This includes all areas for buildings, landscaping, access roads, asset protection zones and any infrastructure and fences.
[2] Based on the 'test of significance' in Section 7.3 of the BC Act. Proponents are only required to carry out the 'test of significance' for Regional Development proposals when the first two thresholds are not exceeded. The Biodiversity Offsets Scheme does not apply to exempt or complying development.

1.6.3 NSW legislation

Environmental Planning and Assessment Act 1979 (EP&A Act)

The EP&A Act provides the legal framework for the assessment and approval of the proposed activities. Part 4 of the EP&A Act requires the proponent to examine and consider to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity.

Biodiversity Conservation Act 2016 (BC Act)

Under the BC Act, the proponent has an obligation to consider impacts to all threatened species, populations and ecological communities listed in NSW, as well as ensuring the proposal does not exacerbate a Key Threatening Process (KTP). Entry to the BOS is triggered if any of the thresholds listed above (see Regulatory Context) are met.

Biodiversity Conservation Regulation 2017 (BCR)

The BCR defines the triggers and entry thresholds for the BOS. It also provides the rules for meeting offset obligations, triggers for authorities to refuse development applications and compliance provisions.

Biosecurity Act 2015

From 1 July 2017, the *Biosecurity Act 2015* and its subordinate legislation commenced. The *Noxious Weeds Act 1993* and part of the *Local Land Services Act 2013* (Part 10 Pests), among other acts, have been repealed under the new *Biosecurity Act 2015*. Schedule 1 of the *Biosecurity Act 2015* contains the special provisions relating to weeds and duty to control weeds, which pose a biosecurity risk.

The Department of Primary Industries (DPI) maintains a list of 'Priority Weeds' (previously referred to as noxious weeds) in NSW for the State and each region which impose an obligation on landholders to prevent, eliminate or minimise, so far as is reasonably practicable, any biosecurity risk they may pose. In addition, Local Government Areas may include their own priority weeds.

Fisheries Management Act 1994 (FM Act)

The objects of the FM Act are to:

- Conserve fish stocks and key fish habitats.
- Conserve threatened species, populations and ecological communities of fish and marine vegetation.
- Promote ecologically sustainable development, including the conservation of biological diversity.

Consistently with those objectives, the FM Act aims to:

- Promote viable commercial fishing and aquaculture industries.
- Promote quality recreational fishing opportunities.
- Appropriately share fisheries resources between the users of those resources.
- Provide social and economic benefits for the wider community of NSW.
- Recognise the spiritual, social and customary significance to Aboriginal persons of fisheries resources and to protect, and promote the continuation of, Aboriginal cultural fishing.

Section 201 of the FM Act states that a person other than a government authority must seek a permit from NSW Department of Primary Industries – Fisheries (DPI – Fisheries) for dredging or reclamation

in a waterway. Dredging work means any work that involves excavating water land. Reclamation work means any work that involves depositing any material on water land.

Water Management Act 2000 (WM Act)

The WM Act aims to provide for the 'sustainable and integrated management of the water sources of the state for the benefit of both present and future generations.'

The WM Act provides for the granting of various licenses and approvals, including for the use of water and water supply work. Additionally, the WM Act identifies provisions relating to 'controlled activities' which includes (among other definitions):

The erection of a building or the carrying out of a work (within the meaning of the EPA Act)

The removal of material (whether or not extractive material) or vegetation from land, whether by way of excavation or otherwise. It includes laying pipes and cables.

Approval (via a 'controlled activity' approval) is required from the Minister for Primary Industries under the WM Act if it is on 'waterfront land'. '*Waterfront land*' means the bed of any river, lake or estuary, and the land within 40 m of the riverbanks, lake shore or estuary mean high water mark.

State Environmental Planning Policies (SEPP)

State Environmental Planning Policy – Koala Habitat Protection 2020

State Environmental Planning Policy Koala Habitat Protection has been released as of 30th November 2020. The SEPP 2020 is made under the EP&A Act and replaces the previous State and Environmental Planning Policy No 44 – Koala Habitat Protection (Sepp 44). SEPP 2020 aims 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'.

SEPP 2020 requires that, before granting consent for development on land over one hectare in area, a consent authority must be satisfied as to whether or not the land is 'core' Koala habitat. Core Koala habitat is defined as:

a. An area of land which has been assessed by a suitably qualified and experienced person in accordance with the Guideline as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or

b. area of land which has been assessed by a suitably qualified and experienced person in accordance with the Guideline as being highly suitable koala habitat and where koalas have been recorded as being present in the previous 18 years.

Where there is an approved Koala Management Plant for the land, the development application must be consistent with the approved koala plan of management that applies to the land. Alternatively, Development Applications must engage a suitably qualified person to survey the land affected by the development proposal for core Koala habitat in accordance with the Koala Habitat Protection Guideline if they are:

a. In an LGA covered by the SEPP, and

b. The landholding is more than 1 ha.

2 Methods

The ecological assessment was carried out in three stages:

1. Desktop searches and review of ecological databases and information to identify threatened species, populations or ecological communities listed in the BC Act, FM Act or the EPBC Act that have the potential to occur in the study area.
2. Field survey of the subject land to collate species lists for the purposes of identifying the vegetation communities present and target predicted threatened species and ecological communities. Where a threatened species or community or habitat feature is identified, document the nature and extent of the protected matter and describe its 'viable local population' or occurrence.
3. Preparation of a BDAR that describes the impacts of the proposed activity on native vegetation and threatened species, populations and ecological communities, and provides recommendations to avoid, minimise and mitigate these impacts. The BDAR also includes a biodiversity credit summary that identifies the number of ecosystem credits and species credits required to offset the development.

2.1 Personnel

OzArk Environment & Heritage Pty Ltd (OzArk) operates under NSW Scientific Research License 101908, and NSW Department of Primary Industries (DPI) Accreditation of a corporation as an animal research establishment Ref No. AW2017/012. The role and key details of personnel involved in the project are provided in **Table 2-1**.

Table 2-1. Summary of OzArk personnel qualifications.

Name	Position	Role	CV Details
Jesse Carpenter	Senior Ecologist	Initial technical lead, completed BAM plots, mapped Plant Community Types, vegetation zones etc.	• Accredited BAM assessor – Accreditation #BAAS18122 • 10 years' experience as a consultant ecologist in public and private sector in NSW and NT • Master of Ornithology (in prep.) • Bachelor of Applied Science – Environmental Management – University of South Australia • 4WD Training • WH&S Induction Training for Construction Work
Dr Emma Gray	Ecologist	Took over as technical lead, completed targeted flora and fauna surveys, reporting, GIS, BAM calculator entry	• Accredited BAM assessor – Accreditation #BAAS19069 • Doctor of Philosophy • Bachelor of Applied Science – Ecology – Queensland University of Technology • WH&S Induction Training for Construction Work
Coral Pearce	Ecologist	Completed fauna surveys, reporting, GIS, BAM calculator entry	• Doctor of Philosophy (in prep) • Master of Science – Ecology – Queensland University of Technology • Bachelor of Applied Science – Ecology – Queensland University of Technology • 4WD Training

			• WH&S Induction Training for Construction Work
Jane Book	Environmental Scientist	Project management, technical review	• M Environmental & Business Management • B App Sci. (Hons) • 20 years' experience in natural resource management
Deryk Engel	Senior Ecologist	Fauna survey guidance, technical review	• Bachelor of Environmental Science with Honours – University of Wollongong • 4WD Training • WH&S Induction Training for Construction Work • 30 years' experience as a consultant ecologist

2.2 Desktop review

Existing information sources were reviewed to contextualise the study area, identify entities for targeted surveys, predict possible constraints, refine field survey methodology and assist with assessing the impacts of the proposal. Information sources consulted included:

- NSW Government Web Map Service (WMS) layers for NSW Imagery (compiled imagery, NSW Property, NSW Base Map and NSW Topographic Map) (http://spatialservices.finance.nsw.gov.au).
- EPBC Protected Matters Search Tool (https://www.environment.gov.au/epbc/protected-matters-search-tool)
- State Vegetation Type Map: Riverina Region Version 1.2 – VIS_ID 4469
- NSW DPI threatened fish indicative distribution maps (www.dpi.nsw.gov.au/fishing/species-protection/threatened-species-distributions-in-nsw/freshwater-threatened-species-distribution-maps)
- NSW BioNet Wildlife Atlas Vegetation classification (https://www.environment.nsw.gov.au/research/Visclassification.htm)
- NSW BioNet Threatened Biodiversity Data Collection (www.bionet.nsw.gov.au/)
- NSW BioNet Atlas (www.bionet.nsw.gov.au/)
- Register of Declared Areas of Outstanding Biodiversity Value (www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/about-threatened-species/critical-habitats)
- PlantNET, NSW Flora Online (www.plantnet.rbgsyd.nsw.gov.au/)
- Department of Environment and Planning *Biodiversity Values Map* (https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap)
- Mapping of vulnerable lands – steep and highly erodible (NSW Office of Environment and Heritage, 2011)

- Acid Sulphate Soils Risk mapping (NSW Office of Environment and Heritage, 1998)
- Directory of Important Wetlands of Australia (DIWA) (https://www.environment.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands)
- NSW wetlands mapping (NSW Office of Environment and Heritage, 2010)
- Important area mapping for Regent Honeyeater and draft important area mapping for Swift Parrot (available on request from NSW Office of Environment and Heritage).

All databases were searched prior to conducting initial fieldwork in August 2019 and reviewed (and updated where applicable) in March 2021 prior to final submission.

Results of the database searches are provided in **Appendix A**.

2.3 Field survey

2.3.1 BAM survey methodology

Vegetation communities are identified in accordance with the online NSW Master Plant Community Type Classification (OEH, 2018b), which is the current state-wide vegetation classification system for Plant Community Types (PCTs). This classification system is used for vegetation mapping, development assessment and site planning purposes. It describes over 1,500 PCTs across the state, and groups the vegetation communities into vegetation Class and Formation / Sub-formation as per Keith (2004).

In this study, PCTs were identified on the basis of the following inputs:

- Regional Scale State Vegetation Map*: Riverina Region Version 1.2 – VIS_ID 4469* (OEH, 2019a), which provides predictive mapping of PCTs in and around the subject land. This mapping is indicative only. It is not necessarily accurate at a fine scale for the purposes of the current study.
- Professional ecological knowledge about locally occurring vegetation types and landscape, soil and topographic patterns, including transitions from one community to another and potential for intergrades between plant communities.
- Field survey results to confirm the flora species present, vegetation structure, landscape position and soil type at the subject land and the extent and condition of native vegetation.
- The BioNet Vegetation Classification database, this being used to identify the candidate vegetation communities likely to be present based on the site conditions (flora species present, vegetation structure, bioregion, and landscape position and soil type) and the relevant published PCT descriptions.

If any of the PCTs were identified as having potential to be part of a Threatened Ecological Community (TEC), the relevant identification guidelines (NSW Scientific Committee listing criteria and Commonwealth identification guides) were consulted to determine the status of the vegetation community present. These guidelines provide the identification criteria used to positively identify the community as being part of the TEC. The criteria include location, species present, overstory species, weed cover, number and type of native species including whether certain 'important' native species are present.

Plant identification followed nomenclature in the Royal Botanic Gardens PlantNet online database (Royal Botanic Gardens and Domain Trust, 2019).

Twelve vegetation plots were surveyed according to the BAM as follows:

- The survey plots consisted of nested 20m x 50m and 20m x 20m plots
- Species composition and structure (species and percent cover) data collected from within 20m x 20m plot
- Vegetation function data (size and number of trees, presence of hollow-bearing trees and woody debris) collected from within 20m x 50m plot
- Percent of litter cover data collected within five 1m x 1m squares positioned at 5m, 15m, 25m, 35m and 45m points of 50m transect
- The plots were positioned within the subject land and their GPS locations were recorded (GDA 94 / MGA Zone 55).

The plot locations were randomly selected whilst ensuring adequate survey effort within each vegetation zone (**Table 2-2**).

Table 2-2. Minimum number of plots and transects required per zone area (DPIE, 2020).

Vegetation zone area (ha)	Minimum number of plots/transects
<2	1 plot/transect
>2 – 5	2 plots/transects
>5 – 20	3 plots/transects
>20 – 50	4 plots/transects
>50 – 100	5 plots/transects
>100 – 250	6 plots/transects
>250 – 1000	7 plots/transects; more plots may be needed if the condition of the vegetation is variable across the zone
>1000	8 plots/transects; more plots may be needed if the condition of the vegetation is variable across the zone

2.3.2 Incidental surveys

Incidental flora and fauna sightings were recorded while undertaking the BAM plots and searching the subject land for hollow-bearing trees and other potential habitat features. Birds were recorded as either present on the site, or as incidental, if recorded only as flying over (and not using) the subject land. Potential habitat such as rock outcrops, loose bark and course woody debris was recorded and examined for signs of cryptic species. Tracks and other areas of suitable substrate were searched for animal tracks. Other evidence of fauna presence on the subject land, such as scats, feathers and sloughed skins were also recorded.

2.3.3 Aquatic surveys

The Strahler stream order and associated riparian buffer distance of each watercourse that occurs within the study area was determined using Appendix E of the BAM Manual (DPIE, 2020).

2.3.4 Targeted fauna surveys

Targeted surveys were carried out to confirm the presence/absence of a number of candidate threatened species credit species identified by the BAM calculator. A summary of OzArks field survey

methods are provided in **Table 2-3** and described in further detail in Section 3 and Section 4 of this report.

Table 2-3. Summary of targeted survey methods and effort.

Survey date	Method	Effort
29/08/2019	BAM vegetation plots; general habitat searches (i.e. identification of hollow-bearing trees); incidental threatened flora and fauna searches	8.5 hours
19/09/2019	Threatened flora transects; habitat searches	4 hours
29/10/2020	Barking Owl (*Ninox connivens*) call playback (2 Ecologists); nocturnal spotlighting	3 hours
31/10/2019	Diurnal bird surveys (6 x 20 min surveys; 2 ecologists); SAT search for Koala scat; habitat searches	3 hours
31/10/2019-20/11/2019	1 x Song Meter SM4 acoustic recorder	126 hours of call recording (over 21 days)
31/10/2019-12/11/2019	1 x Song Meter SM3 bat detector	3086 zero-crossing analysis bat-call sequence files (over 13 nights)

2.4 Habitat suitability

The habitat suitability of the subject land for all of the species credit species generated by the BAM calculator were assessed (**Appendix E**).

The presence / absence of threatened species was categorised as follows:

- 'Present' surveyed– the species was recorded during field surveys or has been previously recorded on the subject land.
- 'Present' expert report – A species expert determines that the species is likely to be present on the subject land.
- 'Assumed present' – the species was predicted to occur by the BAM calculator, suitable habitat features occur on the subject land for that species and no targeted survey or expert report was commissioned.
- 'Absent' constraint – None of the habitat constraints or geographic limitations are present, the habitat is degraded or the species is a vagrant.
- 'Absent' surveyed – Targeted surveys undertaken during the time period specified for the species in the Threatened Biodiversity Data Collection and following DPIE threatened species survey guidelines. Where no relevant published guidelines exist, the survey must be undertaken using best practice methods.
- 'Absent' expert report – A species expert determines that the species is unlikely to be present on the subject land.

EPBC listed fauna that were predicted to occur within 10 km of the subject land were also assessed for their presence or absence on site (**Appendix F**).

2.5 Limitations

This study is based upon the species data available at the time of the field investigation, and the environmental conditions, season, and time constraints imposed by the project for the field survey. Specific limitations on this study include the following:

- The BAM vegetation field survey was completed over a single day at the end of winter of 2019.
- Prevailing climatic conditions at the time of the BAM field survey were extremely dry, which undoubtedly caused some species to be temporarily absent or difficult to detect. This may affect calculation of vegetation integrity.

To overcome some of these limitations, a 'precautionary approach' for species presence has been adopted where required. For example, if suitable habitat for a particular threatened species is present on the site and the conditions for targeted survey are not able to be met (i.e. due to prevailing dry conditions), then the species is assumed to be present.

The above-mentioned constraints were also considered when preparing the recommendations of avoiding, minimising and mitigating potential impacts.

3 Landscape Features

3.1 Overview

A series of background searches were performed to comply with legal standards (**Table 3-1**).

Table 3-1. Environmental protection areas within the study area

Environmental Protection Areas	Presence in the Study Area
Land identified on the Biodiversity Values Map under the *NSW BC Act 2016*	No. (see **Appendix A**).
Area of Outstanding Biodiversity Value (AOBV) under the *NSW BC Act 2016*	No.
Watercourse mapped as Key Fish Habitat (KFH) and/or within the extent of an aquatic Endangered Ecological Community, listed under the *Fisheries Management Act 1994.*	No.
An area reserved or dedicated under the *National Parks and Wildlife Act 1974* or *Wilderness Act 1987*.	No.
Is the proposal located within land reserved or dedicated within the meaning of the *Crown Lands Act 1989* for preservation of other environmental protection purposes.	No.
A World Heritage Area.	No.
Environmental Protection Zones in environmental planning instruments.	Yes. The subject land is mapped as an area of terrestrial biodiversity value in the Narrandera LEP (see **Appendix A**).
Lands protected under *NSW State Environmental Planning Policy*.	Yes Narrandera LGA is an LGA to which SEPP – Koala Habitat Protection 2020 applies.
Lands protected under *SEPP Sydney Drinking Water Catchment*.	No.
Aquatic reserves dedicated under the *Fisheries Management Act 1994.*	No.
Wetland areas dedicated under the Ramsar Wetlands Convention.	No.
Land subject to a conservation agreement under the *National Parks and Wildlife Act 1974.*	No.
Land identified as State Forest under the *Forestry Act 1916.*	No.
Acid sulphate area.	No.

3.2 Bioregion

The study area is situated in the NSW South West Slopes Bioregion, Lower Slopes Subregion as per the Interim Biogeographic Regionalisation of Australia (IBRA) (Thackway & Cresswell, 1995). The Lower Slopes subregion is characterised by geology, landforms, soil types and vegetation as described in **Table 3-2**.

Table 3-2. Description of the Lower Slopes subregion (OEH, 2019b).

NSW South West Slopes Bioregion				
Subregion	**Geology**	**Landform**	**Soils**	**Vegetation**
Lower Slopes	As for the Upper Slopes but with larger areas of Tertiary and Quaternary alluvium. Upper Slopes; Ordovician to Devonian folded and faulted sedimentary sequences with inter-bedded volcanic rocks and large areas of intrusive granites.	Undulating and hilly ranges and isolated peaks set in wide valleys at the apices of the Riverina alluvial fans.	Similar to the Upper Slopes but with more extensive red-brown earths on undulating plains and more extensive grey clays on alluvium.	Dwyer's Red Gum on granite, Red Ironbark on sedimentary rocks Hill Red Gum, White Cypress Pine and Red Stringybark in the ranges. Grey Box woodlands with Yellow Box, White Cypress Pine and Belah on lower areas. Poplar Box, Kurrajong, Wilga and Red Box in the north, limited areas of Bull Mallee, Blue Mallee, Green Mallee and Congoo Mallee in the central west. Myall, Rosewood and Yarran on grey clays, Yellow Box, Polar Box, and Belah on alluvial loams. River Red Gum on all streams with Black Box in the west with some Lignum and River Cooba.

3.3 Mitchell Landscapes

Landscapes with relatively homogenous geomorphology, soils and broad vegetation types in NSW have been classified and mapped at a 1:250 000 scale. These landscapes are referred to as the Mitchell Landscapes (Mitchell, 2002).

The study area is located across two Mitchell Landscapes: Cocoparra Ranges and Footslopes and Murrumbidgee – Tarcutta Channels and Floodplains. These landscapes are described in **Table 3-3** and shown in **Figure 1-1**.

Table 3-3. Mitchell Landscapes of the study area and subject land (Mitchell, 2002).

Mitchell Landscape	Geology and soils	Landform	Vegetation
Cocoparra Ranges and Footslopes	Steep crested ranges, ridges, hills and associated footslopes of Quaternary colluvium with outcrops of upper Devonian sandstone, conglomerate and siltstones. Cliff faces to 30m, bouldery hill slopes with overall relief to 260m.	Extensive rock outcrop, shallow sand lithosols, acid, neutral and calcareous red earths on slopes and deep sandy alluvium in creek lines.	On ranges; scattered White Cypress Pine (*Callitris glaucophylla*), Currawang (*Acacia doratoxylon*), Dwyer's Mallee Gum (*Eucalyptus Dwyeri*) and Red Ironbark (*Eucalyptus sideroxylon*); locally dense Broombush (*Melaleuca uncinata*), Hill Tea-tree (*Leptospermum divaricatum*), Urn Heath (*Melichrus urceolatus*), Wedge-leaf Hopbush (*Dodonaea viscosa*), Punty Bush (*Senna eremophila*), Cough Bush (*Cassinia laevis*), Sugarwood (*Myoporum platycarpum*), Grey Box (*Eucalyptus microcarpa*), Wilga (*Geijera parviflora*), and Deane's Wattle (*Acacia deanei*); Rock Fern (*Cheilanthes sieberi*), Wire Grass (*Aristida sp.*), Mulga Grass (*Thyridolepis mitchelliana*), short grasses and forbs. On lower slopes Bimble Box (*Eucalyptus populnea*), White Cypress Pine, mallees,

Mitchell Landscape	Geology and soils	Landform	Vegetation
			Yarran (*Acacia homalophylla*), Wilga, Emu Bush (*Eremophila longifolia*) and various acacia with grasses and forbs.
Murrumbidgee – Tarcutta Channels and Floodplains	Murrumbidgee tributaries on Quaternary alluvium; undifferentiated organic sand and loam on the floodplain, brown gradational loam and yellow texture-contrast soils on higher terraces.	Channels, floodplain and terraces of Murrumbidgee tributaries; general elevation 200 to 400m, local relief 25m.	River Red Gum (*Eucalyptus camaldulensis*) gallery woodland on banks, Yellow Box (*Eucalyptus melliodora*) and Grey Box (*Eucalyptus microcarpa*) open woodland on floodplain and terraces.

3.4 Geology, Cave, Karst and Soil Features

The underlying geology and soil typical of the study area has been described in **Table 3-2** and **Table 3-3**. There are no large / extensive rocky outcrops on the subject land; however, there are numerous scattered, partially buried rocks. No caves or karst formations were detected on the subject land or within the section of the property that was assessed, though there is an extraction pit rocky wall creating an artificial cliff face.

The Narrandera LEP does not identify any soil hazard at the subject land (based on the NSW Planning Portal, accessed 13/08/2020).

3.5 Biodiversity Values Map

The Biodiversity Values Map identifies land with high biodiversity value, as defined by the *Biodiversity Conservation Regulation 2017*. The subject land does not contain land identified on the Biodiversity Values Map (See **Appendix A**).

3.6 Areas of Outstanding Biodiversity Value

The site does not contain any currently listed areas of outstanding biodiversity value (AOBV).

3.7 SEPP (Koala habitat protection) 2020

State Environmental Planning Policy (SEPP) Koala Habitat Protection 2021 was announced on March 8th, 2021. However, this project has been assessed under SEPP 2020 which was released as of 30th November 2020. SEPP 2020 is made under the EP&A Act and replaced the previous State and Environmental Planning Policy No 44 – Koala Habitat Protection (SEPP 44). The SEPP 2020 aims 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'.

Narrandera LGA is listed under Schedule 1 of SEPP 2020 as an LGA to which the SEPP applies. However, the subject land is not considered potential or core Koala habitat, as the site does not contain any of the feed tree species listed under Schedule 2 of the SEPP.

3.8 Native Vegetation Cover

Native vegetation cover was assessed within the study area and the subject land and estimated as the amount of native vegetation (woody and non-woody vegetation, including regrowth and plantations comprised of plants native to New South Wales) (see **Figure 1-1**). A summary of the vegetation cover estimate is provided in **Table 3-4**. For the purposes of the BAM, the native vegetation cover class has been determined as >30-70%.

Table 3-4. Native vegetation cover estimates in the study area.

Vegetation Cover Type	Description	Area Within Study Area (ha)	Total area of Study Area (ha)	% of Study Area native vegetation
Native woody and non-woody	Regrowth and remnant native vegetation	472.94	911.9	51.86

3.9 Rivers, Streams, Wetlands and Key Fish Habitat

No watercourses, dams or water storage areas are present on the subject land (**Figure 1-1**).

Four Strahler 1st order streams are mapped as occurring within the study area. They are all unnamed, non-perennial, minor waterbodies that do not connect with larger watercourses. None of the recorded streams will be directly impacted by the proposal. Sediment runoff (caused by ground disturbance/vegetation removal by the proposal) may flow into watercourses within the study area and indirectly cause impact. However, if standard mitigation measures are implemented, the likelihood of this occurring is low.

The Murrumbidgee River is located approximately 4.5 km north-east of the Subject land. However, the scope of works proposed will not affect the Murrumbidgee River.

There are no wetlands on the subject land or within the study area.

3.10 Groundwater Dependant Ecosystems

Groundwater plays an important ecological role in directly and indirectly supporting terrestrial and aquatic ecosystems. Groundwater sustains terrestrial and aquatic ecosystems by supporting vegetation and providing discharge to channels, lacustrine and palustrine wetlands, and both the estuarine and marine environment.

The degree of groundwater dependence of ecosystems in terms of three broad categories:

- Non-dependent ecosystems that occur mostly in recharge areas and have no connection with groundwater
- Facultative GDEs that require groundwater in some locations but not in others, particularly where an alternative source of water can be accessed to maintain ecological function. Minor changes to the groundwater regime in facultative GDEs with proportional or opportunistic groundwater dependence may not have any adverse impacts but these ecosystems can be damaged or destroyed if a lack of access to groundwater is prolonged
- Obligate GDEs that are restricted to locations of groundwater discharge and ecosystems located within aquifers (e.g. subterranean cave and stygofauna communities (Kuginis *et al*. 2012). Aquifer ecosystems are inherently groundwater dependent (QLD Department of

Environment and Heritage Protection, 2017).

Groundwater dependant ecosystems have been classified into seven types under two broad categories as follows (Kuginis *et al*. 2012):

- Subsurface ecosystems – Underground ecosystems
- Karst systems and caves (limestone geology)
- Subsurface aquifer (phreatic) ecosystems
- Baseflow streams (hyporheic or subsurface component)
- Surface ecosystems – Above ground ecosystems
- Groundwater dependent wetlands
- Baseflow surface streams (surface/free-water component)
- Estuarine and near shore marine ecosystems
- Groundwater dependent terrestrial ecosystems; dependent on subsurface groundwater (phreatophytic).

The Bureau of Meteorology Atlas of Groundwater Dependant Ecosystems (GDEs) identified areas of low-moderate terrestrial GDEs within the subject land and surrounding study area (**Figure 3-1**; Bureau of Meteorology, 2017). The closest mapped aquatic GDE is a wetland, ~1.5 km east of the subject land.

Groundwater has not been intersected during previous extraction and exploration drilling activities within the existing Quarry Site, with drilling completed to a depth of between 24m to 27m adjacent to and beneath the floor of the existing extraction area i.e. to a minimum elevation of approximately 141m AHD. As such, a separate groundwater study was not required for the proposal. See section 6 for recommended mitigation measures regarding GDEs.

3.11 Connectivity Features

The subject land, a working quarry, is situated amongst agricultural land used for primary production. The subject land is zoned as RU1 Primary Production and is directly adjacent to RU4 Primary Production Small Lots. The subject land is connected to a continuing lightly wooded area, which would be subject to native and non-native grazing (**Figure 1-1**). The subject land is not directly connected to any protected areas, i.e. National Parks, Nature Reserves etc.

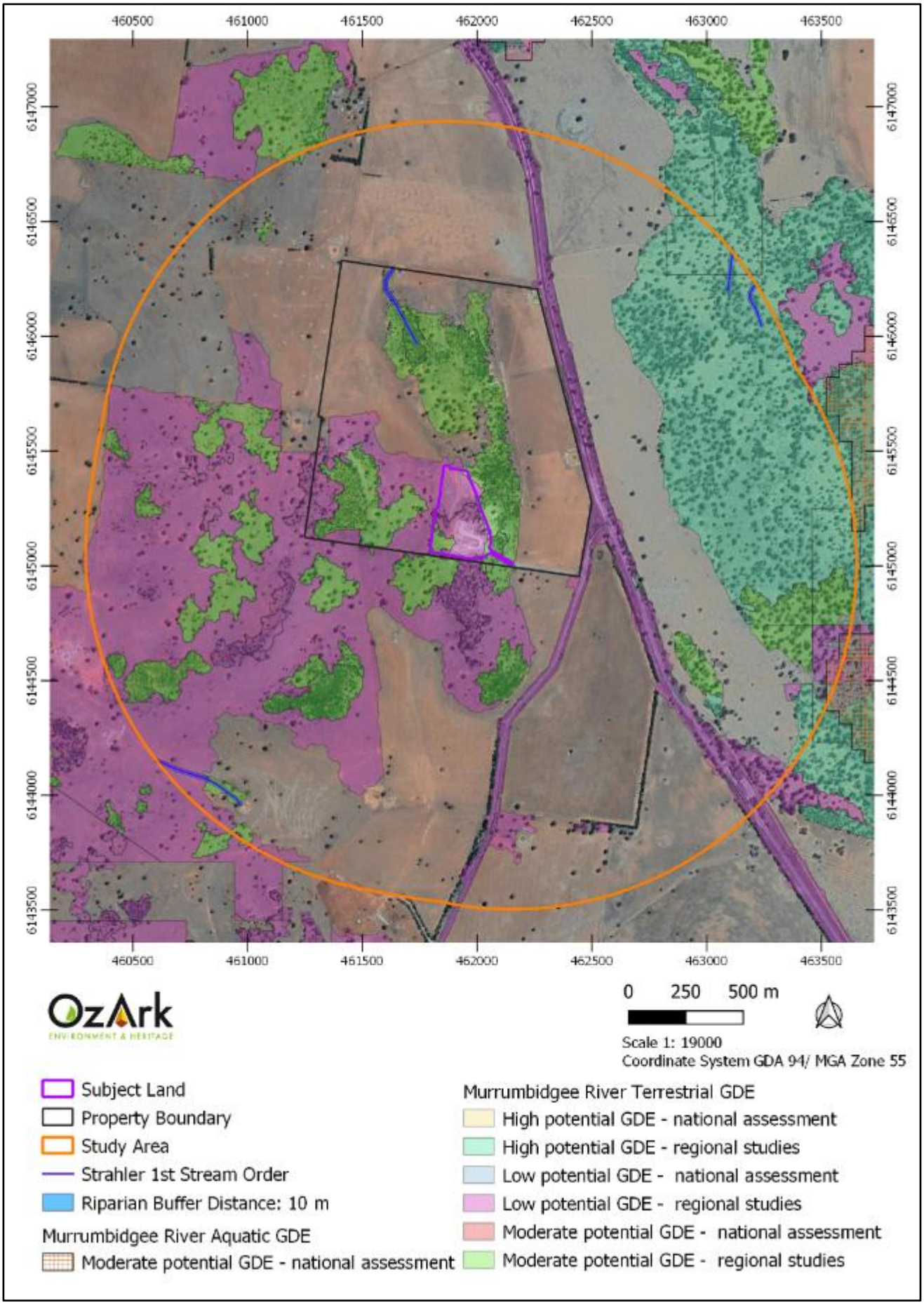

Figure 3-1. Watercourses and groundwater dependent ecosystems of the study area.

3.12 Climate

The BAM vegetation field assessment was undertaken on 29 August 2019. Weather conditions at the time of the survey were cool, reaching a maximum temperature of 16.0° C at Strontian, the closest weather station (Station ID 74148) to the study area (Bureau of Meteorology, 2019). There was 0.2 millimetres (mm) of rainfall recorded on the day of survey, and no rain recorded for the previous eight days. There was below average rainfall recorded for the month of August with a total of 11.0 mm, indicative of overall long-term climatic conditions being much drier than average (Error! Reference source not found.**2)**.

Weather conditions during the nocturnal spotlighting and call playbacks for the Barking Owl (*Ninox connivens*) were conducted during the evening of the 29th October 2019. Conditions on the night were fine and warm, reaching a high of 31.6°C. Diurnal bird and Koala SAT searches were conducted the following day reaching a high of 35°C and no rainfall recorded.

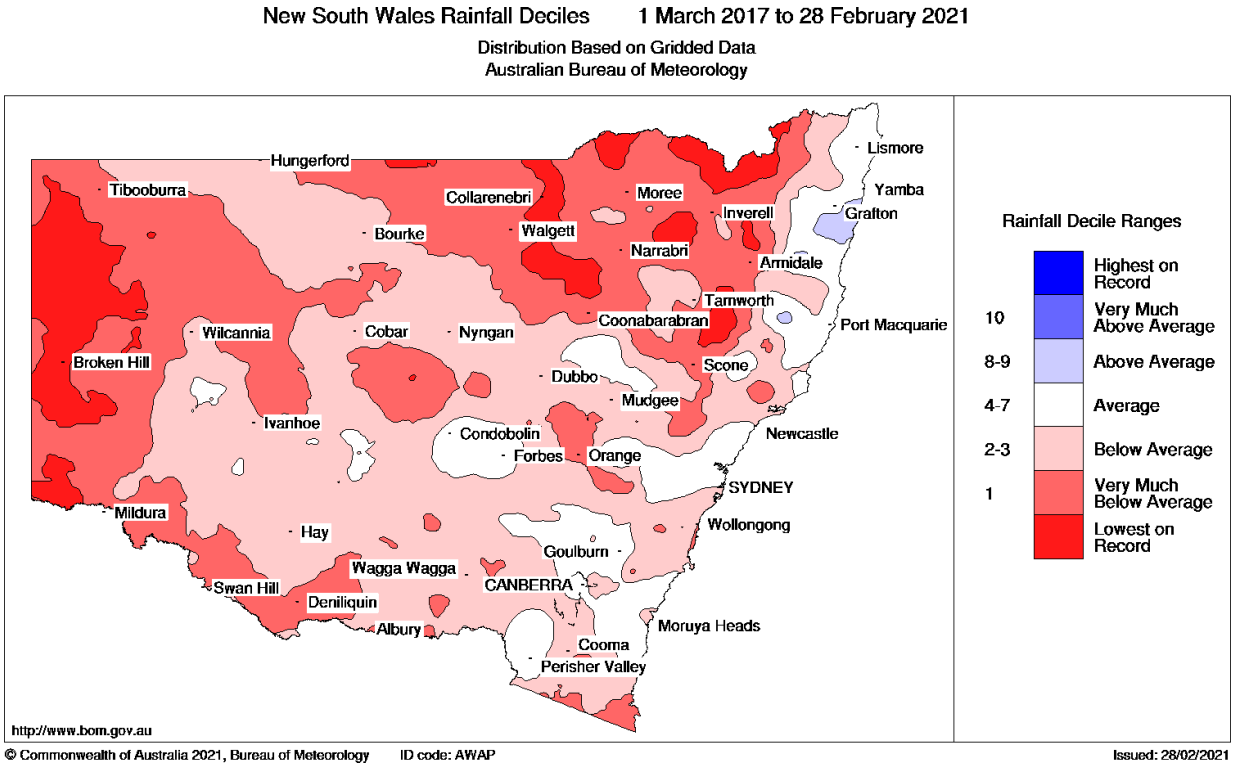

Figure 3-2. Climate data for NSW showing rainfall deciles from March 2018 to February 2021 demonstrating the period of below average rainfall (Bureau of Meteorology, 2021).

4 Native Vegetation

4.1 Plant Community Types

Vegetation on the subject land has been historically cleared with some disturbance due to the subject land's current use as an active quarry.

Three PCTs were determined to be present on the subject land (and wider property), based on existing mapping (OEH, 2019a) and the results of the present field work, these being:

- PCT 185 - Dwyer's Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion. This PCT occurs within the centre of the quarry, bordered by PCT 80 and the extraction pit and access road. This PCT likely extends across the access road and into the surrounding woodland to the north east. There is another patch of PCT 185 along the southern boarder which also likely extends into the wooded area past the subject land.
- PCT 70 - White Cypress Pine woodland on sandy loams in central NSW wheatbelt. Small patches of this PCT occur along the eastern boarder of the subject land and likely continue into the surrounding wooded areas.
- 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. This PCT occurs in multiple patches across the site with the largest occurring in the south western corner.

These PCTs are described further in **Table 4-1** and their extent mapped in **Figure 4-1.**

PCT 250 was found to be present on the subject land, however as per the BAM, when assessing derived communities "*the assessor must determine the most likely original PCT for areas of derived native vegetation*". Therefore, the areas containing PCT 250 are here shown as PCT 80 in a poor condition, as only the ground stratum remains.

Further description of these PCTs, photographs and data sheets completed in the field are provided in **Appendices B** and **C**.

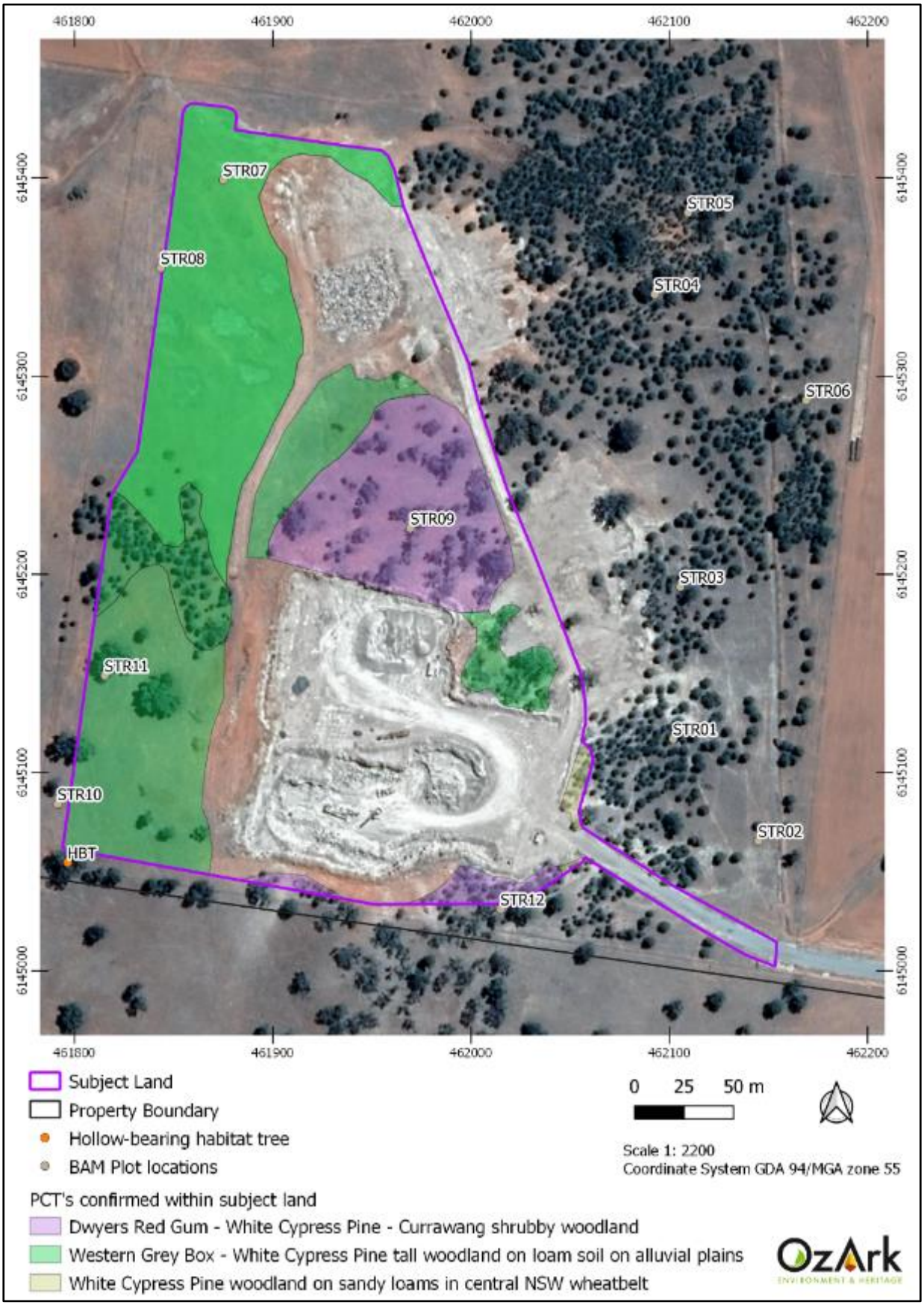

Figure 4-1. Plant Community types determined to be present on the subject land based on BAM survey.

Table 4-1. Plant Community Type present within the subject land.

PCT ID	PCT Name	Vegetation Formation	TEC Status	Justification of Identification	Current NSW Extent (ha)
185	Dwyer's Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion	Semi-arid Woodlands (Shrubby sub-formation)	Not a TEC	• The areas are mapped as PCT 185 on State Vegetation Type Mapping • A large number of the native species recorded within the areas match the grass, forb and wooded species described as occurring within PCT 185, including *Eucalyptus dwyeri*, *Callitris glaucophylla*, *Gonocarpus elatus* and *Goodenia sp*. • The area occurs on rocky, sandy-loam soils.	400000

Description

Tall mallee open woodland dominated by Dwyer's Red Gum (*Eucalyptus dwyeri*), White Cypress Pine (*Callitris glaucophylla*) and/or Currawang (*Acacia doratoxylon*) occasionally with stands of Drooping She-oak (*Allocasuarina verticillata),* Poplar Box (*Eucalyptus populnea*) or Western Grey Box (*Eucalyptus microcarpa*). Grades into communities with Western Grey Box (*Eucalyptus microcarpa*) or Mugga Ironbark (*Eucalyptus sideroxylon*). Kurrajong (*Brachychiton populneus subsp. populneus*) occurs in some locations. The understorey contains a sparse shrub layer that may include *Cassinia laevis, Grevillea floribunda, Acacia deanei* and in some areas *Leptospermum divaricatum*. Low shrubs species include *Melichrus urceolatus, Hibbertia obtusifolia* and thickets of *Platysace lanceolata*. The ground cover is sparse and is often covered in rocks. Species include forbs such as *Gonocarpus elatus, Calotis cuneifolia, Goodenia glabra* and *Hybanthus monopetalus* and grasses such as *Austrodanthonia setacea, Austrostipa scabra, Austrostipa densiflora, Austrodanthonia eriantha, Thyridolepis mitchelliana* and *Amphipogon caricinus*. The rock ferns (*Cheilanthes spp*.) are common. Occurs on shallow gravel, sandy or loamy soils derived from sandstone, conglomerate, chert, granite and volcanics on rocky hills, hill slopes and footslopes on isolated rocky ridges in the NSW South-western Slopes Bioregion extending into the eastern edge of the Cobar Peneplain and Riverina Bioregions. Mainly occurs in the temperate (hot summers) climate zone receiving between 400 and 600 mm of annual rainfall. Not threatened due to position in landscape (rocky ridges) but grazing by domestic stock and goats is adversely affecting some sites. The rare Glossy Black Cockatoo feeds on the fruit of the Drooping She-oak. Frequent fire can eliminate this she-oak therefore inter-fire periods should be greater than 20 years to ensure the she-oak can survive.

PCT ID	PCT Name	Vegetation Formation	TEC Status	Justification of Identification	Current NSW Extent (ha)
70	White Cypress Pine woodland on sandy loams in central NSW wheatbelt.	Grassy Woodlands	Not a TEC	• The area is currently mapped as PCT 70 on State Vegetation Type Mapping • The area is dominated by *Callitris glaucophylla* • A number of the other native species recorded within the area match the grass and forb species described as occurring within PCT 70, including *Oxalis perennans*, *Calotis, Goodenia* and *Sida sp*.	70000

Description

Tall or mid-high woodland to about 18 m high dominated by White Cypress Pine (*Callitris glaucophylla*) that may occupy >90% of the canopy cover. The canopy structure alters depending on degree of clearing, thinning or regrowth. Various box eucalypts may be present including Poplar Box (*Eucalyptus populnea*) and Western Grey Box (*Eucalyptus microcarpa).* Small trees may include Buloke (*Allocasuarina luehmannii*) or Belah (*Casuarina cristata*). Shrubs are sparse and include Deane's Wattle (*Acacia deanei subsp. deanei*), Wilga (*Geijera parviflora*), hopbush (*Dodonaea viscosa*), *Maireana enchylaenoides*, Thorny Saltbush (*Rhagodia spinescens*) and *Senna spp*. The ground cover is sparse dominated by grasses such as *Austrostipa scabra subsp. scabra*, *Enteropogon acicularis, Thyridolepis mitchellii, Austrodanthonia eriantha, Austrodanthonia setacea, Enteropogon acicularis* and *Eragrostis lacunaria*. Forb species include *Calotis cuneifolia, Sida cunninghamii, Oxalis perennans, Goodenia cycloptera, Xerochrysum bracteatum* and *Chrysocephalum apiculatum*. The rock fern *Cheilanthes sieberi subsp. sieberi* is often present. In dry times the ground may be nearly bare. Occurs on red, brown or yellow sandy or loamy soils on flats and rises on alluvial plains. Vegetation structure varies depending on the history of disturbance including logging. Dense regrowth of young Pines may be present. Distributed in central NSW, generally with annual rainfall between 400 and 600 mm. Mainly in the NSW South-western Slopes and Darling Riverine Plain Bioregions. A significant proportion of this community has been cleared as it occurs in the wheatbelt. Remnants occur in state forests, other public lands and on leasehold and private land. This community grades into Poplar Box or Western Grey Box woodlands in the mid-central and south and Poplar Box and Coolabah woodlands in the north that occur on finer texture soils. Grades into White Cypress Pine-Poplar Box community (ID72) in the Cobar Peneplain Bioregion.

PCT ID	PCT Name	Vegetation Formation	TEC Status	Justification of Identification	Current NSW Extent (ha)
80	Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion.	Grassy Woodlands	Not a TEC	• The areas are currently mapped as PCT 80 and PCT 250. • The areas are dominated by *Eucalyptus microcarpa* and *Callitris glaucophylla,* with occasional *Brachychiton populneus.* • A number of the other native species recorded within the areas match the grass and forb species described as occurring within PCT 80, including *Austrostipa scabra, Enteropogon acicularis, Goodenia sp., Sida corrugata* and *Bulbine sp.*	140000

Description

Tall woodland up to 25 m high but averaging about 20m co-dominated by Western Grey Box (*Eucalyptus microcarpa*) and White Cypress Pine (*Callitris glaucophylla*) with the pine tending to be shorter than the eucalypts. Other trees may include Yellow Box (*Eucalyptus melliodora*), Buloke (*Allocasuarina luehmannii*), *Pittosporum angustifolium* and Kurrajong (*Brachychiton populneus*). A sparse layer of shrubs may be present however they may be absent where grazing has been intense or the understorey has been cleared. Tall shrub species may include Wilga (*Geijera parviflora*), *Eremophila deserti,* Quandong (*Santalum acuminatum*) and wattles such as *Acacia deanei subsp. deanei, Acacia hakeoides, Acacia brachybotrya* and *Acacia buxifolia*. The low shrub *Maireana microphylla* is often the most common shrub present when tall shrubs have been eliminated. A sparse to mid-dense ground cover includes short shrubs such as *Einadia nutans subsp. nutans* and *Eremophila debilis* with grass species such as *Austrostipa scabra subsp. scabra, Austrodanthonia setacea, Austrodanthonia fulva, Elymus scaber subsp. scaber, Enteropogon acicularis* and *Aristida ramosa*. Forb species *include Calotis cuneiofolia, Sida corrugata, Dichondra sp. A, Daucus glochidiatus, Oxalis perennans, Arthropodium minus, Bulbine spp*. and *Goodenia pinnatifida*. The rock fern *Cheilanthes sieberi subsp. sieberi* is common along with the graminoid *Lomandra filiformis*. Occurs on sandy-loam to clay-loam soils on alluvial or stagnant alluvial plains in the predominantly winter rainfall belt of southern-central NSW with an average annual rainfall of between 400 to 550 mm. Mainly restricted to the eastern section of the Riverina Bioregion and the western section of the NSW South-western Slopes Bioregion. Most of this community has been cleared for grazing or crops but some sizable patches remain in state forests that have been managed for White Cypress Pine. Much of its remaining extent is threatened by grazing and weed invasion. Grades into Yellow Box - Pine community (ID75) on sandier soils e.g. from Narrandera to Urana. This community is endangered and very poorly conserved as of 2007.

4.2 Vegetation Zones, Patch Size and Vegetation Integrity

To be assessed under the BAM, native vegetation on the subject land has been further stratified into broad condition states and patch size. Native vegetation has then been assigned a zone, based on its condition state and the patch to which it belongs.

Four vegetation zones are recognised as occurring on the subject land (Figure 4-2), comprising three PCTs in poor and moderate conditions. Vegetation on the subject land has been disturbed by historic clearing, current quarry works and grazing by exotic goats (*Capra hircus*).

Broad condition states have been determined by the presence or absence of the key structural elements of the respective PCT and the vegetation integrity (VI) score, calculated in the BOPC using plot data. This method also compares data collected with the benchmarks for each PCT. The presence or absence of structural elements was assessed both by reviewing plot data and general observations made whilst carrying out field work. Results are shown in **Table 4-2**.

Across the subject land, there are clear boundaries between vegetation of different condition states, driven primarily by the presence/absence of an upper and/or mid stratum. A ground stratum containing native grasses and forbs was identified consistently across the subject land.

Vegetation patches are connected areas of native woody and non-woody vegetation that may extend beyond the subject land. Individual patches are defined under the BAM as areas of native vegetation separated by less than 100 m for woody vegetation or 30 m for non-woody vegetation. All native vegetation on the subject land is woody vegetation, with vegetated areas separated by less than 100 m. Thus, all native vegetation on the subject land is part of the same patch.

Surrounding vegetation is mapped as non-native vegetation by the Regional Scale State Vegetation Map: *Riverina Region V 1.2.* However, it is likely that much of this land is also derived native grassland in poor condition. Therefore, a precautionary approach was used, and this land was mapped as being part of one larger connected patch (**Figure 4-3**). Since the patch is >100 ha the extent of the patch was only mapped to the study area.

Table 4-2. Vegetation zones, patch size and number of BAM plots completed.

Vegetation Zone	PCT	Condition	Connected Patch Size (ha)	Patch Size Class	Zone Area Proposed to be Impacted (ha)	Number BAM Plots Completed	Vegetation Integrity
1	185	Moderate	1853	>100 ha	0.98	2	43.4
2	70	Moderate	1853	>100 ha	0.04	2	49.4
3	80	Moderate	1853	>100 ha	0.27	2	63.7
4	80	Poor	1853	>100 ha	2.64	4	9.5

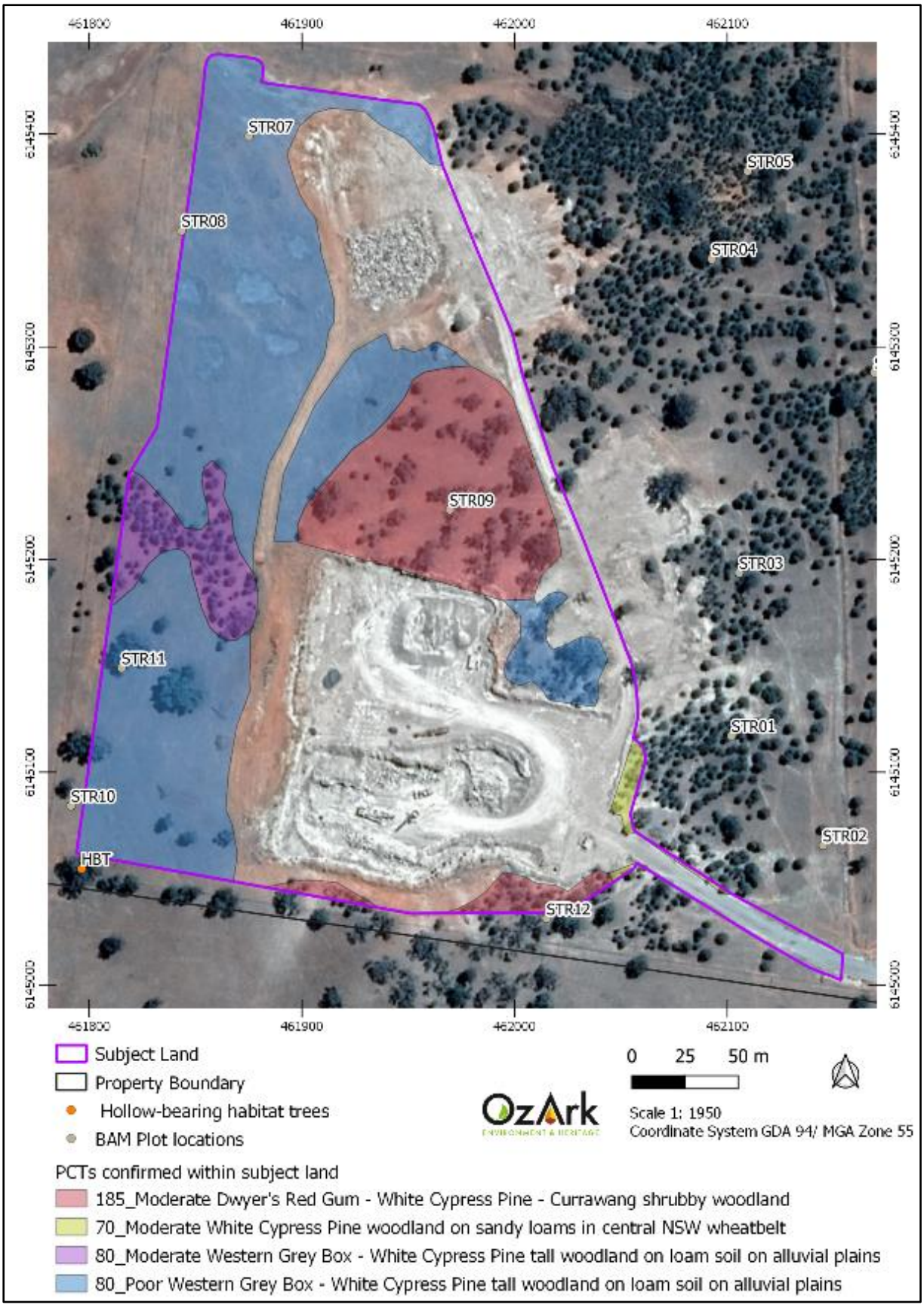

Figure 4-2. Vegetation zone and patch within the subject land and study area.

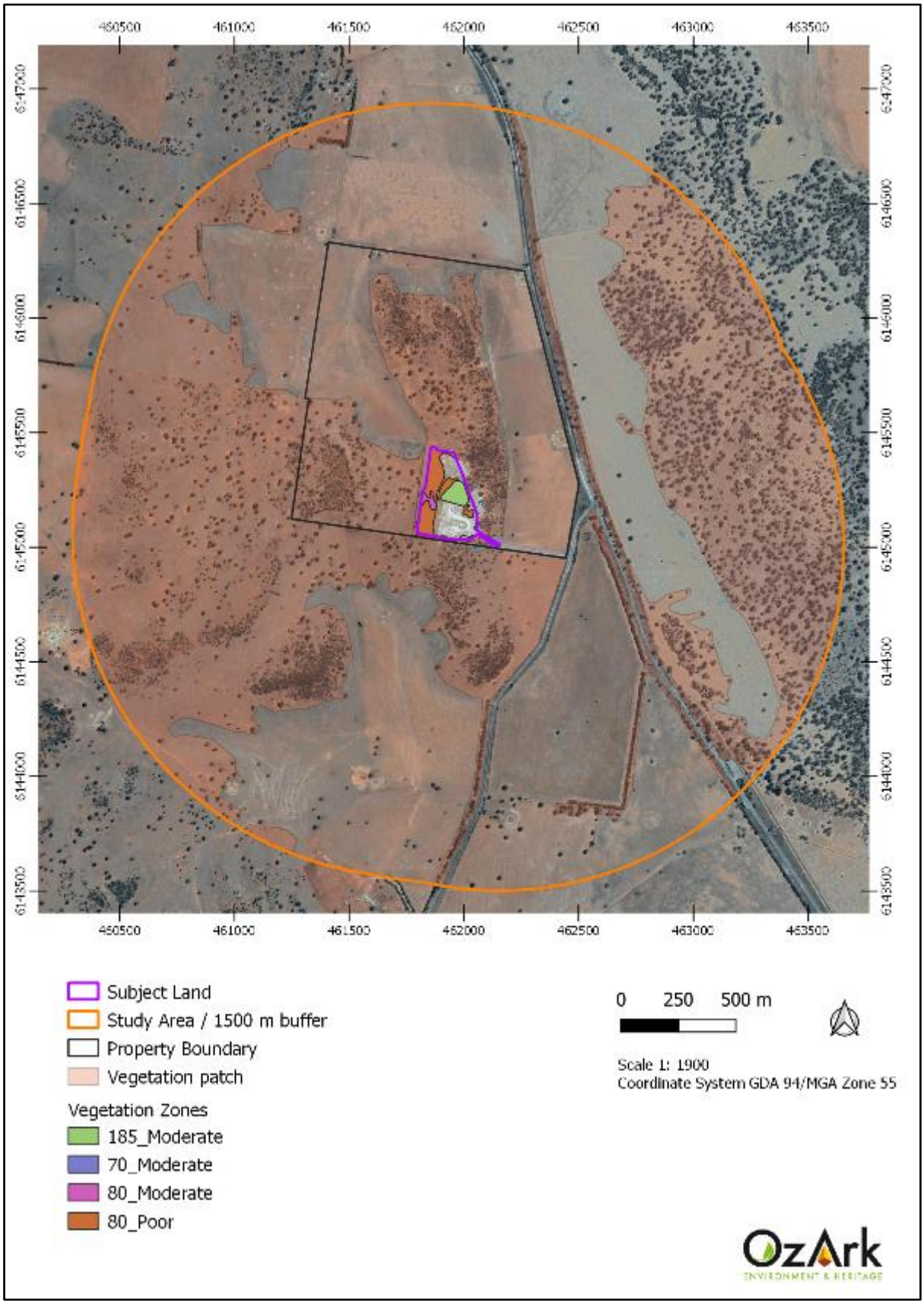

Figure 4-3. Intact native vegetation patches of the study area

4.3 Flora Species Observed

The field survey identified a total of 52 flora species on the subject land and wider property that was assessed. Of these, 46 species were native and six were exotic (one of which being a High Threat Weed under the BAM and therefore the BC Act,). On average 7.5 native plant species were present in each BAM plot (ranging between 16 – 3 species) and a total of 5.8 exotic species (ranging between 8 - 3 species). Therefore, the subject land is native dominated. It should be noted that dryer than average climatic conditions in the months leading up to the survey were likely to have had an impact on the results obtained.

Photographs and a list of all flora species observed during the field assessment are provided in **Appendices B** and **C**.

Mediterranean Turnip (*Brassica tournefortii*), a High Threat Weed, was recorded within plot STR04.

4.4 Threatened Ecological Communities

PCT 80 is associated with the following TECs:

- EPBC Act listed, Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions
- BC Act listed, Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions
- BC Act listed, Mallee and Mallee-Broombush dominated woodland and shrubland, lacking Triodia, in the NSW South Western Slopes Bioregion

However, the listed TECs were determined not to be present on the subject land based on patch size and lack of defining structural characteristics, such as a mid-stratum layer.

PCT 185 and 70 are not associated with any TECs.

5 Threatened Species

For the purpose of credit calculations, these species are listed as either ecosystem credit species or species credit species, where:

- An ecosystem credit species is a species whose likelihood of occurrence can be predicted by vegetation surrogates and landscape features, or for which targeted survey has a low probability of detection. A targeted survey is not required for these species (NSW Office of Environment and Heritage, 2017).
- A species credit species is a species whose likelihood of occurrence cannot be predicted by vegetation surrogates and/or landscape features and can be reliably detected by survey. A targeted survey or expert report is required to confirm presence/absence of these species (NSW Office of Environment and Heritage, 2017).

5.1 Habitat Features Present

The subject land was assessed for its potential to provide habitat for threatened flora and fauna known or predicted to occur in the study area. Habitat features including rock outcrops, caves and overhangs, hollow-bearing trees, wetlands including dams, and watercourses were recorded, if present.

The subject land and property contain loose surface rocks and an artificial quarry rock face. One hollow-bearing tree was recorded on the property; however, it has been excluded from the subject land/impact footprint.

No wetlands or other waterbodies were present.

5.2 Ecosystem Credit Species

In total, 32 ecosystem credit species were required to be assessed as being either present or absent on the subject land based on observations made during the field assessment, current DPIE information of habitat constraints of the species and professional judgement (**Table 5-1**).

Table 5-1. Ecosystem credit species predicted to occur and their nature of presence within the subject land.

Scientific Name	Common Name	Species presence
Ninox connivens	Barking Owl	Assumed present
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Assumed present
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Assumed present
Nyctophilus corbeni	Corben's Long-eared Bat	Assumed present
Stagonopleura guttata	Diamond Firetail	Assumed present
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Assumed present
Petroica phoenicea	Flame Robin	Assumed present
Pachycephala inornata	Gilbert's Whistler	Assumed present
Falco hypoleucos	Grey Falcon	Assumed present

Scientific Name	Common Name	Species presence
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Assumed present
Pteropus poliocephalus	Grey-headed Flying-fox	Assumed present
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	Assumed present
Phascolarctos cinereus	Koala	Assumed present
Hieraaetus morphnoides	Little Eagle	Assumed present
Chalinolobus picatus	Little Pied Bat	Assumed present
Lophochroa leadbeateri	Major Mitchell's Cockatoo	Assumed present
Leipoa ocellata	Malleefowl	Assumed present
Tyto novaehollandiae	Masked Owl	Assumed present
Certhionyx variegatus	Pied Honeyeater	Assumed present
Petroica boodang	Scarlet Robin	Assumed present
Hylacola cautus	Shy Heathwren	Assumed present
Chthonicola sagittata	Speckled Warbler	Assumed present
Circus assimilis	Spotted Harrier	Assumed present
Lophoictinia isura	Square-tailed Kite	Assumed present
Polytelis swainsonii	Superb Parrot	Present
Lathamus discolor	Swift Parrot	Assumed present
Neophema pulchella	Turquoise Parrot	Assumed present
Daphoenositta chrysoptera	Varied Sittella	Assumed present
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Assumed present
Calyptorhynchus lathami	Glossy Black- Cockatoo	Not Present – habitat constraint
Grantiella picta	Painted Honeyeater	Not Present – habitat constraint
Haliaeetus leucogaster	White-bellied Sea- Eagle	Not Present – habitat constraint

A full habitat assessment for each species listed in **Table 5-1** is provided in **Appendix E**.

5.3 Species Credit Species

In total, 29 species credit species were required to be assessed as being present or absent on the subject land. Assessment for each species has been carried out based on the outcomes of observations made during the field assessment, targeted species searches and current DPIE information of habitat constraints of the species. Full survey effort for the targeted species searches is listed in **Table 2-3, section 2.3.4** and discussed further in **section 5.3.1.** All species credit species requiring assessment are listed in **Table 5-2**. The full habitat assessment for each species is listed in **Appendix E**.

Table 5-2. Species credit species predicted to occur and their nature of presence within the subject land.

Scientific Name	Common Name	Species presence
Austrostipa metatoris	A spear-grass	Assumed present
Austrostipa wakoolica	A spear-grass	Assumed present
Brachyscomme papillosa	Mossgiel Daisy	Absent – surveyed
Burhinus grallarius	Bush Stone-curlew	Absent – surveyed
Caladenia arenaria	Sand-hill Spider Orchid	Absent – surveyed
Calyptorhynchus lathami	Glossy Black-Cockatoo (Breeding)	Absent – habitat constraint

Scientific Name	Common Name	Species presence
Calyptorhynchus lathami - endangered population	Glossy Black-Cockatoo, Riverina population	Absent – surveyed
Cercartetus nanus	Eastern Pygmy-possum	Assumed present
Chalinolobus dwyeri	Large-eared Pied Bat	Absent – surveyed
Climacteris affinis – endangered population	White-browed Treecreeper population in Carrathool local government area south of the Lachlan River and Griffith local government area	Absent – surveyed
Crinia sloanei	Sloan's Froglet	Absent – habitat constraint
Diuris sp. (Oaklands, D. L. Jones 5380)	Oaklands Diuris	Assumed present
Diuris tricolor	Pine Donkey Orchid	Absent (surveyed)
Haliaeetus leucogaster	White-bellied Sea-eagle (breeding)	Absent – habitat constraint
Hieraaetus morphnoides	Little Eagle (Breeding)	Absent – surveyed
Lathamus discolor	Swift Parrot (Breeding)	Absent – habitat constraint (not within mapped areas)
Lepidium monoplocoides	Winged Peppercress	Assumed present
Lophochroa leadbeateri	Major Mitchell's Cockatoo (Breeding)	Absent – habitat constraint
Lophoictinia isura	Square-tailed Kite (Breeding)	Absent - surveyed
Ninox connivens	Barking Owl (Breeding)	Absent – habitat constraint
Petaurus norfolcensis	Squirrel Glider	Assumed present
Phascolarctos cinereus	Koala	Absent (surveyed)
Polytelis swainsonii	Superb Parrot	Absent – habitat constraint
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	Absent – habitat constraint
Senecio garlandii	Woolly Ragwort	Absent (surveyed)
Swainsona murrayana	Slender Darling Pea	Absent (surveyed)
Swainsona sericea	Silky Swainson-pea	Absent (surveyed)
Tylophora linearis		Assumed present
Tyto novaehollandiae	Masked Owl (Breeding)	Absent – habitat constraint
Myotis macropus	Southern Myotis	Absent – potential recording. However, no potential habitat present on subject land.

Species polygons for each of the seven species, which were confirmed or assumed present are provided in **Figures 5-1 to 5-5**.

5.4 Species credit species targeted surveys

Threatened flora

Targeted surveys were carried out for six threatened plant species:

- Mossgiel Daisy (*Brachyscomme papillosa*)
- Sand-hill Spider Orchid (*Caladenia arenaria*)
- Pine Donkey Orchid (*Diuris tricolor*)
- Woolly Ragwort (*Senecio garlandii*)
- Slender Darling Pea (*Swainsona murrayana*)
- Silky Swainson-pea (*Swainsona sericea*)

The surveys were conducted in associated habitat for each species following the methods outlined in *NSW Guide to Surveying Threatened Plants* (NSW Office of Environment and Heritage, 2016), as described in **Table 5-3**. The guide recommends parallel field traverses be used to detect threatened plants, because it systematically covers the entire area of potential habitat within a site and can be applied to a diverse range of species, habitats and sites.

The survey was conducted on 19 September 2020. The parallel field traverse survey involved one person searching along a grid of parallel traverses set ~10 m apart. No threatened flora species were recorded on the subject land during the targeted survey in 2019.

Table 5-3. Targeted survey methods used for threatened flora.

Species	Survey Timetable	Associated PCTs	Survey Method
Brachyscomme papillosa **Mossgiel Daisy**	Sep-Nov	80	September 2019. Field traverse (on foot, spaced approx. 10m apart) within associated PCT.
Caladenia arenaria **Sand-hill Spider Orchid**		80	September 2019. Field traverse (on foot, spaced approx. 10m apart) within associated PCT.
Diuris tricolor **Pine Donkey Orchid**		70, 80	September 2019. Field traverse (on foot, spaced approx. 10m apart) within associated PCT.
Senecio garlandii **Woolly Ragwort**		185	September 2019. Field traverse (on foot, spaced approx. 10m apart) within associated PCT.
Swainsona murrayana **Slender Darling Pea**		80	September 2019. Field traverse (on foot, spaced approx. 10m apart) within associated PCT.
Swainsona sericea **Silky Swainson-pea**		70, 80	September 2019. Field traverse (on foot, spaced approx. 10m apart) within associated PCT.

Threatened fauna

A summary of the methods employed to target each species, and the effort accumulated, is presented in **Table 5-4**.

Table 5-4. Survey methods employed and effort accumulated during targeted surveys for species credit species (fauna).

	Diurnal searches for habitat features or indicative signs	SM4 Acoustic Recorder	SM4 Bat Recorder	Call playback / Spotlighting
Burhinus grallarius Bush Stone-curlew	✓	✓		✓
Calyptorhynchus lathami Glossy Black-Cockatoo (Breeding)	✓	✓		
Calyptorhynchus lathami - endangered population Glossy Black-Cockatoo, Riverina population	✓	✓		
Chalinolobus dwyeri Large-eared Pied Bat	✓		✓	
Climacteris affinis White-browed Treecreeper – Endangered Population	✓	✓		
Crinia sloanei Sloan's Froglet	✓			
Hieraaetus morphnoides Little Eagle (Breeding)	✓			
Lophochroa leadbeateri Major Mitchell's Cockatoo (Breeding)	✓	✓		
Lophoictinia isura Square-tailed Kite	✓			

	Diurnal searches for habitat features or indicative signs	SM4 Acoustic Recorder	SM4 Bat Recorder	Call playback / Spotlighting
(Breeding)				
Ninox connivens Barking Owl (Breeding)	✓			✓
Phascolarctos cinereus Koala (Breeding)	✓	✓		✓
Myotis macropus Southern Myotis			✓	
Polytelis swainsonii Superb Parrot (Breeding)	✓	✓		
Pteropus poliocephalus Grey-headed Flying-fox (Breeding)	✓			
Tyto novaehollandiae *Masked Owl* *(Breeding)*	✓			
EFFORT ACCUMULATED	3 hours (over Aug, Sep, Oct)	126 hours of call recording (over 21 days)	3086 zero-crossing analysis bat-call sequence files (over 13 nights)	3 hours (Oct)

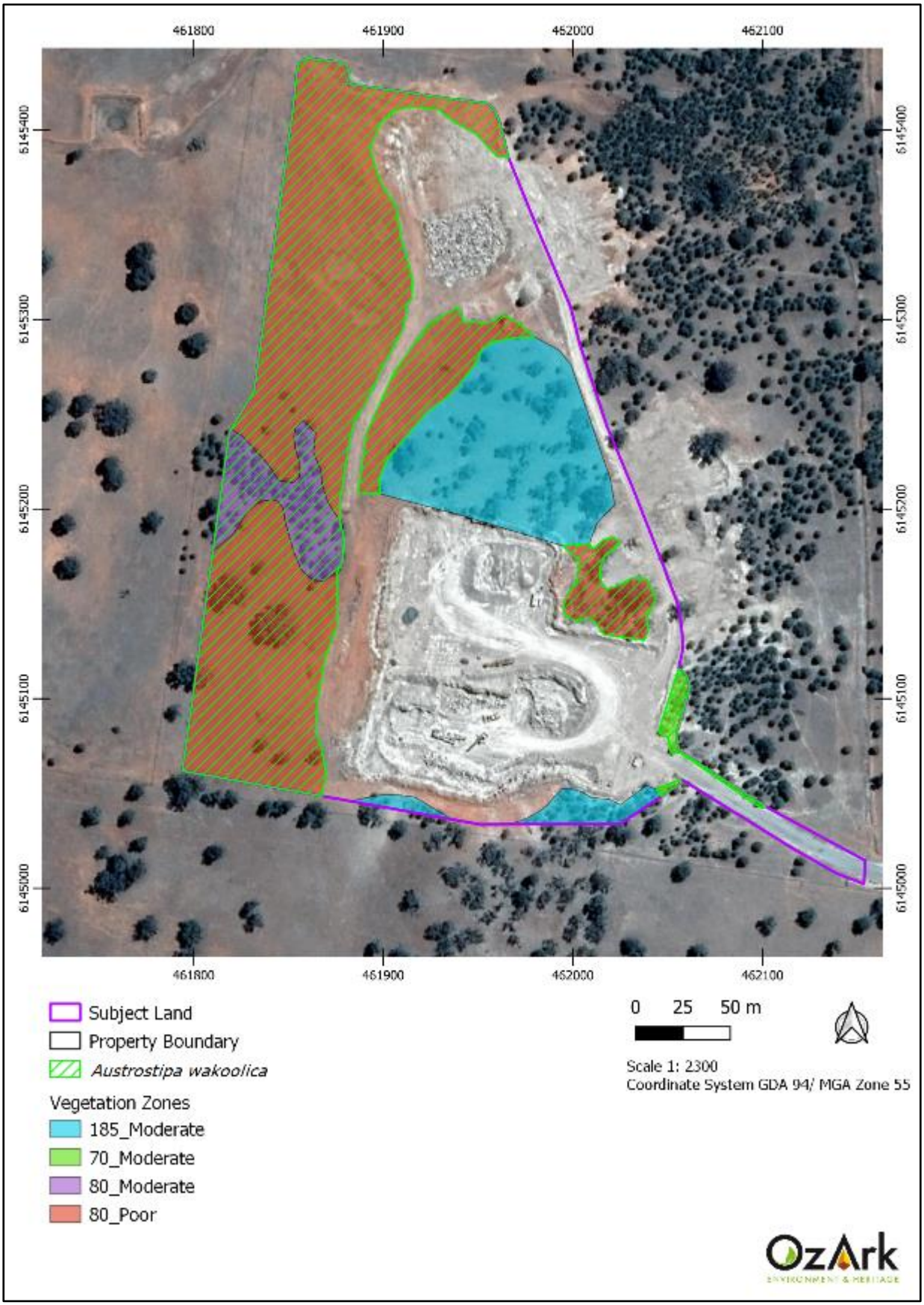

Figure 5-1. Species polygons for *Austrostipa wakoolica* within the subject land and property boundary.

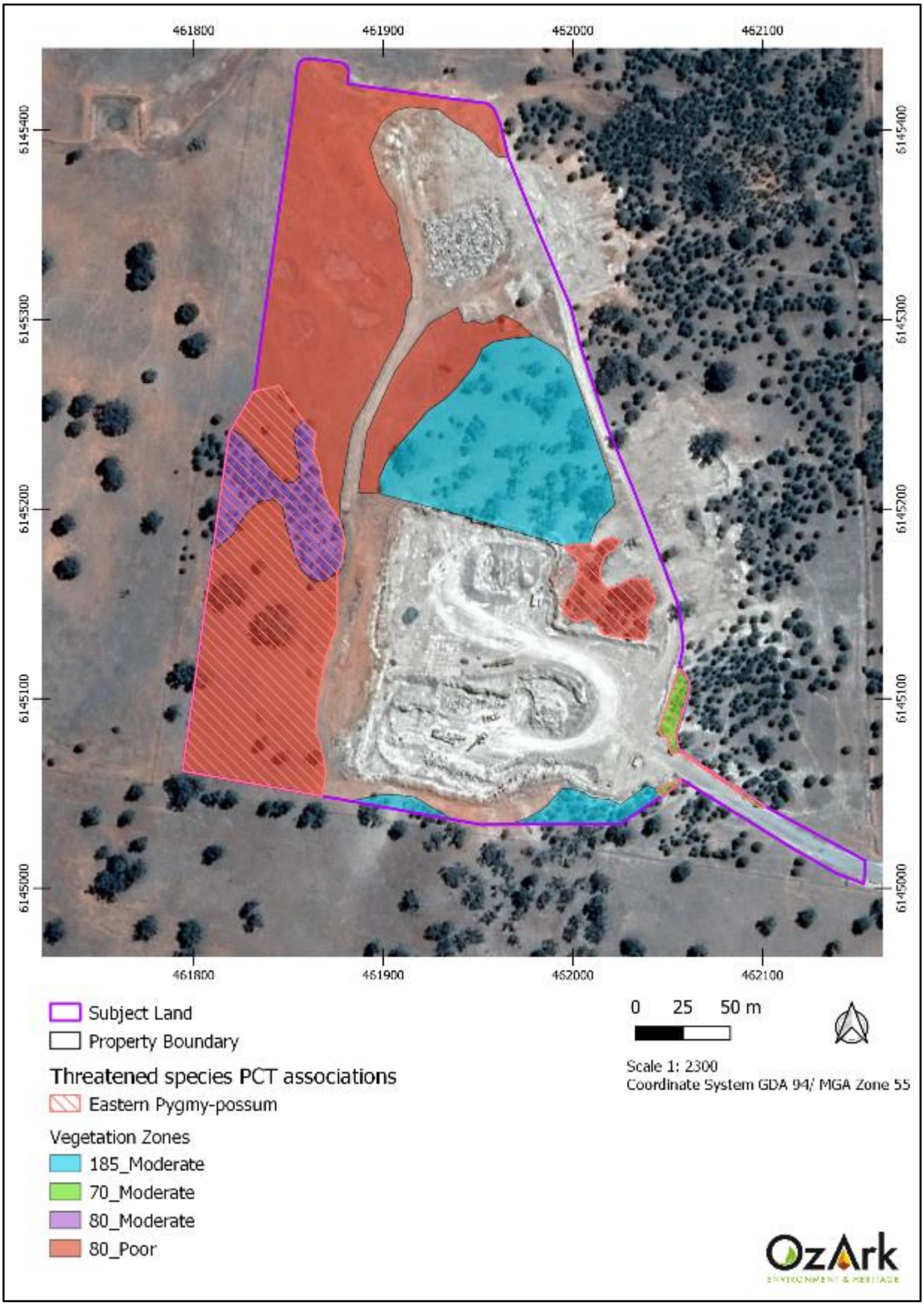

Figure 5-2 Species polygons for Eastern Pygmy-possum within the subject land and property boundary.

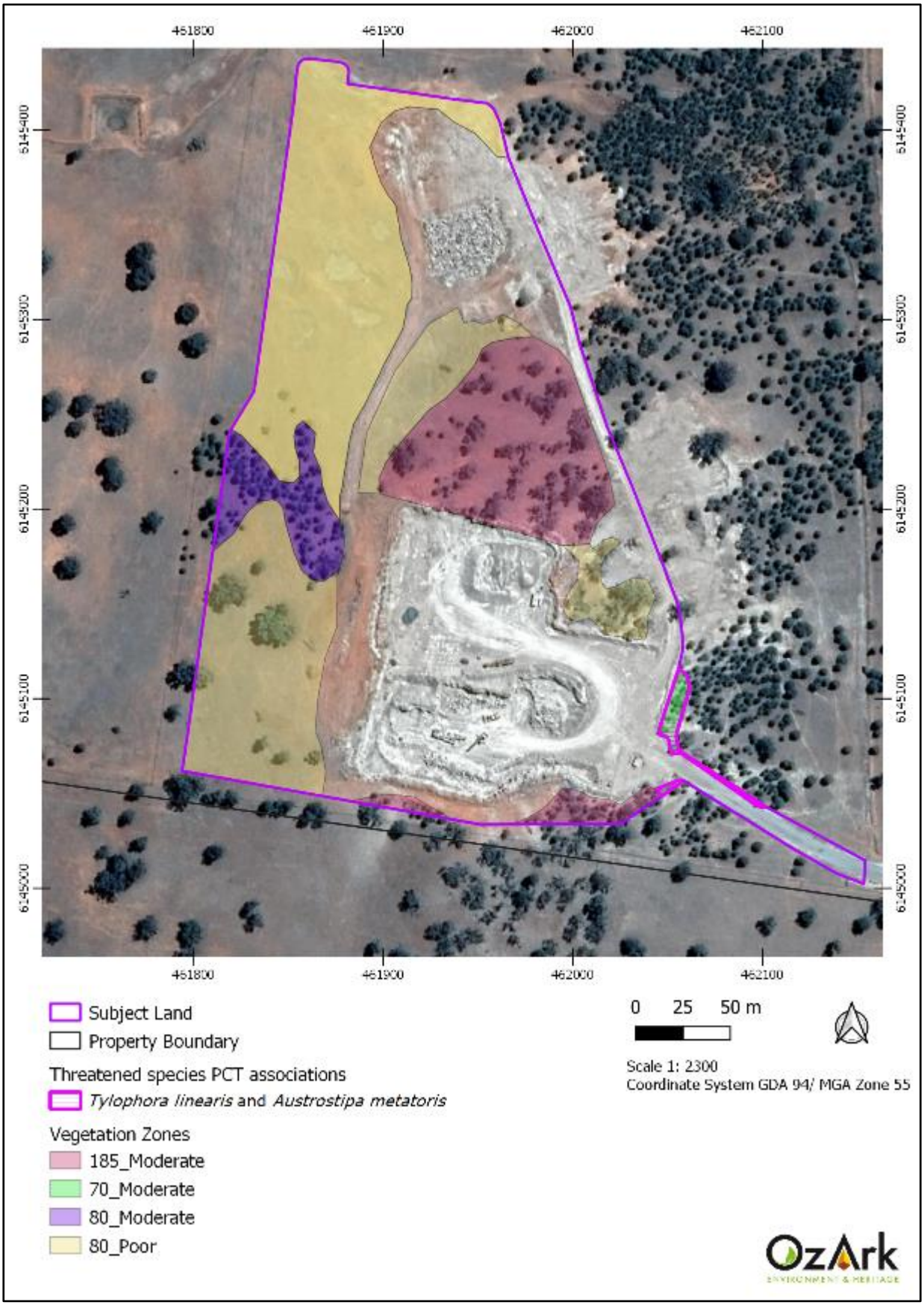

Figure 5-3. Species polygons for *Tylophora linearis* & *Austrostipa metatoris* within the subject land and property boundary.

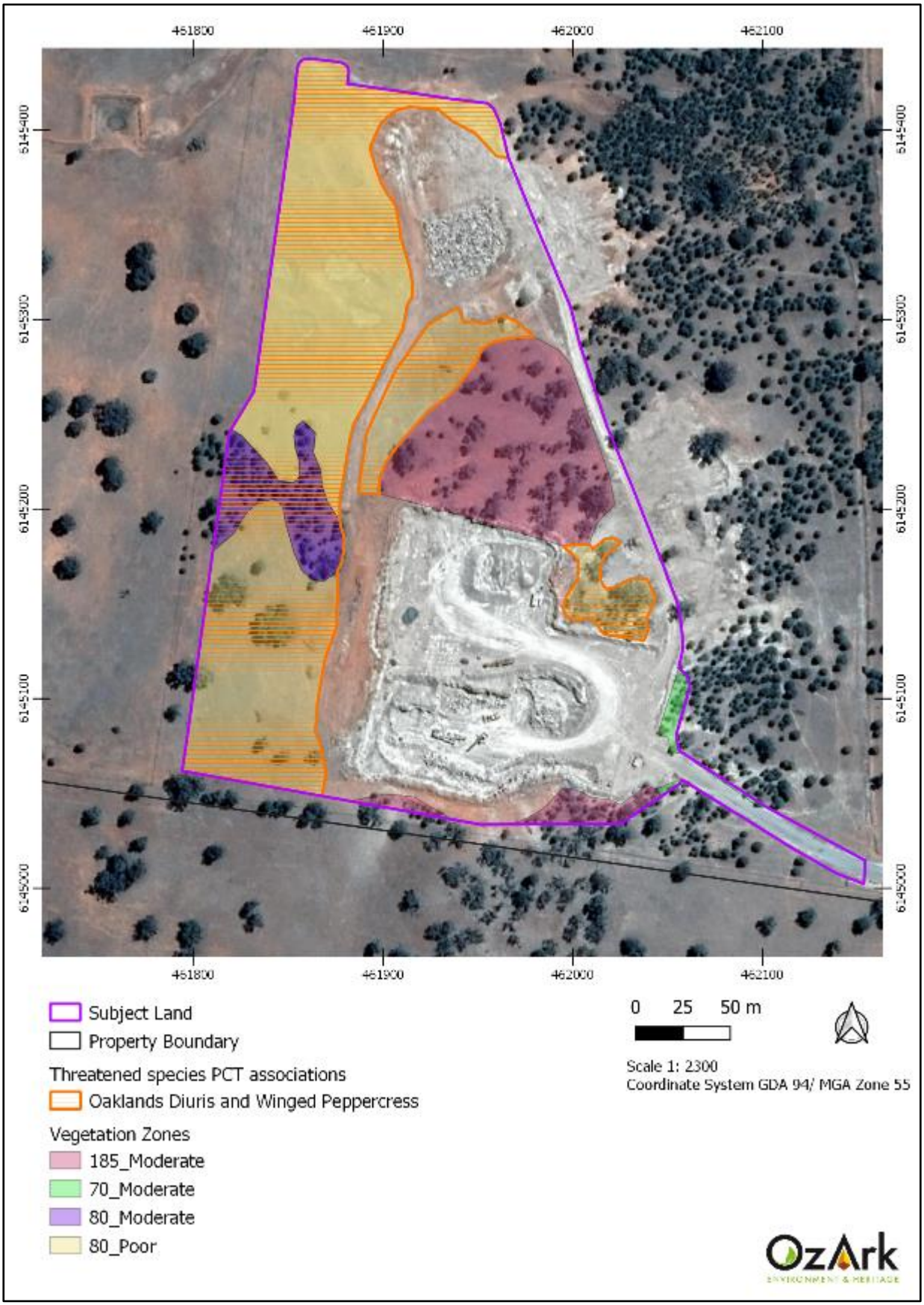

Figure 5-4. Species polygons for Oaklands Diuris & Winged Peppercress within the subject land and property boundary.

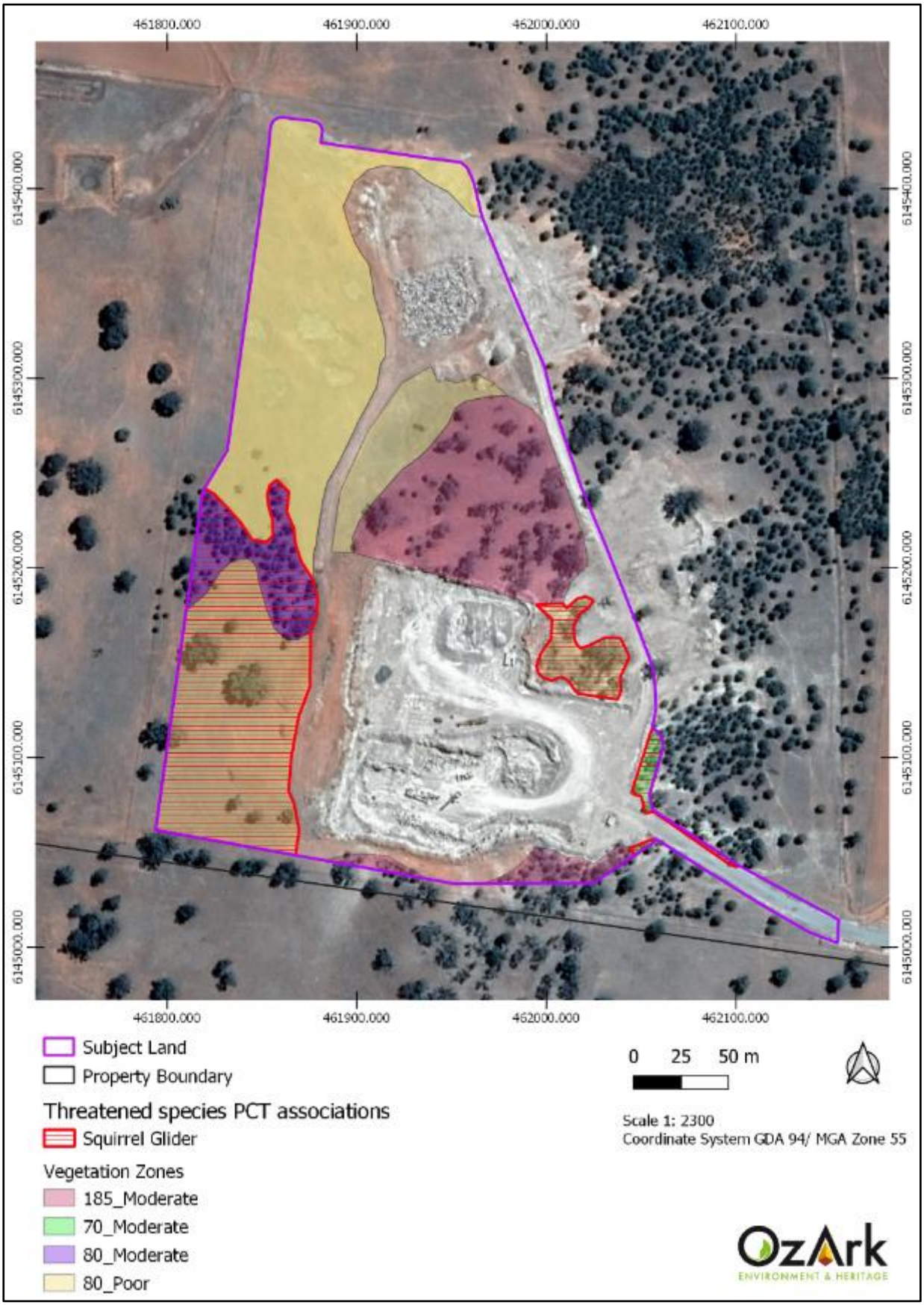

Figure 5-5. Species polygons for the Squirrel Glider within the subject land and property boundary.

6 Impact Summary

6.1 Offset Scheme Threshold

The Proposal will not impact on land mapped on the Biodiversity Values Map.

The Proposal has been assessed against the relevant vegetation clearing thresholds under the BOS. The thresholds applicable to different lot size categories for the land zoning are provided in **Table 6-1** (NSW Office of Environment & Heritage, 2017). The subject land is currently zoned RU1 (primary production), with a minimum lot size of 400 ha. Clearing of 1 ha or more of native vegetation will require entry into the BOS. The Proposal will clear up to 3.93 ha of native vegetation; thus, entry into the BOS is required.

Table 6-1. Area clearing thresholds for entry into the Biodiversity Offset Scheme.

LEP Minimum Lot Size	Threshold Area of Clearing
Less than 1 ha	0.25 ha or more
1 ha to less than 40 ha	0.5 ha or more
40 ha to less than 1000 ha	1 ha or more
1000 ha or more	2 ha or more

6.2 Avoidance, minimisation and mitigation

The following avoidance measures have been integrated into the design and/or are suggested for the implementation of the project:

- The proposed impact footprint has been reduced in the planning phase to minimise impact on biodiversity.

In addition, the following minimisation methods have been or will be implemented:

- Before starting work, all component areas to be disturbed or rehabilitated during the ongoing operation of the quarry will be marked with highly visible permanent markers such as yellow painted concrete posts
- Vegetation will be removed in a manner that avoids damage to surrounding vegetation, ensuring disturbance to vegetation and soil is kept to a minimum.

Table 6-2 outlines recommended environmental safeguards to reduce impacts on vegetation, soil and biodiversity.

Table 6-2. Recommended environmental safeguards.

Impact	Environmental Safeguard	Timing
Clearing and prevention of over-clearing	1. All personnel are to be inducted to be aware that disturbance of any stand of native vegetation outside the development footprint, or otherwise unauthorised disturbance, could have legislative consequences if done without approval. Evidence of all personnel receiving an induction would be kept on file (signed induction sheets).	Pre-disturbance

Impact	Environmental Safeguard	Timing
	2. Before start of work, clearly identify the extent of permitted vegetation clearing and areas to be retained as native vegetation.	Pre-disturbance
	3. A pre-clearing process and unexpected threatened species finds procedure is recommended. Any fauna found during the disturbance are to be allowed (or assisted) to relocate into adjoining habitat.	Pre-disturbance
	4. Vegetation will be removed in such a way to avoid unnecessary damage to surrounding vegetation.	Pre-disturbance
	5. Where possible, vegetation to be removed will be mulched or placed on-site and re-used to stabilise disturbed areas.	Ongoing
	6. Areas will be progressively rehabilitated as they become available and are no longer required for operations. This will involve the natural regeneration of any bare soil or cleared areas encouraged through retention of native vegetation material on site and brush-matting. Vegetation will be cleared towards the remaining vegetated borders to allow fauna to move from the impacted areas.	Ongoing
Bushfire protection	7. Ensure vegetation management for bushfire protection is consistent, as far as practicable, with biodiversity protection and remove only the necessary vegetation to achieve fuel reduction.	Ongoing
Soil management	8. An erosion and sediment control plan will be addressed within the Environmental Management Plan being prepared for the quarry	Pre-disturbance
Damage to native vegetation outside of impact zone	9. Stockpile and compound sites are to be located within the assessed subject land and preferentially according to the following criteria: o At least 40 m away from the nearest waterway. o In areas of low ecological conservation significance (i.e. previously disturbed land). o On relatively level ground.	Ongoing
	10. Stockpiling of materials and equipment, and parking of vehicles, is to be avoided within the dripline (extent of foliage cover) of any tree.	Ongoing
Introduction and spread of significant weeds and pathogens	11. Inspection and control of environmental weeds in accordance with the quarry's Environmental Management Plan and subject to requirements of Council.	Ongoing
	12. Construction machinery (bulldozers, excavators, trucks, loaders and graders) would be clean, and soil- and weed-free, before entry to the work site.	Ongoing
	13. Weed-free fill only to be used for on-site earthwork	Ongoing
	14. Any herbicide use is to be in accordance with the requirements on the label. Any person carrying out herbicide application would be appropriately trained, licensed and competent in its use.	Ongoing
Disturbance to fallen timber, dead wood and bush	15. All bush rock encountered on site is to be relocated to the edge of the disturbance area to enhance habitat and regeneration.	Pre-disturbance

Impact	Environmental Safeguard	Timing
rock	16. If threatened bats are detected, stop work immediately and either leave the area undisturbed until the individuals have dispersed or engage suitably qualified personnel to attempt their removal.	Ongoing
Threatened species	17. No new areas to be cleared without further assessment, as threatened flora species may occur in any unassessed impact area.	Ongoing
	18. If the impact footprint changes from the current extent assessed in the study, re-assessment of the potential impact of the activity would be needed to ensure impacts to threatened species are not inadvertently caused, given that suitable habitat for threatened species occurs elsewhere on the property.	Ongoing
	19. Operational activities to occur only between 6:00am to 6:00pm to avoid indirect impacts on threatened fauna such as vehicle strikes.	Ongoing
	20. Enforce 40 km/h speed limits on access roads to reduce the risk of vehicle strikes.	Ongoing

6.3 Impacts to Wetlands, Watercourses and Aquatic habitat

There are no wetlands on the subject land or within the study area. Any potential for indirect impact to nearby watercourses from erosion and sedimentation related to construction activities will be avoided and minimised by developing and implementing an erosion and sediment control plan.

6.4 Impacts to Native Vegetation

There are three grassy woodland PCTs within the subject land. Up to 3.93 ha of native vegetation in this vegetation zone is required to be cleared. This area has been reduced from the initial impact footprint, avoiding a hollow-bearing habitat tree which was identified during the initial survey.

6.5 Serious and Irreversible Impacts

The Guidance to assist a decision-maker to determine a serious and irreversible impact (SAII) (NSW Office of Environment and Heritage, 2017) and the NSW threatened species data collection has been used to determine which threatened species require further assessment for SAII. It has been determined that one of the species present (or assumed present) on the subject land, the Oaklands Diuris (*Diuris* sp. (*Oaklands, D.L. Jones 5380*), require SAII assessment.

The Oaklands Diuris (*Diuris* sp. (*Oaklands, D.L. Jones 5380*) is associated with 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. The PCT occurs within the subject land in both a poor and moderate condition, its assessment is as follows as per section 10.2.3.1 of the Biodiversity Assessment Methods manual.

a) The species is associated with PCT 80 which occurs in 2.91 ha of the subject land. The original area proposed has been refined to minimize potential impacts to species and others.

b) There is no confirmed population within 10 km of the subject land. The proposal will reduce the suitable habitat for the species and therefore potential occupancy within the local area by 0.19%.
c) The potential impacts to Oaklands Diuris (*Diuris* sp. (*Oaklands, D.L. Jones 5380*)) have been assessed to the criteria as specified within the *Guidance to assist a decision-maker to determine a serios and irreversible impact*. These thresholds broadly fall under the following points:
    i. Are in a rapid rate of decline
    ii. Have a very small population size
    iii. Are severely degraded or disrupted
    iv. Have a very limited geographic distribution
    v. Are unlikely to respond to measures to improve habitat.

The Oaklands Diuris (*Diuris* sp. (*Oaklands, D.L. Jones 5380*)) occurs in only six-seven documented populations, within these the populations are estimated to contain approximately 20-150 individuals. Therefore, the species meets the points **ii** and **iv.** As the population is small, it is susceptible to declines due to stochastic process and therefore meets point **i.** As populations often occur within roadsides and heavily grazed areas it is susceptible to competition (both native and non-native) and habitat degradation and therefore meets point **iii**. Current monitoring and active management are underway within identified Priority Management Sites to determine responses to habitat improvement.

d) The likely impact that the proposal will have on the local population, including but not limited to:
    i. The proposal will remove up to 2.91 ha of available habitat to the species effectively reducing its potential occupancy by an estimated 0.19%
    ii. As above.
    iii. Up to 2.91 ha of available habitat for the species will be removed, which is a modification to the habitat required for the maintenance of processes important to the species' life cycle. However, as there are no current records of the species within the region the proposal is unlikely to modify habitat resulting in disturbance to factors such as pollination, seed set, seed dispersal, germination, impact the genetic diversity of a population or alter the long-term evolutionary development of the species.
e) The likely impact to the ecology of the local population is as follows; There are three priority management sites for the species south of the subject land. These are; Urana West, Urana East and Oaklands, all of which are located within the Federation LGA. Federation LGA is the neighboring LGA to Narrandera, over 17 km south of the subject land. Due to the restricted range of the species the proposal is unlikely to impact on any ecological functions of the population such; pollination cycling, seedbank dynamics, recruitment, and interactions with other species (eg. Pollinators, host species, mycorrhizal associations). Species pollination is selective, with only the Blue-banded bee (*Amegilla cingulata*) being the species' only pollinator. The species' seeds are wind dispersed, therefore a nearby population is required for the species to colonize previously unoccupied areas.
f) It is not anticipated that a population of Oaklands Diuris (*Diuris* sp. (*Oaklands, D.L. Jones 5380*)) will become isolated or fragmented as a result of the proposal as there are no documented populations of the species within the local area. Impacts to the species are limited to the reduction of potential occupancy of the species by reducing the amount of suitable habitat.

g) As there are no recorded populations of the species within the local area the proposal is not anticipated to impact potential relationships between populations of the endangered species such that biological process such as breeding, dispersal and genetic diversity of a population of the species is impacted.
h) As there are no recorded populations of the species within the local area the proposal is not anticipated to result in an increase in threats and indirect impacts, such as the introduction of invasive species, which may decrease population viability.
i) A total of 95 records of Oaklands Diuris (*Diuris* sp. (*Oaklands, D.L. Jones 5380*)) occur within the NSW South Western Slopes IBRA region, all of which occur within the Lower Slopes subregion. All bar one species records occur within the Federation LGA, with one record from 2001 in the Lockhart LGA. Based on these records the proposal will not impact these populations of the species.
j) NSW Department of Planning, Industry and Environment is currently managing the NSW listed Endangered species within three Priority Management Sites for the species which are under active management. The Priority Management Sites are listed above in section e. Each Priority Management Site is engaging in prescribed management actions specific to the site such as strategic crash grazing, controlled burns, reduced competition from native and non-native species by thinning and spot spraying, as well as monitoring of population size and dynamics. The proposal will not impact on these Priority Management Sites or their associated active management strategies.

6.6 Prescribed impacts

The Biodiversity Regulation 2017 lists nine impacts as prescribed impacts that must be avoided, minimised and mitigated. These prescribed impacts and their relevance to the Proposal are described in **Table 6-3.**

Table 6-3. Prescribed impacts of the proposal.

Prescribed Impacts	Site Assessment	Mitigation Measure
Impacts on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs and other features of geological significance.	No karsts, caves, crevices, cliffs or other features of geological significance present on the subject land or within the study area. Anthropogenically created rock faces are present due to the working quarry.	None required.
Impacts of development on the habitat of threatened species or ecological communities associated with rocks.	Rock outcrops occur on the subject land.	Table 6-2 Mitigation measures 1, 3 and 15.
Impacts of development on the habitat of threatened species or ecological communities associated with human made structures.	No human made structures will be disturbed by the Proposal.	None required.
Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation.	No discrete areas of non-native vegetation is present on the development site and is therefore unlikely to provide habitat for ecosystem credit species.	None required.

Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range.	The Proposal impacts on land currently impacted by the existing working quarry. The area of clearing will reduce connectivity by a minimal amount, with passage of fauna possible across adjoining native vegetation.	Table 6-2. Mitigation measures 1 – 7, 9, 15, 17-19.
Impacts of the development on movement of threatened species that maintains their life cycle.	The subject land contains foraging habitat for a number of threated bird species, and some small mammals, however the proposal will not significantly alter connectivity of grassy woodland within the landscape.	Table 6-2 Mitigation measures 1, 3 and 15.
Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities.	No watercourses or wetlands within the subject land.	None required**.**
Impacts of wind turbine strikes on protected animals.	None associated with the proposal.	None required**.**
Impact of vehicle strikes on threatened species of animals or on animals that are part of a TEC.	The possibility of vehicle strikes on animals exists both during the construction and operational phases of the Proposal.	Table 6-2. Mitigation measures 19 and 20.

6.7 Indirect impacts

The main impacts of the proposal are expected to be contained within the subject land, provided there is adequate demarcation between operational and non-operational areas. Disturbance from machinery and construction activities will occur, such as noise and dust. However, these impacts will be minimised by following the environmental safeguards proposed in **Table 6-2**. Additionally, the continued operation of the quarry has and will produce noise and dust.

6.8 Key threatening processes

Key Threatening Processes (KTP's) at the NSW State and Federal level will be exacerbated by the proposal. A summary of the proposed impacts relating to the relevant key threatening processes is given in **Table 6-4**. **Appendix G** lists all KTP and includes explanations as to why many have been assessed as not being present in the study area or exacerbated by the proposal.

Threats exacerbated by poor biosecurity controls will be potentially exacerbated by the proposal. However, implementing the measures for preventing the introduction and spread of weeds described in **Table 6-2**, this potential is removed.

Table 6-4. Key threatening processes exacerbated by the proposal.

Name	NSW status	Comm status	KTP Present in Study Area?	Exacerbated by Proposal?
Anthropogenic Climate Change	KTP	KTP	YES	**NEGLIGIBLE**
Clearing of native vegetation	KTP	KTP	YES	**IMPACT** Up to 3.93 ha of native vegetation will be cleared.
Importation of Red Fire Ants *Solenopsis invicta*	KTP	KTP	POTENTIAL	**POTENTIAL** Machinery used on site can potentially act as a

				transport for biosecurity risks
Infection of native plants by *Phytophthora cinnamomi*	KTP	KTP	POTENTIAL	**POTENTIAL** Machinery used on site can potentially act as a transport for biosecurity risks
Invasion and establishment of exotic vines and scramblers	KTP		POTENTIAL	**POTENTIAL** Machinery used on site can potentially act as a transport for biosecurity risks
Invasion and establishment of Scotch Broom (*Cytisus scoparius*)	KTP		POTENTIAL	**POTENTIAL** Machinery used on site can potentially act as a transport for biosecurity risks
Invasion of native plant communities by African Olive *Olea europaea* subsp. *cuspidata*	KTP		POTENTIAL	**POTENTIAL** Machinery used on site can potentially act as a transport for biosecurity risks
Invasion of native plant communities by Chrysanthemoides monilifera	KTP		POTENTIAL	**POTENTIAL** Machinery used on site can potentially act as a transport for biosecurity risks
Invasion of native plant communities by exotic perennial grasses	KTP		POTENTIAL	**POTENTIAL** Machinery used on site can potentially act as a transport for biosecurity risks
Invasion of the Yellow Crazy Ant, *Anoplolepis gracilipes* into NSW	KTP		POTENTIAL	**POTENTIAL** Machinery used on site can potentially act as a transport for biosecurity risks

6.9 Matters of National Environmental Significance

Under the environmental assessment provisions of the EPBC Act, Matters of National Environmental Significance (MNES) and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government DAWE.

The EPBC Act protected matters search has identified, three TECs, 26 threatened species and 10 listed migratory and marine species that could possibly occur in the 10 km search area (**Appendix A**). Of these, 14 threatened and seven migratory species possibly occur, based on the identification of those habitats present in the subject land (**Appendix F**). An assessment of impact significance has been undertaken for these threatened species following EPBC guidelines, as detailed in Sections **6.9.1** and **6.9.2**.

A summary of these matters and whether the proposal is likely to impact them is provided in **Table 6-5**. It is concluded that no MNES will be significantly impacted by the proposal.

Table 6-5. Impacts to matters of national environmental significance.

Factor	Potential impact
Any impact on a World Heritage property?	NIL
Any impact on a National Heritage place?	NIL
Any impact on a wetland of international importance?	NIL

Factor	Potential impact
Any impact on a listed threatened species or communities?	Non-significant impact (Section 6.9).
Any impacts on listed migratory species?	Non-significant impact (Section 6.9)
Any impact on a Commonwealth marine area?	NIL
Does the proposal involve a nuclear action (including uranium mining)?	NIL
Additionally, any impact (direct or indirect) on Commonwealth land?	NIL
Any impact on a water resource, in relation to coal seam gas development and large coal mining development?	NIL

6.9.1 EPBC Listed Threatened Species

Four Critically Endangered and ten Endangered species were determined to have the potential to be impacted by the proposal, as were ten Vulnerable listed species.

Under the EPBC Act, an action is likely to have a significant impact on an Endangered species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of a population
- reduce the area of occupancy of the species
- fragment an existing population into two or more populations
- adversely affect habitat critical to the survival of a species
- disrupt the breeding cycle of a population
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
- introduce disease that may cause the species to decline, or
- interfere with the recovery of the species.

Each species listed above has been assessed against these guidelines, (see **Appendix F).**

6.9.2 EPBC Act listed migratory species

Seven migratory species have the potential to be impacted by proposal.

Under the EPBC Act, an action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

- 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
- Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or
- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

Each species listed above has been assessed against these guidelines (see **Appendix F).**

7 Biodiversity Credit and Offset Report

7.1 Management Zones

The BAM considers future vegetation condition of different areas of the development footprint when calculating biodiversity credits and offsets. Due to the absence of detailed site plans, it has been assumed that all vegetation within the development footprint will be managed the same; i.e. cleared. Therefore, offset requirements have been assessed assuming only one management zone:

- Quarry expansion area and associated infrastructure. This area includes Asset Protection Zones (APZ). All native vegetation is assumed to be completely cleared to ground level.

7.2 Vegetation Integrity Assessment

Vegetation integrity (VI) scores have been calculated for each vegetation zone based on patch size, area to be impacted, vegetation composition, structure and function, as defined below.

Patch size – Area in hectares of total vegetation zone patch (i.e. the connected woody and non-woody vegetation).

Area – Area within the property that will be subject to clearing, modification or other treatment by the Proposal. There is only one management zone as described above.

Composition – Score calculated based on species richness, i.e. the number of native species present.

Structure – Score calculated based on the cover (%) of each native species growth form.

Function – Score calculated based on habitat features, i.e. presence of tree sizes, hollow trees, coarse woody debris, litter cover (%) and high threat weed cover (%).

Benchmark data for the PCTs is also used in this calculation.

Data required for the calculation was collected in the field using the BAM, as described above. The VI assessment for each vegetation zone including the loss of VI due to the Proposal, averaged across the construction and APZ areas, is shown in **Table 7-1**.

Table 7-1. Vegetation Integrity (VI) assessment

Vegetation Zone	PCT	Area of Zone to be Impacted (ha)	Assessed VI Score	Management Zone	Future VI Score	Change in VI Score	Total Change in VI Score
1	185	0.98	43.4	Moderate	0	-43.4	-43.4
2	70	0.04	49.4	Moderate	0	-49.4	-49.4
3	80	0.27	63.7	Moderate	0	-63.7	-63.7
4	80	2.64	9.5	Poor	0	-9.5	-9.5

7.3 Ecosystem Credit Summary

Biodiversity credits requiring offset by the proposal have been calculated using field data entered into the BAM calculator. A summary of the ecosystem and species credits generated is provided in **Table 7-2** and **Table 7-3**

The Biodiversity Credit Report generated by the BAM calculator is appended to the BDAR as **Appendix D**.

Table 7-2. Ecosystem credits for plant community types, ecological communities and threatened species habitat.

Zone	Vegetation zone name	Vegetation integrity loss/gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Ecosystem credits
1	70_Moderate	49.4	0.04	0.25	high sensitivity to potential gain	1.75	1
2	80_Moderate	52.8	0.3	0.25	high sensitivity to potential gain	2	9
3	80_Poor	13.2	2.6	0.25	high sensitivity to potential gain	2	0
4	185_Moderate	43.4	1	0.25	high sensitivity to potential gain	1.5	16
						Total	26

Table 7-3. Species credits for threatened species.

Vegetation zone name	Habitat condition (HC)	Area (ha)/ individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species Credits
Austrostipa metatoris / A spear-grass (Flora)						
70_Moderate	49.4	0.04	0.25	2	FALSE	1
					Subtotal	1
Austrostipa wakoolica / A spear-grass (Flora)						
70_Moderate	49.4	0.04	0.25	2	FALSE	1
80_Moderate	63.7	0.27	0.25	2	FALSE	9
80_Poor	9.5	2.64	0.25	2	FALSE	13
					Subtotal	23
Cerartetus nanus / Eastern Pygmy-possum (Fauna)						
70_Moderate	49.4	0.04	0.25	2	FALSE	1
80_Moderate	63.7	0.27	0.25	2	FALSE	9
80_Poor	9.5	2.4	0.25	2	FALSE	11
					Subtotal	21
Diuris sp. (Oaklands, D. L. Jones 5380) / Oaklands Diuris (Flora)						
80_Moderate	63.7	0.27	0.25	3	FALSE	13
80_Poor	9.5	2.64	0.25	3	FALSE	19
					Subtotal	32
Lepidium monoplocides / Winged Peppercress (Flora)						
80_Moderate	63.7	0.27	0.25	2	FALSE	9
80_Poor	9.5	2.64	0.25	2	FALSE	13
					Subtotal	22
Petaurus norfolcensis / Squirrel Glider (Fauna)						
70_Moderate	49.4	0.04	0.25	2	FALSE	1
80_Moderate	63.7	0.27	0.25	2	FALSE	9
80_Poor	9.5	1.03	0.25	2	FALSE	5
					Subtotal	15
Tylophora linearis / *Tylophora linearis* (Flora)						
70_Moderate	49.4	0.04	0.25	2	FALSE	1
					Subtotal	1

7.4 Offset Requirement

Like for like credit retirement options and the variation rules according to the Biodiversity Conservation Regulation 2017 are summarised in **Figure 7-1** (ecosystem credits) and **7-2** (species credits).

70-White Cypress Pine woodland on sandy loams in central NSW wheatbelt	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Floodplain Transition Woodlands This includes PCT's: 56, 70, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=50% and <70%	70_70_Moderate	No	1	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
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**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	80_80_Moderate	No	9	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	80_80_Poor	No	0	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
185-Dwyer's Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Inland Rocky Hill Woodlands This includes PCT's: 104, 106, 122, 175, 176, 177, 178, 180, 184, 185, 186, 188, 218, 239, 256, 257, 258, 292, 317, 318, 319, 328, 329, 332, 334, 357, 424, 427, 439	Inland Rocky Hill Woodlands <50%	185_185_Moderate	No	16	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Figure 7-1. Retirement options for ecosystem credits, including like-for-like and variation options.

Austrostipa metatoris/ A spear-grass	Spp		IBRA region
	Austrostipa metatoris/A spear-grass		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing	IBRA region
		under Part 4 of the BC Act shown below	
	Flora	Vulnerable	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Austrostipa wakoolica/ A spear-grass	Spp		IBRA region
	Austrostipa wakoolica/A spear-grass		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Endangered	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Cercartetus nanus/ Eastern Pygmy-possum	Spp		IBRA region
	Cercartetus nanus/Eastern Pygmy-possum		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Diuris sp. (Oaklands, D.L. Jones 5380)/ Oaklands Diuris	Spp		IBRA region
	Diuris sp. (Oaklands, D.L. Jones 5380)/Oaklands Diuris		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Endangered	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Lepidium monoplocoides/ Winged Peppercress	Spp		IBRA region

	Lepidium monoplocoides/Winged Peppercress	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Endangered	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Petaurus norfolcensis/ Squirrel Glider	Spp	IBRA region	
	Petaurus norfolcensis/Squirrel Glider	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Tylophora linearis/ Tylophora linearis	Spp	IBRA region	
	Tylophora linearis/Tylophora linearis	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Vulnerable	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Figure 7-2. Retirement options for species credits, including like-for-like and variation options.

8 Summary and conclusions

The following summary of findings and conclusions are provided to assist with ongoing project planning.

The proposal to extend Strontian Quarry within Lots 133 DP726537 and 134 DP726537 Strontian Road, Narrandera, will clear up to 3.93 ha of native vegetation. The native vegetation consists of three Plant Community Types:

- PCT 70 - White Cypress Pine woodland on sandy loams in central NSW wheatbelt
- 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
- PCT 185 - Dwyer's Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion

PCT 80 is associated with the following Threatened Ecological Communities (TECs):

- EPBC Act listed, Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions
- BC Act listed, Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions
- BC Act listed, Mallee and Mallee-Broombush dominated woodland and shrubland, lacking Triodia, in the NSW South Western Slopes Bioregion

However, the listed TECs were determined not to be present on the subject land based on patch size and lack of defining structural characteristics, such as a mid-stratum layer. PCT 185 and 70 are not associated with any TECs.

In total, 29 ecosystem credit species and seven species credit species were assumed to be present or confirmed on the subject land after targeted searches were completed. The proponent must offset the impacts of the development by purchasing or retiring the correct number and type of ecosystem and species credits on the open market, based on the like-for-like options. If the correct credits cannot be sourced, the proponent may offset by paying an amount directly to the Biodiversity Conservation Trust.

The significance of the proposed impact to EPBC Listed threatened, migratory, wetland and marine species predicted to occur within a 10 km search area was assessed. No significant impact to a threatened, migratory, wetland or marine species likely to result in the extinction of a local population was identified. The residual ecological impacts of the proposal would be adequately mitigated using the management actions recommended. Therefore, a referral of the proposal to the Federal Department of Agriculture, Water and the Environment for these matters is not required.

This assessment covers the current form of the proposal. Any change to the scope of work may require re-assessment.

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Appendix A: Database search results

EPBC Protected matters report

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

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

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

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

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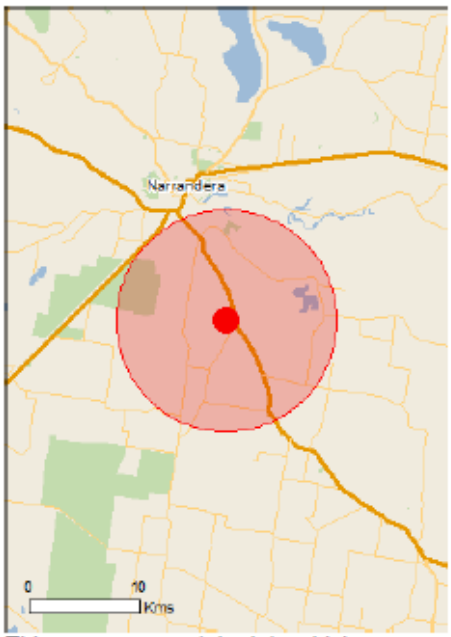

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

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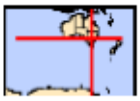


Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	27
Listed Migratory Species:	10

Other Matters Protected by the EPBC Act

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

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

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

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

Extra Information

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

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	24
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Banrock station wetland complex	500 - 600km upstream
Hattah-kulkyne lakes	300 - 400km upstream
Riverland	500 - 600km upstream
The coorong, and lakes alexandrina and albert wetland	600 - 700km upstream

Listed Threatened Ecological Communities [Resource Information]

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

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

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Polytelis swainsonii		
Superb Parrot [738]	Vulnerable	Breeding known to occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within 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
Maccullochella macquariensis		
Trout Cod [26171]	Endangered	Species or species habitat may occur within area
Maccullochella peelii		
Murray Cod [66633]	Vulnerable	Species or species habitat known to occur within area
Macquaria australasica		
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Frogs		
Litoria raniformis		
Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Nyctophilus corbeni		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Amphibromus fluitans		
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat may occur within area
Austrostipa wakoolica		
[66623]	Endangered	Species or species habitat known to occur within area
Brachyscome muelleroides		
Mueller Daisy [15572]	Vulnerable	Species or species habitat may occur within area
Caladenia arenaria		
Sand-hill Spider-orchid [9275]	Endangered	Species or species habitat may occur within area
Caladenia xanthochila		
Yellow-lip Spider-orchid [55509]	Endangered	Species or species habitat likely to occur within area
Sclerolaena napiformis		
Turnip Copperburr [11742]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Swainsona murrayana		
Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Aprasia parapulchella		
Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

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

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name

Commonwealth Land - Australian Telecommunications Commission

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Murrumbidgee Valley	NSW

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis		
Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis		
European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus		
House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus		
Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Sturnus vulgaris		
Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula		
Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus		
Domestic Cattle [16]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-34.83559 146.58418

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.

BioNET Atlas search – threatened species predicted to occur within the NSW South Western Slopes Bioregion, Lower Slopes IBRA subregion.

*NSW Status: P=Protected, P13=Protected native plant, V=Vulnerable, E1=Endangered, E2=Endangered population, E4=Extinct, E4A=Critically endangered, 2=Category 2 sensitive species, 3=Category 3 sensitive species.
+Comm. Status: C=CAMBA, J=JAMBA, K=ROKAMBA, CE=Critically endangered, E=Endangered, V=Vulnerable.
-Number of Records: P = predicted to occur.

Scientific Name	Common Name	NSW status.	Comm. Status	Records
Crinia sloanei	Sloane's Froglet	V,P		6
Litoria raniformis	Southern Bell Frog	E1,P	V	14
Aprasia parapulchella	Pink-tailed Legless Lizard	V,P	V	4
Leipoa ocellata	Malleefowl	E1,P	V	82
Anseranas semipalmata	Magpie Goose	V,P		23
Oxyura australis	Blue-billed Duck	V,P		26
Stictonetta naevosa	Freckled Duck	V,P		45
Apus pacificus	Fork-tailed Swift	P	C,J,K	17
Hirundapus caudacutus	White-throated Needletail	P	C,J,K	18
Ardea ibis	Cattle Egret	P	C,J	12
Botaurus poiciloptilus	Australasian Bittern	E1,P	E	16
Ixobrychus flavicollis	Black Bittern	V,P		1
Plegadis falcinellus	Glossy Ibis	P	C	133
Circus assimilis	Spotted Harrier	V,P		75
Haliaeetus leucogaster	White-bellied Sea-Eagle	V,P	C	26
Hamirostra melanosternon	Black-breasted Buzzard	V,P,3		7
Hieraaetus morphnoides	Little Eagle	V,P		146
Lophoictinia isura	Square-tailed Kite	V,P,3		6
Pandion cristatus	Eastern Osprey	V,P,3		2
^^*Falco hypoleucos*	Grey Falcon	E1,P,2		49
Falco subniger	Black Falcon	V,P		58
Grus rubicunda	Brolga	V,P		53
Ardeotis australis	Australian Bustard	E1,P		1
Burhinus grallarius	Bush Stone-curlew	E1,P		51
Pluvialis fulva	Pacific Golden Plover	P	C,J,K	3
Pedionomus torquatus	Plains-wanderer	E1,P	CE	2
Rostratula australis	Australian Painted Snipe	E1,P	E	18
Actitis hypoleucos	Common Sandpiper	P	C,J,K	4
Calidris acuminata	Sharp-tailed Sandpiper	P	C,J,K	43
Calidris ferruginea	Curlew Sandpiper	E1,P	CE,C,J,K	3
Calidris melanotos	Pectoral Sandpiper	P	J,K	3
Calidris ruficollis	Red-necked Stint	P	C,J,K	5
Gallinago hardwickii	Latham's Snipe	P	C,J,K	19
Limosa lapponica	Bar-tailed Godwit	P	C,J,K	3
Limosa limosa	Black-tailed Godwit	V,P	C,J,K	6
Numenius phaeopus	Whimbrel	P	C,J,K	1
Tringa glareola	Wood Sandpiper	P	C,J,K	5
Tringa nebularia	Common Greenshank	P	C,J,K	13

Scientific Name	Common Name	NSW status.	Comm. Status	Records
Tringa stagnatilis	Marsh Sandpiper	P	C,J,K	12
Glareola maldivarum	Oriental Pratincole	P	C,J,K	1
Chlidonias leucopterus	White-winged Black Tern	P	C,J,K	1
Gelochelidon nilotica	Gull-billed Tern	P	C	19
Hydroprogne caspia	Caspian Tern	P	C,J	7
Callocephalon fimbriatum	Gang-gang Cockatoo	V,P,3		1
^^Calyptorhynchus lathami	Glossy Black-Cockatoo, Riverina population	E2,V,P,2		76
^^Calyptorhynchus lathami	Glossy Black-Cockatoo	V,P,2		86
^^Lophochroa leadbeateri	Major Mitchell's Cockatoo	V,P,2		78
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	V,P,3		1
Glossopsitta pusilla	Little Lorikeet	V,P		92
Lathamus discolor	Swift Parrot	E1,P,3	CE	116
Neophema pulchella	Turquoise Parrot	V,P,3		214
Polytelis swainsonii	Superb Parrot	V,P,3	V	698
Ninox connivens	Barking Owl	V,P,3		71
Tyto novaehollandiae	Masked Owl	V,P,3		P
Merops ornatus	Rainbow Bee-eater	P	J	543
Climacteris affinis	White-browed Treecreeper population in Carrathool local government area south of the Lachlan River and Griffith local government area	E2,P		16
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V,P		1851
Chthonicola sagittata	Speckled Warbler	V,P		406
Hylacola cautus	Shy Heathwren	V,P		116
Anthochaera phrygia	Regent Honeyeater	E4A,P	CE	13
Certhionyx variegatus	Pied Honeyeater	V,P		14
Epthianura albifrons	White-fronted Chat	V,P		96
Grantiella picta	Painted Honeyeater	V,P	V	113
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V,P		205
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V,P		885
Cinclosoma castanotum	Chestnut Quail-thrush	V,P		3
Daphoenositta chrysoptera	Varied Sittella	V,P		153
Pachycephala inornata	Gilbert's Whistler	V,P		308
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V,P		812
Drymodes brunneopygia	Southern Scrub-robin	V,P		10
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V,P		262
Petroica boodang	Scarlet Robin	V,P		49
Petroica phoenicea	Flame Robin	V,P		189
Stagonopleura guttata	Diamond Firetail	V,P		688
Dasyurus maculatus	Spotted-tailed Quoll	V,P	E	9
Phascogale tapoatafa	Brush-tailed Phascogale	V,P		1
Sminthopsis macroura	Stripe-faced Dunnart	V,P		P
Macrotis lagotis	Bilby	E4,P	V	2

Scientific Name	Common Name	NSW status.	Comm. Status	Records
Phascolarctos cinereus	Koala	V,P	V	219
Cercartetus nanus	Eastern Pygmy-possum	V,P		P
Petaurus norfolcensis	Squirrel Glider in the Wagga Wagga Local Government Area	E2,V,P		10
Petaurus norfolcensis	Squirrel Glider	V,P		112
Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V	17
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V,P		32
Chalinolobus dwyeri	Large-eared Pied Bat	V,P	V	P
Chalinolobus picatus	Little Pied Bat	V,P		24
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V,P		1
Myotis macropus	Southern Myotis	V,P		6
Nyctophilus corbeni	Corben's Long-eared Bat	V,P	V	6
Scoteanax rueppellii	Greater Broad-nosed Bat	V,P		1
Vespadelus baverstocki	Inland Forest Bat	V,P		1
Tylophora linearis		V	E	36
Brachyscome muelleroides	Claypan Daisy	V	V	51
Brachyscome papillosa	Mossgiel Daisy	V	V	3
Kippistia suaedifolia	Fleshy Minuria	E1		4
Leptorhynchos orientalis	Lanky Buttons	E1		68
Senecio garlandii	Woolly Ragwort	V		3
Lepidium aschersonii	Spiny Peppercress	V	V	11
Lepidium monoplocoides	Winged Peppercress	E1	E	25
Wilsonia rotundifolia	Round-leafed Wilsonia	E1		1
Eleocharis obicis	Spike-Rush	V	V	2
Cullen parvum	Small Scurf-pea	E1		3
Swainsona murrayana	Slender Darling Pea	V	V	42
Swainsona recta	Small Purple-pea	E1	E	2
Swainsona sericea	Silky Swainson-pea	V		73
Acacia ausfeldii	Ausfeld's Wattle	V		1
Pilularia novae-hollandiae	Austral Pillwort	E1,3		22
Eucalyptus leucoxylon subsp. pruinosa	Yellow Gum	V		1
^^Caladenia arenaria	Sand-hill Spider Orchid	E1,P,2	E	1313
^^Caladenia concolor	Crimson Spider Orchid	E1,P,2	V	P
^^Diuris sp. (Oaklands, D.L. Jones 5380)	Oaklands Diuris	E1,P,2		95
^^Diuris tricolor	Pine Donkey Orchid	V,P,2		403
Amphibromus fluitans	Floating Swamp Wallaby-grass	V	V	3
Austrostipa metatoris	A spear-grass	V	V	1
Austrostipa wakoolica	A spear-grass	E1	E	79
Grevillea ilicifolia subsp. ilicifolia	Holly-leaf Grevillea	E4A		P
Philotheca angustifolia subsp. angustifolia		E4,P		1
Philotheca ericifolia		P	V	5
Miniopterus orianae oceanensis	Large Bent-winged Bat	V		1

BioNET Atlas search – threatened ecological communities predicted to occur within the NSW South Western Slopes Bioregion, Lower Slopes IBRA subregion.

*NSW Status: P=Protected, P13=Protected native plant, V=Vulnerable, E1=Endangered, E2=Endangered population, E4=Extinct, E4A=Critically endangered, 2=Category 2 sensitive species, 3=Category 3 sensitive species. +Comm. Status: C=CAMBA, J=JAMBA, K=ROKAMBA, CE=Critically endangered, E=Endangered, V=Vulnerable. -Number of Records: P = predicted to occur.

Community	NSW Status	Comm. Status	Records
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	E3		K
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	E3	E	K
Mallee and Mallee-Broombush dominated woodland and shrubland, lacking Triodia, in the NSW South Western Slopes Bioregion	E4B		K
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	E3	E	K
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	E3		P
White Box Yellow Box Blakely's Red Gum Woodland	E3	CE	K

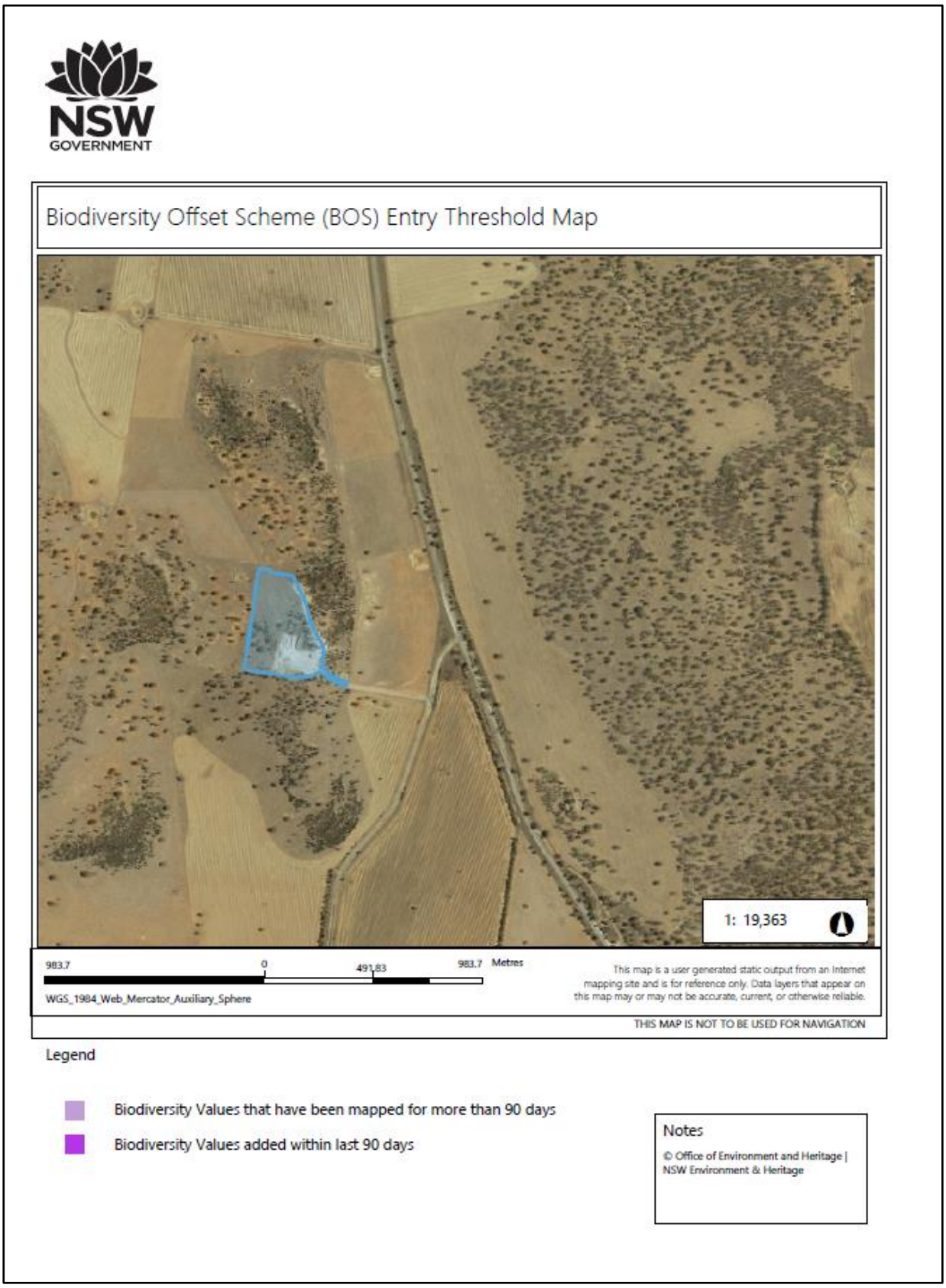
BioNET Atlas search – key threatening processes predicted to occur within the NSW South Western Slopes Bioregion, Lower Slopes IBRA subregion.

Threat	NSW Status	Comm. Status	Records
Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners, Manorina melanocephala (Latham, 1802)	KTP	KTP	P
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	KTP		P
Anthropogenic Climate Change	KTP	KTP	P
Bushrock removal	KTP		P
Clearing of native vegetation	KTP	KTP	P
Competition and grazing by the feral European Rabbit, Oryctolagus cuniculus (L.)	KTP	KTP	P
Competition and habitat degradation by Feral Goats, Capra hircus Linnaeus 1758	KTP	KTP	P
Competition from feral honey bees, Apis mellifera L.	KTP		P
Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners	KTP		P
Herbivory and environmental degradation caused by feral deer	KTP		P
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	KTP		P
Importation of Red Imported Fire Ants Solenopsis invicta Buren 1972	KTP	KTP	P
Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations	KTP	KTP	P
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	KTP	KTP	P
Infection of native plants by Phytophthora cinnamomi	KTP	KTP	P
Introduction of the Large Earth Bumblebee Bombus terrestris (L.)	KTP		P
Invasion and establishment of exotic vines and scramblers	KTP		P
Invasion and establishment of Scotch Broom (Cytisus scoparius)	KTP		P
Invasion and establishment of the Cane Toad (Bufo marinus)	KTP	KTP	P

Threat	NSW Status	Comm. Status	Records
Invasion of native plant communities by African Olive Olea europaea subsp. cuspidata (Wall. ex G. Don) Cif.	KTP		P
Invasion of native plant communities by Chrysanthemoides monilifera	KTP		P
Invasion of native plant communities by exotic perennial grasses	KTP		P
Invasion of the Yellow Crazy Ant, Anoplolepis gracilipes (Fr. Smith) into NSW	KTP		P
Invasion, establishment and spread of Lantana (Lantana camara L. sens. Lat)	KTP		P
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	KTP	KTP	P
Loss of Hollow-bearing Trees	KTP		P
Loss or degradation (or both) of sites used for hill-topping by butterflies	KTP		P
Predation and hybridisation by Feral Dogs, Canis lupus familiaris	KTP		P
Predation by Gambusia holbrooki Girard, 1859 (Plague Minnow or Mosquito Fish)	KTP		P
Predation by the European Red Fox Vulpes Vulpes (Linnaeus, 1758)	KTP	KTP	P
Predation by the Feral Cat Felis catus (Linnaeus, 1758)	KTP	KTP	P
Predation, habitat degradation, competition and disease transmission by Feral Pigs, Sus scrofa Linnaeus 1758	KTP	KTP	P
Removal of dead wood and dead trees	KTP		P

Biodiversity Values Map.

Areas marked as purple are areas of biodiversity value. The blue polygon indicates the subject land. Note that no areas of Biodiversity Values are included indicated.



NSW GOVERNMENT

Biodiversity Values Map and Threshold Report

Results Summary

Date of Calculation	11/03/2021 5:22 PM		**BDAR Required***
Total Digitised Area	8.49	ha	
Minimum Lot Size Method	LEP		
Minimum Lot Size	400	ha	
Area Clearing Threshold	1	ha	
Area clearing trigger Area of native vegetation cleared	Unknown #		Unknown #
Biodiversity values map trigger Impact on biodiversity values map(not including values added within the last 90 days)?	no		no
Date of the 90 day Expiry	N/A		

*If BDAR required has:

- at least one 'Yes': you have exceeded the BOS threshold. You are now required to submit a Biodiversity Development Assessment Report with your development application. Go to https://customer.lmbc.nsw.gov.au/assessment/AccreditedAssessor to access a list of assessors who are accredited to apply the Biodiversity Assessment Method and write a Biodiversity Development Assessment Report
- 'No': you have not exceeded the BOS threshold. You may still require a permit from local council. Review the development control plan and consult with council. You may still be required to assess whether the development is "likely to significantly affect threatened species' as determined under the test in s. 7.3 of the Biodiversity Conservation Act 2016. You may still be required to review the area where no vegetation mapping is available.

Where the area of impact occurs on land with no vegetation mapping available, the tool cannot determine the area of native vegetation cleared and if this exceeds the Area Threshold. You will need to work out the area of native vegetation cleared - refer to the BOSET user guide for how to do this.

On and after the 90 day expiry date a BDAR will be required.

Disclaimer

This results summary and map can be used as guidance material only. This results summary and map is not guaranteed to be free from error or omission. The State of NSW and Office of Environment and Heritage and its employees disclaim liability for any act done on the information in the results summary or map and any consequences of such acts or omissions. It remains the responsibility of the proponent to ensure that their development application complies will all aspects of the *Biodiversity Conservation Act 2016*.

The mapping provided in this tool has been done with the best available mapping and knowledge of species habitat requirements. This map is valid for a period of 30 days from the date of calculation (above).

Acknowledgement

I as the applicant for this development, submit that I have correctly depicted the area that will be impacted or likely to be impacted as a result of the proposed development.

Signature_____ Date: 11/03/2021 05:22 PM

Narrandera Local Environmental Plan 2012 – Biodiversity Map.

Areas marked as green are areas of biodiversity value. The red polygon indicates the property boundary. The red hatched polygons indicate saline land.

Appendix B: Vegetation plot locations

Plot Name	PCT	Easting (Zone 55)	Northing (Zone 55)	Photographs	
STR01	70	462100	6145117		

STR02	70	462146	6145062		

STR03	70	462105	6145193		

STR04	80	462091	6145342		

STR05	80	462109	6145382		

STR06	80	462168	6145287		

STR07	250	461875	6145400		
STR08	250	461843	6145353	Missing	Missing

STR09	185	461970	6145225		

STR10	80	461790	6145085		

STR11	80	461815	6145147		

STR12	185	462014	6145031		

Appendix C: Field survey results

Flora species list

These species were identified on the subject land during the field surveys:

*FG = Forb, GG = Grass and Grass-like, SG = Shrub, TG = Tree, EG = Fern, OG = Other
N = Native, Ex = Exotic, THE = High Threat Exotic

Growth Form Code	Species Name	Common Name	Native (N)/ Exotic (E)/ High Threat Weed (HTW)
FG	*Actinobole uliginosum*	Flannel Cudweed	N
FG	*Arctotheca calendula*	Cape Dandelion	E
GG	*Aristida jerichoensis*	Jericho Wiregrass	N
GG	*Austrodanthonia sp.*		N
GG	*Austrostipa scabra subsp. scabra*	Speargrass	N
GG	*Bothriochloa macra*	Red Grass	N
TG	*Brachychiton populneus*	Kurrajong	N
GG	*Bromus sp.*		E
FG	*Bulbine alata*	Bulbine Lily	N
FG	*Calandrinia Sp.*		N
TG	*Callitris glaucophylla*	White Cypress Pine	N
FG	*Calotis hispidula*	Bogan Flea	N
EG	*Cheilanthes sieberi*	Poison rock fern	N
GG	*Chloris truncata*	Windmill Grass	N
FG	*Chrysocephalum apiculatum*	Common everlasting	N
FG	*Crinum flaccidum*	Darling lily	N
FG	*Daucus glochidiatus*	Native carrot	N
FG	*Dichondra repens*	Kidney Weed	N
FG	*Echium plantagineum*	Paterson's curse	E
FG	*Einadia nutans*	Climbing Saltbush	N
GG	*Elymus scaber*	Common Wheat Grass	N
GG	*Enteropogon acicularis*		N
FG	*Erodium cicutarium*	Common Crowfoot	N
TG	*Eucalyptus dwyeri*	Dwyer's red gum	N
TG	*Eucalyptus microcarpa*	Grey Box	N
FG	*Goodenia hederacea*	Forest goodenia	N
SG	*Hakea spp.*		N
GG	*Hordeum vulgare*	Barley	E
FG	*Hypochaeris glabra*	Smooth Catsear	E
SG	*Indigofera australis*	Australian indigo	N
FG	*Isoetopsis graminifolia*	Grass cushion	N
GG	*Lomandra filiformis*	Wattle mat-rush	N
GG	*Lomandra longifolia*	Spiny-headed mat-rush	N

Growth Form Code	Species Name	Common Name	Native (N)/ Exotic (E)/ High Threat Weed (HTW)
FG	*Maireana enchylaenoides*	Wingless Bluebush	N
FG	*Medicago polymorpha*	Burr medic	N
GG	*Microlaena stipoides*	Weeping grass	N
GG	*Monachather paradoxus*	Bandicoot Grass	N
FG	*Oxalis perennans*		N
FG	*Plantago debilis*		N
FG	*Ptilotus spathulatus*	Pussytails	N
FG	*Rhodanthe pygmaea*	Pigmy Sunray	N
FG	*Sida corrugata*	Corrugated sida	N
FG	*Stuartina muelleri*	Spoon Cudweed	N
GG	*Thyridolepis mitchelliana*	Mulga Mitchell Grass	N
FG	*Vittadinia spp.*		N
FG	*Wahlenbergia communis*	Tufted Bluebell	N
FG	*Wurmbea dioica*	Early Nancy	N
FG	*Chenopodium desertorum*		N
FG	*Brassica tournefortii*	Mediterranean Turnip	HTW
FG	*Vittadinia cuneata*	Fuzzweed	N
GG	*Austrodanthonia eriantha*		N
FG	*Sida cunninghamii*	Ridged Sida	N

Fauna species list

These species were identified on the subject land during the field surveys:

* V= Vulnerable, P = Protected, Ex = Exotic

+V = Vulnerable, - = Not listed

Species Name	Common Name	*BC Act	+EPBC Act	Notes
Polytelis swainsonii	Superb Parrot	V	V	Seen/heard
Corcorax melanoramphos	White-winged Chough	P	-	Seen/heard
Eolophus roseicapilla	Galah	P	-	Seen/heard
Struthidea cinerea	Apostlebird	P	-	Seen/heard
Nymphicus hollandicus	Cockatiel	P	-	Seen/heard
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	P	-	Seen/heard

Species Name	Common Name	*BC Act	+EPBC Act	Notes
Coracina novaehollandiae	Black-faced cuckooshrike	P	-	Seen/heard
Geopelia placida	Peaceful Dove	P	-	Seen/heard
Grallina cyanoleuca	Magpie Lark	P	-	Seen/heard
Psephotus haematonotus	Red-rumped Parrot	P	-	Seen/heard
Lepus europaeus	European Hare	Ex	-	Seen/heard
Corvus coronoides	Australian Raven	P	-	SM4 acoustic. Also nest recorded in Cypress Pine
Pyrrholaemus sagittatus	Speckled Warbler	V	-	Seen/heard
Petroica goodenovii	Red-capped Robin	P	-	Seen/heard
Petaurus breviceps	Sugar Glider	P	-	SM4 acoustic
Chenonetta jubata	Australian Wood Duck	P	-	SM4 acoustic
Ocyphaps lophotes	Crested Pigeon	P	-	SM4 acoustic
Dacelo novaeguineae	Laughing Kookaburra	P	-	SM4 acoustic
Manorina melanocephala	Noisy Miner	P	-	SM4 acoustic
Cracticus tibicen	Australian Magpie	P	-	SM4 acoustic
Rhipidura leucophrys	Willie Wagtail	P	-	SM4 acoustic
Vanellus miles	Masked Lapwing	P	-	SM4 acoustic
Ninox novaeseelandiae	Southern Boobook	P	-	SM4 acoustic
Limnodynastes tasmaniensis	Spotted Grass Frog	P	-	SM4 acoustic
Capra hircus	Feral Goat	Ex	-	SM4 acoustic
Ovis aries	Domesticated Sheep	Ex	-	SM4 acoustic
Chalinolobus gouldii	Gould's Wattled Bat	P	-	SM4 Bat
Chalinolobus morio	Chocolate Wattled Bat	P	-	SM4 Bat
Myotis macropus	Southern Myotis	V	-	SM4 Bat. Potential recording.

Species Name	Common Name	*BC Act	+EPBC Act	Notes
Nyctophilus sp.		V	V	SM4 Bat. Unknown *Nyctophilus* species recorded. Three species potentially occur in the study area, including: *N. geoffroyi*; *N. gouldi*; and the threatened *N. corbeni*. *N. corbeni* is an Ecosystem Credit Species.
Scotorepens balstoni	Western Broad-nosed Bat	P	-	SM4 Bat
Scotorepens greyii	Little Broad-nosed Bat	P	-	SM4 Bat
Scotorepens orion	Eastern Broad-nosed Bat	P	-	SM4 Bat
Vespadelus darlingtoni	Large Forest Bat	P	-	SM4 Bat
Vespadelus vulturnus	Little Forest Bat	P	-	SM4 Bat
Austronomus australis	White-striped Free-tailed Bat	P	-	SM4 Bat
Ozimops petersi	Inland Free-tailed Bat	P	-	SM4 Bat
Ozimops planiceps	South-eastern Free-tailed Bat	P	-	SM4 Bat
Ozimops ridei	Ride's Free-tailed Bat	P	-	SM4 Bat
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	SM4 Bat. Call not positive. Balance! Environmental advised "it is considered very unlikely that the species is present in the study area" (see full report in **Appendix H**)

BAM Plot – Field Survey Datasheets

12 Superb Parrots

BAM Plot - Field Survey Sheet

Page 1 of ( )

Date 19/8/14	Survey Name MILBRAE		
Recorders		Plot ID # STR01	Zone ID
Photo #		Plot dimensions 20 x 50	
Datum	Zone	Plot bearing along midline 179	
Easting 149°35'07.8" E	Northing 34°50'07.9" S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type 70, White Cypress Pine	Condition state Mod.

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m (6) | 10 x 40 m | Sum values*

Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m (3) | 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) –	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) –	Record stems for living trees only, and for all species
30 - 49	(+/-) –	For multistemmed trees, record only the largest stem
20 - 29	(+/-) ✓	Presence of <5cm stems records regeneration
10 - 19	(+/-) ✓	Record # trees with hollows, not number of hollows
5 - 9	(+/-) ✓	Count as one stem where tree is multistemmed
< 5	(+/-) ✓	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows		Total #
0	<20cm	0
	>20cm**	
Length of logs		Total (m) 0

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	80	40	40	70	70	
	Bare ground	–	–	–	5	5	
	Cryptogam	–	50	50	10	10	
	Rock	20	10	10	15	15	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	2	O	Microrelief
Cultivation	0		Slope Mid Slope
Grazing (native / stock)	2	R	Aspect
Soil erosion	1	R	Soil surface texture Rocky loam
Firewood removal	0		Soil colour brown
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	2	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes Upper layer of Cypress. Mid layer absent. Ground layer of native + exotic forbs. Grasses very sparse.

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BAM Plot - Field Survey Sheet

Page 2 of ( )

Date 29/8/19	Survey Name MILBRAE				
Recorders		Plot ID # STR01		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Callitris glaucophylla	70			
	Lomandra filiformis	0.5	100		
	Arctotheca calendula	20		E	
	Microlaena stipoides	0.5	200		
	Aristida jerichoensis	0.1	50		
	Erodium crinitum	0.5	50		
	Sida corrugata	0.1	10		
	Ptilotus spathulatus	0.1	5		
	Monachather paradoxus	0.1	50		
	Daucus	0.1	100		
	Calotis hispidula	0.5	200		
	Stuartina muelleri	0.1	100		
	Hypochaeris glabra	0.1	100		
	Rhodanthe pygmaea	0.1	50		
	Medicago polymorpha	0.5	200		
	Oxalis perennans	0.1	100		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. Genus sp1, Genus sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

EH - Version 1.1 - Date 1/11/2017

BAM Plot - Field Survey Sheet

Page 1 of ( )

Date 29/8/19	Survey Name MILBRAE		
Recorders JC		Plot ID # STR02	Zone ID
Photo #		Plot dimensions 20x50	
Datum	Zone	Plot bearing along midline 320	
Easting 146°35'09.6" E	Northing 34°50'07.7" S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point). Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type 70 White Cypress	Condition state Poor

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m | 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) –	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) –	Record stems for living trees only, and for all species
30 - 49	(+/-) –	For multistemmed trees, record only the largest stem
20 - 29	(+/-) ✓	Presence of <5cm stems records regeneration
10 - 19	(+/-) –	Record # trees with hollows, not number of hollows
5 - 9	(+/-) –	Count as one stem where tree is multistemmed
< 5	(+/-) ✓	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows 0	<20cm	Total # 0
	>20cm**	
Length of logs		Total (m) 8

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	10	5	20	20	30	
	Bare ground	50	60	10	30	20	
	Cryptogam	–	–	5	10	10	
	Rock	–	–	5	5	15	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	3	O	Microrelief
Cultivation	0		Slope Lower s/lope
Grazing (native / stock)	2	R	Aspect
Soil erosion	0		Soil surface texture loam
Firewood removal	0		Soil colour red-brown
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	3	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes Very sparse upper layer. No shrubs. Mostly exotic grass ground layer.

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BAM Plot - Field Survey Sheet

Page 2 of ( )

Date 27/8/19	Survey Name MILBRAE				
Recorders JC		Plot ID # STR02		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Callitris glaucophylla	5			
	Arctotheca calendula	60		E	
	Medicago polymorpha	10		E	
	Erodium cirrhitum	5			
	Lomandra filiformis	0.1	20		
	Vittadinia cuneata	0.1	5		
	Rhodanthe pygmaea	0.1	50		
X	Austrodanthonia ~~sp~~ eriantha.	5			
	Calotis hispidula	0.1	100		
	Sida cunninghamii	0.1	5		
	Microlaena stipoides	0.1	50		
	Echium plantagineum	0.5	20	E	
	Erodium	0.5	100	E	
	Stuartina muelleri	0.1	150		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. Genus sp1, Genus sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

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BAM Plot - Field Survey Sheet

Page 1 of ( )

Date 29/8/19	Survey Name MILBRAE		
Recorders JC		Plot ID # STR03	Zone ID
Photo #		Plot dimensions 20x50	
Datum	Zone	Plot bearing along midline 34°	
Easting 34°50'05.5"	Northing 34°50'05.4"	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type 70 White Cypress	Condition state Mod.

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m | 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) —	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) 1	Record stems for living trees only, and for all species
30 - 49	(+/-) —	For multistemmed trees, record only the largest stem
20 - 29	(+/-) —	Presence of <5cm stems records regeneration
10 - 19	(+/-) ✓	Record # trees with hollows, not number of hollows
5 - 9	(+/-) ✓	Count as one stem where tree is multistemmed
< 5	(+/-) ✓	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows	<20cm	Total #
0	>20cm**	0

Length of logs	Total (m)
	0

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots)

Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	40	50	55	10	50	
	Bare ground	~~105~~	5	20	30	30	
	Cryptogam	5	20	20	5	0	
	Rock	50	20	5	5	0	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	2	0	Microrelief
Cultivation	0		Slope Mid slope
Grazing (native / stock)	2	R	Aspect
Soil erosion	0		Soil surface texture Rocky loam
Firewood removal	0		Soil colour red-brown
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off.
Storm damage	0		Distance to nearest water
Weediness	2	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes As for STR01

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BAM Plot - Field Survey Sheet

Page 2 of ( )

Date 29/8/19	Survey Name MILBRAE				
Recorders JC		Plot ID # STR03		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Callitris glaucophylla	70			
	Hakea (limited)	5			
	Stuartina muelleri	0.1	100		
	Arctotheca calendula	40		E	
	Lomandra filiformis	0.5	100		
	Wurmbea sp	0.1	10		
	Erodium cinitum	0.5	100		
	Monoclathes paradoxus	0.5	100		
	Microlaena stipoides	0.1	50		
*	Austrodanthonia sp triantha	0.1	100		
	Coldtis hispidula	0.1	100		
	Oxalis perennans	0.1	100		
	Goodenia heterophylla	0.1	50		
	Rhodanthe pygmaea	0.1	100		
*	Elymus sp. scabber	0.1	20		
	Cirsium vulgare	0.1	5		
	Bromus sp	0.1	50	E	
	Medicago polymorpha	5		E	
*	Daucus glochidiatus	0.1	50		
	Echium plantagineum	0.5	20	E	
	Sida corrugata	0.1	5		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. Genus sp1, Genus sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

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BAM Plot - Field Survey Sheet

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Date 29/8/19	Survey Name		
Recorders JC		Plot ID # STR04	Zone ID
Photo #		Plot dimensions 20x50	
Datum	Zone	Plot bearing along midline 310°	
Easting 146°35'07.5" E	Northing 34°50'00.6" S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point). Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Grey Box 10	Condition state Mod.

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m^2)		
Dimensions (circle applicable size) 20 x 20 m	10 x 40 m	Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m^2)			
Dimensions (circle applicable size) 20 x 50 m, 10 x 100 m			
Tree stem DBH (cm)			Notes on function attributes:
>80	(#)	—	Stem size class records # large trees (cf. benchmark)
50 - 79	(#)	2	Record stems for living trees only, and for all species
30 - 49	(+/-)	✓	For multistemmed trees, record only the largest stem
20 - 29	(+/-)	✓	Presence of <5cm stems records regeneration
10 - 19	(+/-)	✓	Record # trees with hollows, not number of hollows
5 - 9	(+/-)	✓	Count as one stem where tree is multistemmed
< 5	(+/-)	✓	Hollow bearing stem may be a dead stem (incl. stag)
# Trees with hollows 0		<20cm / >20cm**	Total # 0
Length of logs (tally marks)			Total (m) 87

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) — Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	70	50	50	80	70	
	Bare ground	20	10	10	10	20	
	Cryptogam	0	10	10	5	0	
	Rock	10	30	30	5	10	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform	
Clearing (incl. logging)	2	0	Microrelief	
Cultivation	0		Slope	Upper slope
Grazing (native / stock)	2	R	Aspect	
Soil erosion	0		Soil surface texture	Rocky clay loam
Firewood removal	0		Soil colour	red
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage	run off
Storm damage	0		Distance to nearest water	
Weediness	1	R	Distance to nearest rock outcrop /cave	

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe
Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes: Upper layer of Grey Box + white Cypress. Mid layer of thickening cypress. Very sparse ground layer.

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BAM Plot - Field Survey Sheet

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Date 29/8/19	Survey Name MILBRAE				
Recorders JL.		Plot ID # STR04		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Eucalyptus microcarpa	25			
	Callitris glaucophylla	50			
	Einadia nutans	1	50		
	Microlaena stipoides	0.5	50		
	Cabotia hispidula	0.1	50		
	Enteropogon acicularis	0.1	20		
	Lomandra filiformis	0.1	100		
*	Atriplex sp. (Chenopodium desertorum)	0.1	20		
	Sida corrugata	0.1	10		
	Rhodanthe pygmaea	0.1	50		
	Thyridolepis mitchelliana	0.1	50		
	Arctotheca calendula	1	200	E	
*	Austrodanthonia setacea	0.1	50		
	Stuartina muelleri	0.1	50		
	Hypochaeris glabra	0.5	200	E	
	Aristida jerichoensis	0.5	50		
	Brassica tournefortii	1	200	E	
	Cheilanthes sieberi	0.1	20		
*	Daucus glochidiatus	0.1	100		
	Austrostipa scabra	0.1	100		
	Goodenia heterophylla	0.1	100		
	Calandrinia sp.	0.1	20		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. Genus sp1, Genus sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

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BAM Plot - Field Survey Sheet

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Date 19/8/17	Survey Name MILBRATE		
Recorders		Plot ID # STR05	Zone ID
Photo #		Plot dimensions 20x50	
Datum	Zone	Plot bearing along midline 92	
Easting 148 35'08.2"E	Northing 34°49'59.3" S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Grey Box 90	Condition state Mod

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m | 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) –	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) –	Record stems for living trees only, and for all species
30 - 49	(+/-) ✓	For multistemmed trees, record only the largest stem
20 - 29	(+/-) ✓	Presence of <5cm stems records regeneration
10 - 19	(+/-) ✓	Record # trees with hollows, not number of hollows
5 - 9	(+/-) ✓	Count as one stem where tree is multistemmed
< 5	(+/-) ✓	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows	<20cm	Total #
0	>20cm**	0
Length of logs		Total (m) 5

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots)

Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	60	85	85	95	40	
	Bare ground	30	5	0	5	50	
	Cryptogam	5	0	5	0	5	
	Rock	5	10	10	0	5	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	1	0	Microrelief
Cultivation	0		Slope Mid slope
Grazing (native / stock)	2	R	Aspect
Soil erosion	0		Soil surface texture Stony clay-loam
Firewood removal	0		Soil colour red
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	1	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

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BAM Plot - Field Survey Sheet

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Date 29/8/19	Survey Name MILBRAE				
Recorders		Plot ID # STR05		Zone ID	
GF code	**Genus species** (tick if photographed or sample taken)	**Cover %**	**Abund** (count)	**N, E, HTE**	Stratum
	Eucalyptus microcarpa	25			
	Callitris glaucophylla	60			
	Stackhousia muelleri	1	200		
	Rhodanthe pygmaea	1	300		
	Hypochaeris glabra	1	300	E	
	Cheilanthes sieberi	0.1	50		
	Arctotheca calendula	5		E	
*	A. daisy Actinobole uliginosum	0.1	20		
	Calotis hispidula ~~uliginosum~~	1	300		
	Convolvulus filiformis	0.1	100		
	Calandrinia sp.	0.1	200		
	Ptilotus spathulatus	0.1	20		
	Bulbine alata	0.1	50		
	Erodium crinitum	0.1	50		
	Plantago ~~sp~~ debilis	0.1	20		
*	Elymus scaber	0.1	50		
	Microlaena stipoides	0.5	100		
*	Wurmbea dioica	0.1	20		
✓	Wahlenbergia ~~sp~~ communis	0.1	10		
	Einadia nutans	0.1	5		
	Dichondra repens	0.1	5		
	Enteropogon acicularis	0.1	10		
	~~Exot~~ Maireana enchylaenoides	0.1	20		
	Sonchus sp.	0.1	20	E	
	Chrysocephalum apiculatum	0.1	5		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2 m, 5% = 4x5m, 25% = 10x10m

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BAM Plot - Field Survey Sheet

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Date 29/8/19	Survey Name MILBRAE		
Recorders		Plot ID # STR06	Zone ID
Photo #		Plot dimensions 20x50	
Datum	Zone	Plot bearing along midline 238	
Easting 146°35'10.5"E	Northing 34°50'02.4"S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Grey Box	80 Condition state Moderate

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m | 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#)	Stem size class records # large trees (cf. benchmark)
50 - 79	(#)	Record stems for living trees only, and for all species
30 - 49	(+/-) ✓	For multistemmed trees, record only the largest stem
20 - 29	(+/-) ✓	Presence of <5cm stems records regeneration
10 - 19	(+/-) ✓	Record # trees with hollows, not number of hollows
5 - 9	(+/-) ✓	Count as one stem where tree is multistemmed
< 5	(+/-)	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows		Total #
0	<20cm	
	>20cm**	0

Length of logs	Total (m)
	0

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	50	90	60	60	50	
	Bare ground	30	5	10	0	20	
	Cryptogam	5	0	10	5	10	
	Rock	0	5	20	35	20	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	2	0	Microrelief
Cultivation	0		Slope Lower slope
Grazing (native / stock)	2	R	Aspect
Soil erosion	0		Soil surface texture Clay - loam
Firewood removal	0		Soil colour red - brown
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	2	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

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BAM Plot - Field Survey Sheet

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Date 29/8/19	Survey Name MILBRAE				
Recorders JC		Plot ID # STR06		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Callitris glaucophylla	50			
	Eucalyptus microcarpa	10			
	Arctotheca calendula	25		E	
	Echium plantagineum	0.1	20	E	
	Calotis hispidula	5			
	Aristida jerichoensis	0.5	50		
	Chrysanthes sieberi	0.1	50		
	Sida corrugata	0.1	20		
	~~Forst~~ Maireana cochlaeoides	0.1	100		
	Einadia nutans	0.1	10		
4	Austrodanthonia setacea	0.5	100		
	Stenotina muelleri	0.5	100		
	Calandrinia sp	0.1	100		
	Phlebus spathulatus	0.1	50		
	Lomandra filiformis	0.1	50		
	Enteropogon acicularis	0.1	50		
	Austrostipa scabra	0.1	50		
	Erodium cohitum	1	50		
	Rhodanthe pygmaea	0.1	20		
	Maireana sp	1	200		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

IOY - Version 1.1 - Date 1/12/2017

BAM Plot - Field Survey Sheet

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Date 29/8/19	Survey Name MILBRAE		
Recorders X.		Plot ID # STR07	Zone ID
Photo #		Plot dimensions 20 x 50	
Datum	Zone	Plot bearing along midline 220°	
Easting 146°34'54.0" E	Northing 34°49'58.7" S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Derived Grassland 250	Condition state Poor

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m (10 x 40 m)

		Sum values*
Native Richness (count of native species)	Trees	0
	Shrubs	0
	Grasses etc	6
	Forbs	8 8 7
	Ferns	0
	Other	0
Cover (sum of cover of natives species)	Trees	0
	Shrubs	0
	Grasses etc	0.6%
	Forbs	6.5%
	Ferns	0
	Other	0
High threat weed cover		0

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m (10 x 100 m)

Tree stem DBH (cm)		
>80	(#)	~
50 - 79	(#)	~
30 - 49	(+/-)	~
20 - 29	(+/-)	~
10 - 19	(+/-)	~
5 - 9	(+/-)	~
< 5	(+/-)	~

Notes on function attributes:
- Stem size class records # large trees (cf. benchmark)
- Record stems for living trees only, and for all species
- For multistemmed trees, record only the largest stem
- Presence of <5cm stems records regeneration
- Record # trees with hollows, not number of hollows
- Count as one stem where tree is multistemmed
- Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows		Total #
0	<20cm	0
	>20cm**	
Length of logs		Total (m) 0

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots)

Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	20	5	20	5	5	11
	Bare ground	50	70	70	20	20	
	Cryptogam	0	5	0	20	20	
	Rock	30	5	0	0	0	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	3	0	Microrelief
Cultivation	0		Slope Lower slope
Grazing (native / stock)	2	R	Aspect
Soil erosion	0		Soil surface texture clay-loam
Firewood removal	0		Soil colour red
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	3	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes Very sparse grass cover. Ground layer mostly of exotic forbs, with some native species present.

BH - Version 1.1 - Date 1/12/2017

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N 6145400

BAM Plot - Field Survey Sheet

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Date 29/8/19	Survey Name MILBRAE				
Recorders		Plot ID # STR07		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	~~Calend~~ Arctotheca calendula	60		E ✓	
FG	Rhodanthe pygmaea	5			
	Echium plantagineum	0.5		E ✓	
FG	~~Forb~~ Maireana enchylaenoides	0.5	300		
FG	Calotis hispidula	0.5	200		
FG	Lined daisy (photo) Isoetopsis graminifolia	0.1	100		
FG	Sida corrugata	0.1	10		
✓ GG	Austrodanthonia sp. setacea	0.1	100		
GG	Microlaena stipoides	0.1	100		
GG	Enteropogon acicularis	0.1	100		
GG	Bothriochloa macra	0.1			
GG	Aristida jerichoensis	0.1			
✓ FG	Goodenia	0.1	1		
✓ FG	Ptilotus spathulatus	0.1	50		
✓ FG	Vittadinia bottled leaf	0.1	5		
	Medicago polymorpha	5		E	
GG	Chloris truncata	0.1	20		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

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BAM Plot - Field Survey Sheet

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Date 29/8/19	Survey Name MILBRAE		
Recorders JL		Plot ID # STR08	Zone ID
Photo #		Plot dimensions 20x50	
Datum	Zone	Plot bearing along midline 141°	
Easting 146°34'57.7" E	Northing 34°50'00.2" S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Derived Grassland 250	Condition state Poor

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x (20) m | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 (x 50) m | 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) —	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) —	Record stems for living trees only, and for all species
30 - 49	(+/-) —	For multistemmed trees, record only the largest stem
20 - 29	(+/-) —	Presence of <5cm stems records regeneration
10 - 19	(+/-) —	Record # trees with hollows, not number of hollows
5 - 9	(+/-) —	Count as one stem where tree is multistemmed
< 5	(+/-) ✓	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows		Total #
0	<20cm	0
	>20cm**	
Length of logs		Total (m) 0

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots)

Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	50	20	20	5	5	
	Bare ground	20	70	70	70	70	
	Cryptogam	10	5	5	5	5	
	Rock	20	5	5	5	5	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	3	O	Microrelief
Cultivation	0		Slope lower slope
Grazing (native / stock)	2	R	Aspect
Soil erosion	0		Soil surface texture stony clay - loam
Firewood removal	0		Soil colour red
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	L	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

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BAM Plot - Field Survey Sheet

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Date 27/8/17	Survey Name MILBRAE				
Recorders		Plot ID # STR08		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Rhodanthe pygmaea	5			
	Arctotheca calendula	50		E	
	Calotis hispidula	1	500		
	Echium plantagineum	1	50	E	
	~~Forb 1~~ Meiriana emilyiaenoides	0.5	200		
	Bulbine alata	0.1	20		
*	Phlotus spathulatus	0.1	50		
	STR07 daisy Isotropis grammifolia	0.1	200		
	Sida corrugata	0.1	10		
	Enteropogon acicularis	0.1	20		
	Bothriochloa macra	0.1	20		
	Microlaena stipoides	0.1	50		
	Hordeum vulgare	0.1	50		
*	Hypochaeris glabra	0.1	10		
	Chloris truncata	0.1	20		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. Genus sp1, Genus sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

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BAM Plot - Field Survey Sheet

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Date 29/8/19	Survey Name MILBRAE		
Recorders		Plot ID # STR09	Zone ID
Photo #		Plot dimensions 20x50	
Datum	Zone	Plot bearing along midline 338	
Easting 146° 35' 02.7" E	Northing 34° 50' 09.4" S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point). Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Dwyers RG 185	Condition state Moderate

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20x50 m | 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) –	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) –	Record stems for living trees only, and for all species
30 - 49	(+/-) 3	For multistemmed trees, record only the largest stem
20 - 29	(+/-) ✓	Presence of <5cm stems records regeneration
10 - 19	(+/-) ✓	Record # trees with hollows, not number of hollows
5 - 9	(+/-) –	Count as one stem where tree is multistemmed
< 5	(+/-) ✓	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows		Total #
	<20cm	
	>20cm**	
Length of logs ///		Total (m)

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots)

Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	5	5	60	50	5	
	Bare ground	70	70	5	5	70	
	Cryptogam	10	0	10	10	10	
	Rock	10	20	25	25	10	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	2	O	Microrelief
Cultivation	0		Slope Crest
Grazing (native / stock)	3	R	Aspect
Soil erosion	0		Soil surface texture Rocky clay - loam
Firewood removal	0		Soil colour Red
Fire (growth stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	2	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes Intact upper layer. Mid layer sparse-absent, ground layer exotic + native forbs. Weedy. Heavily grazed by goats

BDS Version 1.1 Date 1/12/2017

BAM Plot - Field Survey Sheet

Page 2 of ( )

Date 27/8/19	Survey Name MIGRATE				
Recorders		Plot ID # STR09		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Eucalyptus dwyeri	30			
	Callitris glaucophylla	10			
	~~Pomax~~ Thyridolepis mitchelliana	0.5	150		
	Calotis hispidula	0.5	200		
	Arctotheca calendula	60		E	
	Microlaena stipoides	0.1	100		
	~~Forb~~ Mairiana enchylaenoides	0.1	200		
	Erodium crinitum	0.1	20		
	Austrostipa scabra	0.1	50		
	Calandrinia sp.	0.1	100		
	Goodenia hederacea	0.1	50		
	Rhodanthe pygmaea	0.1	100		
	STR07 Dwing Isoetopsis graminifolia	0.1	10		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions)
Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

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BAM Plot - Field Survey Sheet

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Date 29/8/19	Survey Name MILBRAE		
Recorders		Plot ID # STR10	Zone ID
Photo #		Plot dimensions 20x50	
Datum	Zone	Plot bearing along midline 353	
Easting 146°34'55.6" E	Northing 34°50'08.9"S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Grey Box 80	Condition state Poor

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20x20 m | 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20x50 m | 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) 1	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) 1	Record stems for living trees only, and for all species
30 - 49	(+/-) –	For multistemmed trees, record only the largest stem
20 - 29	(+/-) –	Presence of <5cm stems records regeneration
10 - 19	(+/-) –	Record # trees with hollows, not number of hollows
5 - 9	(+/-) –	Count as one stem where tree is multistemmed
< 5	(+/-) –	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows		Total #
0	<20cm	
	>20cm**	0

Length of logs	Total (m)
IIII IIII I	11

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots)

Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	10	5	60	50	5	
	Bare ground	30	60	20	40	70	
	Cryptogam	0	10	5	0	5	
	Rock	5	5	10	0	20	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	2	O	Microrelief
Cultivation	0		Slope lower slope
Grazing (native / stock)	3	R	Aspect
Soil erosion	0		Soil surface texture clay - loam
Firewood removal	0		Soil colour red
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage run off
Storm damage	0		Distance to nearest water
Weediness	2	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes Upper layer. No mid. Exotic forb ground layer. No regen. d-upper layer

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BAM Plot - Field Survey Sheet

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Date 29/8/19	Survey Name MILBRAE				
Recorders		Plot ID # STR10		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Callitris glaucophylla	10			
	Eucalyptus microcarpa	1	0		
	Arctotheca calendula	70		E	
	Echium plantagineum	1	50	E	
	Erodium cnbi?tum	1	100		
	Rhodanthe pygmaea	0.5	100		
	Calotis hispidula	1	200		
	Microlaena stipoides	1	200		
	Bulbine alata	0.1	50		
	Austrostipa scabra	0.1	50		
	Oxalis perennans	0.5	150		
	Enteropogon acicularis	0.1	50		
	Maireana enchylaenoides	0.1	50		
	Phlebus spathulatus	0.1	10		
	Sida corrugata	0.1	5		
	Hypochaeris glabra	0.1	100		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

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BAM Plot - Field Survey Sheet

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Date 29/8/19	Survey Name MILBRAE		
Recorders		Plot ID # STR11	Zone ID
Photo #		Plot dimensions 20x50	
Datum 4017 94.	Zone	Plot bearing along midline 132	
Easting 146°34'56.6 E	Northing 34°50'06.9 S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Grey Box 80	Condition state Poor

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m; 10 x 40 m

		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m; 10 x 100 m

Tree stem DBH (cm)		Notes on function attributes:
>80	(#) ~	Stem size class records # large trees (cf. benchmark)
50 - 79	(#) ~	Record stems for living trees only, and for all species
30 - 49	(+/-) ~	For multistemmed trees, record only the largest stem
20 - 29	(+/-) ~	Presence of <5cm stems records regeneration
10 - 19	(+/-) ~	Record # trees with hollows, not number of hollows
5 - 9	(+/-) ~	Count as one stem where tree is multistemmed
< 5	(+/-) ~	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows	<20cm	Total #
0	>20cm**	0

Length of logs	Total (m)
	0

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	0	10	10	5	20	
	Bare ground	60	60	50	60	50	
	Cryptogam	20	0	10	0	10	
	Rock	20	30	20	0	0	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	2	0	Microrelief
Cultivation	0		Slope
Grazing (native / stock)	3	R	Aspect
Soil erosion	0		Soil surface texture
Firewood removal	0		Soil colour
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage
Storm damage	0		Distance to nearest water
Weediness	2	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes Ik for STR10.

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BAM Plot - Field Survey Sheet

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Date 29/8/19	Survey Name MILBRAE				
Recorders	JC	Plot ID # STR11		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	E. microcarpa	1	0		
	Arctotheca calendula	50		E	
	Thyridolepis mitchelliana	0.1	50		
	Microlaena stipoides	0.5	200		
	Austrostipa scabra	0.5	200		
	Rhodanthe pygmaea	0.1	200		
	Calotis hispidula	1	300		
	Lomandra filiformis	0.1	20		
	Pilotus spathulatus	0.1	20		
	Echium plantagineum	0.1	20	E	
	Hordeum vulgare	0.1	50	E	
	Goodenia hederacea	0.1	50		
	~~Fest~~ Maireana enchylaenoides	0.1	100		
	Brachychiton populneus	1	0		
	Sida corrugata	0.1	5		

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

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BAM Plot - Field Survey Sheet

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Date 29/8/17	Survey Name MILBRAE		
Recorders JC		Plot ID # STR12	Zone ID
Photo #		Plot dimensions 20x50	
Datum	Zone	Plot bearing along midline 247°	
Easting 146°35'09.9" E	Northing 34°30'10.7" S	Record magnetic bearing along midline from 0 m point	

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	
Subregion	
Likely Vegetation Class	
Plant Community Type Dwyer 1835	Condition state Poor

Floristics plot is centred on the midline, at 0 m point, 10 m either side

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Composition / Structure plot (400m²)		
Dimensions (circle applicable size) 20 x 20 m / 10 x 40 m		Sum values*
Native Richness (count of native species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
Cover (sum of cover of natives species)	Trees	
	Shrubs	
	Grasses etc	
	Forbs	
	Ferns	
	Other	
High threat weed cover		

*These values summarise the floristic data for input into BAM calculator

BAM Function plot (1000m²)			
Dimensions (circle applicable size) 20 x 50 m / 10 x 100 m			
Tree stem DBH (cm)		Notes on function attributes:	
>80	(#) –	Stem size class records # large trees (cf. benchmark)	
50 - 79	(#) –	Record stems for living trees only, and for all species	
30 - 49	(+/-) 2	For multistemmed trees, record only the largest stem	
20 - 29	(+/-) ✓	Presence of <5cm stems records regeneration	
10 - 19	(+/-) ✓	Record # trees with hollows, not number of hollows	
5 - 9	(+/-) ✓	Count as one stem where tree is multistemmed	
< 5	(+/-) –	Hollow bearing stem may be a dead stem (incl. stag)	
# Trees with hollows	<20cm		Total #
	>20cm**		
Length of logs			Total (m)

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	Litter	80	30	10	40	30	
	Bare ground	5	20	15	10	10	
	Cryptogam	10	5	5	10	5	
	Rock	5	20	70	40	30	

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)	2	O	Microrelief
Cultivation	0		Slope Upper slope
Grazing (native / stock)	2	R	Aspect
Soil erosion	0		Soil surface texture Rocky clay loam
Firewood removal	0		Soil colour red - brown
Fire (ground stratum, mid, canopy burnt?)	0		Site drainage non det.
Storm damage	0		Distance to nearest water
Weediness	2	R	Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

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BAM Plot - Field Survey Sheet

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Date 29/8/19	Survey Name MIGRATE				
Recorders JL.		Plot ID # STR12		Zone ID	
GF code	Genus species (tick if photographed or sample taken)	Cover %	Abund (count)	N, E, HTE	Stratum
	Eucalyptus dwyeri	40			
	Callitris glaucophylla	25			
	Acacia calendulae	40		E	
	Indigofera australis	1	1		
	~~Forb~~ Maireana enchylaenoides	0.5	100		
	Erodium crinitum	0.5	50		
✓	Vulpia ~~myuros~~	1 ~~2~~	~~3~~00	E	
	Bulbine glauca	0.1	50		
	Lomandra bracteata	0.1	10		
	Enteropogon acicularis	0.1	20		
#	Bromus sp	0.1	50	E	
	Carex appressa	0.1	100		
	Hypochaeris glabra	1	200	E	
	Microlaena stipoides	0.1	200		
	Hordeum vulgare	0.1	50	E	

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifyer e.g. Genus sp1, Genus sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

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Appendix D: BAM Biodiversity Credit Report

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id 00017727/BAAS19069/20/00021558	Proposal Name Strontian_revised_19082020	BAM data last updated * 22/02/2021
Assessor Name Emma Gray	Assessor Number BAAS19069	BAM Data version * 37
Proponent Names	Report Created 15/03/2021	BAM Case Status Finalised
Assessment Revision 0	Assessment Type Part 4 Developments (General)	Date Finalised 15/03/2021
BOS entry trigger BOS Threshold: Area clearing threshold	* 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
Nil		
Species		
Diuris sp. (Oaklands, D.L. Jones 5380) / Oaklands Diuris		

Additional Information for Approval

BAM Biodiversity Credit Report (Like for like)

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami / Glossy Black-Cockatoo
Grantiella picta / Painted Honeyeater
Haliaeetus leucogaster / White-bellied Sea-Eagle

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
70-White Cypress Pine woodland on sandy loams in central NSW wheatbelt	Not a TEC	0.0	0	1	1
185-Dwyer's Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion	Not a TEC	1.0	0	16	16
80-Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Not a TEC	2.9	0	9	9

NSW GOVERNMENT

BAM Biodiversity Credit Report (Like for like)

70-White Cypress Pine woodland on sandy loams in central NSW wheatbelt

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Floodplain Transition Woodlands This includes PCT's: 56, 70, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=50% and <70%	70_70_Moderate	No	1	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

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

Class	Trading group	Zone	HBT	Credits	IBRA region
Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	80_80_Moderate	No	9	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

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	Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	80_80_Poor	No	0	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
185-Dwyer's Red Gum - White Cypress Pine - Currawang shrubby woodland mainly in the NSW South Western Slopes Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Inland Rocky Hill Woodlands This includes PCT's: 104, 106, 122, 175, 176, 177, 178, 180, 184, 185, 186, 188, 218, 239, 256, 257, 258, 292, 317, 318, 319, 328, 329, 332, 334, 357, 424, 427, 439	Inland Rocky Hill Woodlands <50%	185_185_Moderate	No	16	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

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BAM Biodiversity Credit Report (Like for like)

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Austrostipa metatoris / A spear-grass	**70_70_Moderate**	0.0	1.00
Austrostipa wakoolica / A spear-grass	**70_70_Moderate, 80_80_Moderate, 80_80_Poor**	3.0	23.00
Cercartetus nanus / Eastern Pygmy-possum	**70_70_Moderate, 80_80_Moderate, 80_80_Poor**	2.7	21.00
Diuris sp. (Oaklands, D.L. Jones 5380) / Oaklands Diuris	**80_80_Moderate, 80_80_Poor**	2.9	32.00
Lepidium monoplocoides / Winged Peppercress	**80_80_Moderate, 80_80_Poor**	2.9	22.00
Petaurus norfolcensis / Squirrel Glider	**70_70_Moderate, 80_80_Moderate, 80_80_Poor**	1.3	15.00
Tylophora linearis / Tylophora linearis	**70_70_Moderate**	0.0	1.00

Credit Retirement Options

Like-for-like credit retirement options

Austrostipa metatoris / A spear-grass	Spp	IBRA subregion
	Austrostipa metatoris / A spear-grass	Any in NSW
Austrostipa wakoolica / A spear-grass	Spp	IBRA subregion
	Austrostipa wakoolica / A spear-grass	Any in NSW

NSW GOVERNMENT

BAM Biodiversity Credit Report (Like for like)

Cercartetus nanus / Eastern Pygmy-possum	Spp	IBRA subregion
	Cercartetus nanus / Eastern Pygmy-possum	Any in NSW
Diuris sp. (Oaklands, D.L. Jones 5380) / Oaklands Diuris	Spp	IBRA subregion
	Diuris sp. (Oaklands, D.L. Jones 5380) / Oaklands Diuris	Any in NSW
Lepidium monoplocoides / Winged Peppercress	Spp	IBRA subregion
	Lepidium monoplocoides / Winged Peppercress	Any in NSW
Petaurus norfolcensis / Squirrel Glider	Spp	IBRA subregion
	Petaurus norfolcensis / Squirrel Glider	Any in NSW
Tylophora linearis / Tylophora linearis	Spp	IBRA subregion
	Tylophora linearis / Tylophora linearis	Any in NSW

Appendix E: Habitat Suitability Assessment

Assessment of presence/absence of threatened species predicted to occur by the BAM calculator

Ecosystem Credit Species

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V		Yes	The Dusky woodswallow occurs throughout most of NSW however is sparsely scattered in, or largely absent from, much of the upper western region. The majority of breeding occurs on the western slopes of the Great Dividing Range. Primarily inhabits dry, open eucalypt forests and woodlands, including mallee associations, with an open - sparse understory of eucalypt saplings and acacias, and understory of grasses, sedges and fallen woody debris. This species is sometimes found in farmland usually at the edges or forests or woodlands. The species migrates after breeding, to the north of NSW and south-eastern QLD, generally between March and May and do not return until breeding the following spring. Nesting occurs in trees or shrubs and is generally associated within an abundance of invertebrate food near watercourses. **Assumed present - The species is known to occur within the Lower Slopes and has no geographic restrictions within this region. The species is known to occur within the vegetation type; PCT 70, 80 and 185. There are four records of the species within 10 km of the subject land.**	Assumed Present
Calyptorhynchus lathami	Glossy Black-Cockatoo (foraging)	V		No	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia. Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, *Allocasuaraina diminuta*, and *A. gymnathera*. Belah is also utilised and may be a critical food source for some populations. **Absent - Habitat constraint – *Allocasuarina* and *Casuarina sp*. not present**	Absent – habitat constraint
Certhionyx variegatus	Pied Honeyeater	V		No	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.	Assumed present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
					Assumed present - The species generally associated with mistletoe species, none of which were recorded within the subject land. The species is known to occur within the vegetation type; PCT 70, 80 and 185.	
Chalinolobus picatus	Little Pied Bat	V		No	The Little-Pied Bat is found in inland Queensland and NSW (including Western Plains and slopes) extending slightly into South Australia and Victoria. Occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress pine forest and mallee and Bimbil box woodlands. Roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings. Can tolerate high temperatures and dryness but need access to nearby open water. **Assumed present - The species is assumed present based on PCT associations and the lack of known habitat constraints impacting use by this species. The species is known to occur within the vegetation type; PCT 70 and 185.**	Assumed Present
Chthonicola sagittata	Speckled Warbler			Yes	The Speckled Warbler has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. The species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast. There has been a decline in population density throughout its range, with the decline exceeding 40% where no vegetation remnants larger than 100ha survive. The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. **Assumed present - The species is assumed present based on PCT associations and the lack of know habitat constraints impacting use by this species. The species is known to occur within the vegetation type; PCT 70, 80 and 185. There is one record of the species within 10 km.**	Assumed Present
Circus assimilis	Spotted Harrier	V		Yes	The Spotted Harrier occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. Individuals of the species disperse widely in NSW and a comprise a single population. It is found most commonly in native grassland but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands where it preys on terrestrial mammals, birds, reptiles and occasionally insects and carrion. **Assumed present - It is known to occur within the Lower Slopes IBRA subregion. The species is known to occur within the vegetation type; PCT 70. There is one record of the species within 10 km.**	Assumed Present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
***Climacteris picumnus victoriae (BTC subspecies)**	Brown Treecreeper (eastern subspecies)	V		Yes	The eastern subspecies lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands such as the Snowy River Valley, Cumberland Plains, Hunter Valley and parts of the Richmond and Clarence Valleys. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains. **Assumed present - It is known to occur within the Lower Slopes IBRA subregion and east of the Newell Highway. The species is known to occur within the vegetation type; PCT 70. There is 30 record of the species within 10 km.**	Assumed Present
Daphoenositta chrysoptera	Varied Sittella	V		No	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland. **Assumed present - The species is assumed present based on PCT associations and the lack of know habitat constraints impacting use by this species. The species is known to occur within the vegetation type; PCT 70, 80 and 185.**	Assumed Present
Falco hypoleucos	Grey Falcon	E		No	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with occasional vagrant east of the Great Dividing Range. The population estimate is <5000 individuals. The species is believed to be extinct in area with more than 500mm rainfall in NSW. 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. It is also found near watercourses where surface attracts prey. Prey is primarily birds, especially parrots and pigeons, reptiles and mammals are also potential prey. The Grey Falcon utilises the nests of other birds of prey and ravens, usually high in living eucalypts near water or a watercourse. **Assumed present - The species is known to occur within the Lower Slopes IBRA subregion and the identified vegetation type. This species is assumed present due to it**	Assumed Present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
					utilising open areas. The species is known to occur within the vegetation type; PCT 70 and 80.	
Grantiella picta	Painted Honey-eater	V	V	No	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree/ Weeping Myall (*Acacia pendula),* Brigalow (*A. harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests. **Absent – habitat constraint - mistletoe not present at a density of greater than five mistletoes per hectare.**	Absent – habitat constraint
Haliaeetus leucogaster	White-bellied Sea-Eagle (foraging)	V		No	The White-bellied Sea-Eagle is distributed around the Australian coastline, including Tasmania, and inland along rivers and wetlands of the Murry-Darling Basin. The species' habitat is characterised by the presence of large areas of open water including larger rivers, swamps, lakes and the sea. Occurs at sites near the sea-shore, beaches, reefs, lagoons, estuaries and mangroves; and at or in the vicinity of freshwater swamps, lakes and reservoirs, billabongs and saltmarshes. Within NSW the species is widespread along the east coast and along all major inland rivers and waterways. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forests. **Breeding** requires tall open forest and woodland and swamp sclerophyll forest close to foraging habitat. Emergent eucalypts with dead emergent branches are required for nests and surveillance. The species feeds mainly on fish and freshwater turtles, though also takes waterbirds, reptiles, mammals and carrion. **Absent - Habitat constraint – Subject land not within 1 km of a river, lake, large dam, or creek, wetland and coastline**	Absent – habitat constraint
Hieraaetus morphnoides	Little Eagle (foraging)	V		Yes	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. The species occupies eucalyptus forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. **Breeding** The species nests in tall living trees within a remnant patch. The species preys on birds, reptiles and mammals, occasionally large insects and carrion. **Assumed present - The species is known to occur within the IBRA subregion of the Lower Slopes and this vegetation type and has no geographic restrictions. This species is assumed as present as there are three records within 10km of the search area and has no specific requirements that are not provided by this site. However, this site does not**	Assumed Present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
					possess any key requirements such as breeding habitat. This site is a potential foraging site. The species is known to occur within the vegetation type; PCT 70, 80 and 185.	
Hylacola cautus	Shy Heathwren	V		No	Occurs across southern Australia extending from the wheatbelt in southern Western Australia east to central NSW, including Kangaroo Island. Two subspecies occur in NSW. The first (*macrorhyncha*) is confined to central NSW between Griffith, Roto, Nymagee and West Wyalong, with most records within OEH managed reserves (including Yathong, Nombinnie, Round Hill and The Charcoal Tank Nature Reserves and Cocoparra National Park). The nominate subspecies (*cautus*) occurs in the far south west between Balranald and Trentham Cliffs (including Mallee Cliffs National Park), north into the Scotia Mallee (including Tarawi Nature Reserve and Scotia Sanctuary). This subspecies also occurs in north west Victoria and eastern South Australia (as far west as the Flinders Ranges). **Assumed present - The species is known to occur within the Lower Slopes IBRA subregion and the identified vegetation type. Within this region the species is geographically restricted to west of Wyalong, which the subject land is located. The species is known to occur within the vegetation type; PCT 185.**	Assumed Present
Lathamus discolour	Swift Parrot (foraging)			No	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Migrates to the Australian south-east mainland between February and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera,* Forest Red Gum *E. tereticornis*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens.* **Assumed present - The species is known to occur within the Lower Slopes IBRA subregion and the identified vegetation type. The species is known to occur within the vegetation type; PCT 80.**	Assumed Present
Leipoa ocellata	Malleefowl			No	Predominantly inhabit mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300 - 450 mm mean annual rainfall) areas. Utilises mallee with a spinifex understorey, but usually at lower densities than in areas with a shrub understorey. Less frequently found in other eucalypt woodlands, such as Inland Grey Box, Ironbark or Bimble Box Woodlands with thick understorey, or in other woodlands such dominated by Mulga or native Cypress Pine species.	Assumed Present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
					Assumed present - The species is known to occur within the Lower Slopes IBRA subregion and the identified vegetation type. The species is known to occur within the vegetation type; PCT 185.	
Lophochroa leadbeateri	Major Mitchell's Cockatoo (foraging)	V		No	The Major Mitchell's Cockatoo is found across the arid and semi-arid inland and, from south-western Queensland, south to north-west Victoria, through most of South Australia, north into the south-west of the Northern Territory and across to the west coast. Within NSW the species is regularly found as far east as Bourke and Griffith and occasionally further. The species occupies a wide range of treed and treeless inland habitats, always within easy reach of water. The species feeds mostly on the ground, especially on the seeds of native and exotic melons, some saltbushes, wattles and cypress pines. **Breeding** The species requires tree hollows to breed. The species is known to occur within the IBRA subregion and within this vegetation type. **Assumed present - The species is known to occur within the Lower Slopes IBRA subregion and the identified vegetation type. This species is assumed as present, as the species is known to occur within the vegetation types PCT 70, 80 and 185 and there are no habitat constraints. However, the subject land is unlikely to provide adequate foraging ground for the species due to the lack of understory species and minimal tree hollows (only one recorded within the site, which has since been excluded from the subject land).**	Assumed Present
Lophoictinia isura	Square-tailed Kite	V		No	The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. **Assumed present - The species is known to occur within the Lower Slopes IBRA subregion and the identified vegetation type. The species is known to occur within the vegetation type; PCT 70.**	Assumed Present
Melanodryas cucullate cucullata	Hooded robin			No	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places, and rarely found on the coast. It is considered a sedentary species, but local seasonal movements are possible. The south-eastern form (subspecies *cucullata*) is found from Brisbane to Adelaide and throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies *picata*. Two other subspecies occur outside NSW. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas.	Assumed Present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
					Assumed present - The species is known to occur within the Lower Slopes IBRA subregion and the identified vegetation type. The species is known to occur within the vegetation type; PCT 70, 80 and 185.	
Melithreptus gularis gularis	Black-chinned honeyeater	V		Yes	The Black-chinned Honeyeater has two subspecies, with only the nominate (*gularis*) occurring in NSW. The other subspecies (*laetior*) was formerly considered a separate species (Golden-backed Honeyeater) and is found in northern Australia between central Queensland west to the Pilbara in Western Australia. The eastern subspecies extends south from central Queensland, through NSW, Victoria into south eastern South Australia, though it is very rare in the last state. In NSW it is widespread, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Inland Grey Box (*E. microcarpa*), Yellow Box (*E. melliodora*), Blakely's Red Gum (*E. blakelyi*) and Forest Red Gum (*E. tereticornis*). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. **Assumed present - The species is known to occur within the Lower Slopes IBRA subregion and the identified vegetation type. The species is known to occur within the vegetation type; PCT 70 and 80. There is one record of the species within 10 km.**	Assumed Present
Neophema pulchella	Turquoise parrot -	V		No	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Forages quietly and may be quite tolerant of disturbance. However, if flushed it will fly to a nearby tree and then return to the ground to browse as soon as the danger has passed. Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust. **Assumed present - The species is known to occur within the Lower Slopes IBRA subregion and the identified vegetation type. The species is known to occur within the vegetation type; PCT 70, 80 and 185.**	Assumed Present
Ninox connivens	Barking owl (Foraging)	V		Yes	The Barking Owl is found throughout continental Australia except for the central arid regions. Although still common in parts of northern Australia, the species has declined greatly in southern Australia and now occurs in a wide but sparse distribution in NSW. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in	Assumed Present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
					heavily cleared habitats (e.g. western NSW) due to the higher density of prey found on these fertile riparian soils. Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as *Acacia* and *Casuarina* species. During nesting season, the male perches in a nearby tree overlooking the hollow entrance. **Assumed present - The species is known to occur within the Lower Slopes IBRA subregion and the identified vegetation type. The species is known to occur within the vegetation type; PCT 70 and 80. There is one record within 10 km.**	
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	No	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. Inhabits a variety of vegetation types, including mallee, bulloke *Allocasuarina leuhmanni* 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. Slow flying agile bat, utilising the understorey to hunt non-flying prey - especially caterpillars and beetles - and will even hunt on the ground. **Assumed present - The species is known to occur within the Lower Slopes IBRA subregion and the identified vegetation type. The species is known to occur within the vegetation type; PCT 70, 80 and 185. *Nyctophilus* species were also recorded during targeted surveys, however their call is difficult to differentiate from other species in the genus.**	Assumed Present
Pachycephala inornata	Gilbert's Whistler	V		No	The Gilbert's Whistler occurs in a range of habitats within NSW, though the shared feature appears to be a dense shrub layer. It is widely recorded in mallee shrublands, but also occurs in box-ironbark woodlands, Cypress Pine and Belah woodlands and River Red Gum forests, though at this stage it is only known to use this habitat along the Murray, Edwards and Wakool Rivers. Within the mallee the species is often found in association with an understorey of spinifex and low shrubs including wattles, hakeas, sennas and hop-bushes. In woodland habitats, the understorey comprises dense patches of shrubs, particularly thickets of regrowth *Callitris* pine. Parasitic 'cherries' (*Exocarpus* species) appear to be an important habitat component in Belah and Red Gum communities, though in the latter case other dense shrubs, such as Lignum and wattles, are also utilised. **Assumed present - The species is known to occur within the Lower Slopes IBRA subregion and the identified vegetation type. The species is known to occur within the vegetation type; PCT 70, 80 and 185.**	Assumed Present
Petroica boodang	Scarlet Robin	V		Yes	The Scarlet Robin is found from south east QLD to south east SA. It is also found in Tasmania and south west WA. Within NSW, it occurs from the coast to the inland slopes.	Assumed present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
					The species occurs within dry eucalypt forest and woodlands with an open understory of grasses and scattered shrubs. It occurs both within mature and regrowth vegetation, occasionally within mallee or wet forest communities, or in wetlands and tea-tree swamps. An important component of this habitat is the abundance of logs and fallen timber. The species predominantly occupies forests and woodlands however adults and young birds do disperse to more open habitat after breeding. In autumn and winter many Scarlet Robins live in open grassy woodlands and grasslands or grazed paddocks with scattered trees. **Foraging** The species forages from low branches or fence posts where they are able to pounce onto small invertebrates or off of tree trunks and logs. Foraging generally occurs within dry forests or woodlands. **Breeding** - Breeding requires trees or shrubs above 2m in height, often in dead branches. The species is known to occur within the IBRA subregion of the Lower Slopes and the identified vegetation type. **Assumed present** - **The species is known to occur within the IBRA subregion of the Lower Slopes and this vegetation type and has no geographic restrictions. This species is assumed as present as the species can inhabit grazed paddocks. However, the lack of logs and fallen timber at the site or large tracts of connected woodland indicates that this site is unlikely provide valuable habitat to this species. The species is known to occur within the vegetation type; PCT 70, 80 and 185. There are two records of the species within 10 km.**	
Petroica phoenicea	Flame Robin	V		Yes	The Flame Robin is found from ear the QLD border to the south east SA and in Tasmania. Within NSW there is likely two separate populations, one in the Northern Tablelands and another ranging from the central to southern Tablelands. The species prefers clearings and areas with open understories. The species can occasionally occur in temperate rainforest, herbfields, healthands, shrublands and sedgelands at high altitudes. During winter the species migrate to drier more open habitats in the lowlands such as valleys below ranges and the western slope plains. Within these regions they occupy dry forests, open woodlands and in native grasslands and pastures, with or without scattered trees. **Breeding** The Flame Robin breeds in tall most eucalypt forests and woodlands, often on ridges or slopes. **Assumed Present - The species occurs within this IBRA subregion and the identified vegetation community. This area would not be suitable breeding habitat for the species as they require sheltered sites within tree cavities, stumps or banks. However, this site could feasibly be utilised during winter, after breeding, when the species forages in more open native grasslands and grazed pastures with or without scattered trees. The species is known to occur within the vegetation type; PCT 70, 80 and 185. There are 22 records of the species within 10 km.**	Assumed Present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
Phascolarctos cinereus	Koala (foraging)	V	V	Yes	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales, koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. **Assumed Present - The species occurs within this IBRA subregion and the identified vegetation community. It should be noted that the subject land falls within the Narrandera Koala ARK. The species is known to occur within the vegetation type; PCT 70, 80 and 185. There are 189 records of Koalas within 10 km.**	Assumed Present
Polytelis swainsonii	Superb Parrot	V	V	Yes	The Superb Parrot is found throughout eastern inland NSW. The species inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. **Breeding** in the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. It is estimated that there are less than 5000 breeding pairs left in the wild. **Foraging** May forage up to 10 km from nesting sites, primarily in grassy box woodland. Feed in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. Also eaten are fruits, berries, nectar, buds, flowers, insects and grain. **Present - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. The species was recorded during the field survey and a further 40 recorded sightings occur within 10km of the subject land. Can feed on the ground on grass seeds. However, the subject land does not provide breeding habitat for the species as it is outside of the breeding range and does not possess appropriate tree species. The species is known to occur within the vegetation type; PCT 70 and 80.**	Present
Pomatostomus temporalis temporalis	Grey-crowned Babbler	V		Yes	The Grey-crowned Babbler has two distinctive subspecies that intergrade to the south of the Gulf of Carpentaria. The eastern subspecies (temporalis occurs from Cape York south through Queensland, NSW and Victoria and formerly to the south east of South Australia.	Assumed present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
					This subspecies also occurs in the Trans-Fly Region in southern New Guinea. In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. It may be extinct in the southern, central and New England tablelands. The species inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. **Foraging -** The species feeds on invertebrates by foraging at the trunks of eucalyptus and other woodland trees or on the ground amongst litter and tussock grasses. **Breeding** Nests are building within the branches of shrubs or sapling eucalypts or in the outermost branches of large eucalypts. **Assumed present - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. Potential foraging habitat present as species can forage for invertebrates between tussocks and leaf litter. The species is known to occur within the vegetation type; PCT 70, 80 and 185. There are 10 records of the species within 10 km.**	
Pteropus poliocephalus	Grey-headed flying fox (foraging)	V		Yes	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. 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. Feed on the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca* and *Banksia*, and fruits of rainforest trees and vines. **Assumed present - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. The species is known to occur within the vegetation type; PCT 70. There is one record of the species within 10 km.**	Assumed present
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	V		No	The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. **Assumed present - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. The species is known to occur within the vegetation type; PCT 70, 80 and 185.**	Assumed present

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
Stagonopleura guttata	Diamond Firetail	V		Yes	The Diamond Firetail is endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley and the Bega Valley. This species has a scattered distribution over the rest of NSW, though is very rare west of the Darling River. This species is found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. It also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Foraging 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). Breeding Nests built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests. Birds roost in dense shrubs or in smaller nests built especially for roosting. **Assumed present – As subject land could be a foraging ground for the species. The species would not use this area to roost or breed. Known to occur with the IBRA subregion, the vegetation type and has 23 known sightings within 10km of the study area. The species is known to occur within the vegetation type; PCT 70, 80 and 185.**	Assumed Present
Tyto novaehollandiae	Masked owl (foraging)	V		No	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. A forest owl, but often hunts along the edges of forests, including roadsides. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. **Assumed present - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. There is large hollow-bearing tree present within the originally survey subject land, however it has since been excluded and will not be impacted by the proposal. The species is known to occur within the vegetation type; PCT 70 and 80.**	Assumed Present

Species Credit Species

Scientific Name	Common Name	NSW status	Comm. status	Records within 10km	Assessment	Species presence
Austrostipa metatoris	A spear-grass	V	V	No	Most records occur in the Murray Valley with sites including Cunninyeuk Station, Stony Crossing, Kyalite State Forest (now part of Murrumbidgee Valley Regional Park) and Lake Benanee. Scattered records also occur in central NSW including Lake Cargelligo, east of Goolgowi, Condobolin and south west of Nymagee. Otherwise only known from near Bordertown in south east South Australia, where it may be locally extinct. Associated species include *Eucalyptus populnea, E. intertexta, Callitris glaucophylla, Casuarina cristata, Santalum acuminatum* and *Dodonaea viscosa*. It is not known if fire plays a role in the ecology of this species although most species of *Austrostipa* provide an abundance of highly flammable ephemeral fuel in periods following above-average rainfall. **Assumed present - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. The species is known to occur within the vegetation type; PCT 70. Targeted flora survey not conducted in the recommended survey timeframe for the species.**	Assumed Present
Austrostipa wakoolica	A spear-grass	E	E	Yes	Grows on floodplains of the Murray River tributaries, 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. Associated species include *Callitris glaucophylla, Eucalyptus microcarpa, E. populnea, Austrostipa eremophila, A. drummondii, Austrodanthonia eriantha* and *Einadia nutans.* Flowers from October to December, mainly in response to rain. **Assumed present - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. Known to occur on Alluvial plains and plains and is geographically restricted south of Narrandera. The species is known to occur within the vegetation type; PCT 70 and 80. There is one record within 10 km. Targeted flora survey not conducted in the recommended survey timeframe for the species.**	Assumed Present
Brachyscome papillosa	Mossgiel Daisy	V	V	No	Recorded primarily in clay soils on Bladder Saltbush (*Atriplex vesicaria*) and Leafless Bluebush (*Maireana aphylla*) plains, but also in grassland and in Inland Grey Box (*Eucalyptus microcarpa*) - Cypress Pine (*Callitris* spp.) woodland. Flowers from June to December. Recorded as locally occasional to common in populations. **Absent - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. The species is geographically restricted south and west of Coolamon to Ardlethan Rd, west of Lockhart and north of Rand. Targeted surveys for the species were conducted within the recommended September survey period and the species was not detected.**	Absent (surveyed)
Burhinus grallarius	Bush Stone-curlew	E		No	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range. Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber.	Absent (surveyed)

					Absent - **Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. The species requires fallen/standing dead timber including logs. Targeted surveys for the species were conducted within the recommended October - November survey period and the species was not detected.**	
Caladenia arenaria	Sand-hill Spider Orchid	E	E	No	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. **Absent** - **Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. The species is geographically restricted to west of Lockhart and north of rand. Targeted surveys for the species were conducted within the recommended September survey period and the species was not detected.**	Absent (surveyed)
Calyptorhynchus lathami	Glossy Black-Cockatoo (Breeding)	V		No	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia. Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. Dependent on large hollow-bearing eucalypts for nest sites. **Absent** - **Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. The species requires living and dead hollow-bearing trees contain hollows of greater than 15 cm diameter and greater than 5 m above ground. No hollow-bearing trees occur within the subject land.**	Absent – habitat constraint
Calyptorhynchus lathami	Endangered population Glossy Black-Cockatoo, Riverina population	E		No	The Riverina population of the Glossy Black-Cockatoo is largely restricted to hills and low ridges where suitable stands of its food plant, Drooping She-Oak (Allocasuarina verticillata), remain within the Narrandera Range and to the north-west in the Brobenah Hills, McPhersons Range, Cocoparra Range, Lachlan Range and Jimberoo State Forests, and the Naradhan Range. This population now occurs west of longitude 146º 40' E, within Cobar, Carrathool, Narrandera and Leeton local government areas. The population is largely restricted to hills and low ridges where suitable stands of its food plant Drooping Sheoak (*Allocasuarina verticillata*) remain. **Absent** - **Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. The species is geographically restricted to Carrathool, Griffith, Leeton and Narrandera LGAs. Targeted surveys for the species were conducted within the recommended October - November survey period and the species was not detected.**	Absent (surveyed)
Cercartetus nanus	Eastern Pygmy-possum	V		No	The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extends from the coast inland as far as the	Assumed Present

					Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. 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, except in north-eastern NSW where they are most frequently encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. **Assumed present - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. The species is associated with PCT 70 and 80. No targeted surveys were undertaken.**	
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	No	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. There are scattered records from the New England Tablelands and North West Slopes. 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. **Absent - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. The species is restricted to landscapes containing rocky areas, caves and overhangs, or cervices or within 2 km of old mines and tunnels. As the subject land is an existing quarry appropriate habitat is considered present. Targeted surveys for the species were conducted within the recommended November survey period and the species was not detected.**	Absent (surveyed)
Climacteris affinis	Endangered population White-browed Treecreeper population in Carrathool local government area south of the Lachlan River and Griffith local government area	E		No	In NSW, occupies a broad area of western NSW, west from a line from Balranald to Lake Cargelligo then Lightning Ridge. The species appears absent in the far north west of the state with no records occurring west of a line from Broughams Gate, 100km northwest of Broken Hill to Hungerford. A small population, now recognised as isolated, occurs in Carrathool local government area south of the Lachlan River and Griffith local government areas. Occurs in a range of semi-arid and arid tall shrublands and woodlands across the southern half of Australia. In NSW, the species occupies a variety of habitats including Mulga, Brigalow, Gidgee, Belah, Buloke and White Cypress. The species may also occur in habitats adjacent to those detailed above, including Coolibah, River Red Gum and Black Box. **Absent - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. Targeted surveys for the species were conducted within the recommended October - November survey period and the species was not detected.**	Absent (surveyed)
Crinia sloanei	Sloane's Froglet	V	E	No	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. It has not been recorded recently in the northern part of its range and has only been recorded infrequently in the southern part of its	Absent – habitat constraint

					range in NSW. At a number of sites where records are verified by museum specimens, the species has not been subsequently detected during more recent frog surveys in the vicinity (e.g. Holbrook, Nyngan, Wagga Wagga and Tocumwal). The low number of sites, low number of recorded individuals per site, and the low proportion of records of this species in regional surveys all indicate that a moderately low number of mature individuals exist. The apparent loss from previous recorded sites and decline in recording rates indicates that this is not just a rare or uncommonly encountered species, but that there has been a reduction in population size and range. **Absent - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. The species requires watercourses within 500 m including semi-permanent/ephemeral wet areas, swamps and waterbodies. These features are not present on the subject land.**	
Diuris sp. (Oaklands, D.L. Jones 5380)	Oaklands Diuris	E		No	The species is currently known only from the Oaklands-Urana region of southern NSW. Grows in White Cypress Pine (*Callitris glaucophylla*) Woodland, either among dense grasses in flat areas with associated eucalypts, or amongst sparse grasses and forbs on low sandhills. Grows mostly on sandy loam soils. **Assumed present - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. The species is known to occur within the vegetation type; PCT 80. Targeted surveys were not conducted for this species.**	Assumed present
Diuris tricolor	Pine Donkey Orchid	V		Yes	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. 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. 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. **Absent - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. Targeted surveys for the species were conducted within the recommended September survey period and the species was not detected.**	Absent (surveyed)
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)	V		Yes	The White-bellied Sea-Eagle is distributed around the Australian coastline, including Tasmania, and inland along rivers and wetlands of the Murry-Darling Basin. The species' habitat is characterised by the presence of large areas of open water including larger rivers, swamps, lakes and the sea. Occurs at sites near the sea-shore, beaches, reefs, lagoons, estuaries and mangroves; and at or in the vicinity of freshwater swamps, lakes and reservoirs, billabongs and saltmarshes. Within NSW the species is widespread along the east coast and along all major	Absent – habitat constraint

					inland rivers and waterways. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forests. **Breeding** requires tall open forest and woodland and swamp sclerophyll forest close to foraging habitat. Emergent eucalypts with dead emergent branches are required for nests and surveillance. The species feeds mainly on fish and freshwater turtles, though also takes waterbirds, reptiles, mammals and carrion. **Absent -This species is considered absent due to the lack of proximity to water bodies, especially any saline environments such as brackish swamps or saltmarshes. Though the species occurs within the IBRA bioregion of the NSW South Western Slopes and the determined vegetation type, the lack of a major river system within the study site indicates that the species is unlikely to occur in this area either to breed or forage. There are three records within 10 km.**	
Hieraaetus morphnoides	Little Eagle (Breeding)	V		Yes	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. The species occupies eucalyptus forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. **Breeding** The species nests in tall living trees within a remnant patch. The species preys on birds, reptiles and mammals, occasionally large insects and carrion. **Absent - The species is known to occur within the IBRA subregion of the Lower Slopes and this vegetation type and has no geographic restrictions. Live and dead large trees occur within the subject land that could be used for nesting. However, targeted surveys for nests were conducted within the recommended September-October survey period and no nests were detected.**	Absent (surveyed)
Lathamus discolor	Swift Parrot (Breeding)	E	CE	No	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Migrates to the Australian south-east mainland between February and October. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata,* Red Bloodwood *C. gummifera*, Forest Red Gum *E. tereticornis*, Mugga Ironbark *E. sideroxylon,* and White Box *E. albens*. **Absent -This species is geographically restricted to Tasmania as a breeding site and mapped areas of the mainland as foraging grounds which breeding is dependent on. The subject land does not fall within these mapped areas.**	Absent – habitat constraint
Lepidium monoplocoides	Winged Peppercress	E	E	No	The species 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,*	Assumed present

					Homopholis proluta, Myriophyllum crispatum, Utricularia dichotoma and *Pycnosorus globosus*, on waterlogged grey-brown clay. Also recorded from a *Maireana pyramidata* shrubland. **Assumed present - The species is known to occur within the IBRA subregion of the Lower Slopes and this vegetation type and has no geographic restrictions. The species is associated with PCT 80. Targeted flora survey not conducted in the recommended survey timeframe for the species.**	
Lophochroa leadbeateri	Major Mitchell's Cockatoo (Breeding)	V		No	The Major Mitchell's Cockatoo is found across the arid and semi-arid inland and, from south-western Queensland, south to north-west Victoria, through most of South Australia, north into the south-west of the Northern Territory and across to the west coast. Within NSW the species is regularly found as far east as Bourke and Griffith and occasionally further. The species occupies a wide range of treed and treeless inland habitats, always within easy reach of water. The species feeds mostly on the ground, especially on the seeds of native and exotic melons, some saltbushes, wattles and cypress pines. **Breeding** The species requires tree hollows to breed. The species is known to occur within the IBRA subregion and within this vegetation type. **Absent - The species requires living or dead hollow-bearing trees containing hollows of greater than 10 cm diameter. No hollow-bearing trees occur within the subject land.**	Absent – habitat constraint
Lophoictinia isura	Square-tailed Kite (Breeding)	V		No	The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. **Absent – breeding habitat of the species is determined by the presence of trees with visible raptor nests and/or tall emergent trees that are suitable to contain nests. Live and dead large trees occur within the subject land that could be used for nesting. However, targeted surveys for nests were conducted within the recommended September-October survey period and no nests were detected.**	Absent (surveyed)
Ninox connivens	Barking Owl (Breeding)	V		Yes	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey found on these fertile riparian soils. Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as *Acacia* and *Casuarina* species. During nesting season, the male perches in a nearby tree overlooking the hollow entrance. Nesting occurs during mid-winter and spring, being variable between pairs and among years	Absent – habitat constraint

					Absent – the species requires hollow-bearing habitat trees containing hollows greater than 20 cm in diameter and greater than 4m above the ground. There are no hollow-bearing trees within the subject land. One night of call playback was also conducted.	
Petaurus norfolcensis	Squirrel Glider	V		No	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Require abundant tree hollows for refuge and nest sites. **Assumed present - The species is known to occur within the IBRA subregion of the Lower Slopes and this vegetation type and has no geographic restrictions. The species is associated with PCT 70 and 80. Areas of PCT 70 and 80 that do not contain the wooded connectivity required (eg. Trees no more than 50 m apart, as per BioNet) have not been included as suitable habitat within the BOAMS (see figure 5.4 species polygons for suitable habitat areas).**	Assumed present
Phascolarctos cinereus	Koala (Breeding)	V	V	Yes	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales, koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Spend most of their time in trees but will descend and traverse open ground to move between trees. **Absent - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. Targeted surveys for the species were conducted within the recommended September - October survey period and the species was not recorded. There are 189 records of the species within 10 km.**	Absent (surveyed)
Polytelis swainsonii	Superb Parrot (Breeding)	V	V	Yes	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. It is estimated that there are less than 5000 breeding pairs left in the wild. Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. Nest in small colonies, often with more than one nest in a single tree. May forage up to 10 km from nesting sites, primarily in grassy box woodland. **Absent - The species is known to occur within the IBRA subregion of the Lower Slopes and this vegetation type and has no geographic restrictions. The species is associated with PCT 70 and 80. The species was detected utilising the subject land for foraging during vegetation surveys. However, there are no hollow-bearing trees within the subject land suitable for breeding.**	Absent – habitat constraint

Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	V	V	Yes	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Feed on the nectar and pollen of native trees, in particular *Eucalyptus, Melaleuca* and *Banksia*, and fruits of rainforest trees and vines. **Absent – the species breeds within breeding camps. These are mapped nationally by the Australian Government Department of Agriculture, Water and Environment. No breeding camps were identified within or near the subject land. There is one record of the species within 10 km.**	Absent – habitat constraint
Senecio garlandii	Woolly Ragwort	V		No	This daisy is found between Temora, Bethungra and Albury and possibly Burrinjuck near Yass. The largest populations are at The Rock and Mt Tabletop (and surrounds). There is a single population in Victoria at Chiltern. Woolly Ragwort occurs on sheltered slopes of rocky outcrops. Flowering occurs in spring. **Absent - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. Targeted surveys for the species were conducted within the recommended September survey period and the species was not recorded.**	Absent (surveyed)
Swainsona murrayana	Slender Darling Pea	V	V	No	Found throughout NSW, it has been recorded in the Jerilderie and Deniliquin areas of the southern riverine plain, the Hay plain as far north as Willandra National Park, near Broken Hill and in various localities between Dubbo and Moree. Grows in a variety of vegetation types including bladder saltbush, black box and grassland communities on level plains, floodplains and depressions and is often found with Maireana species. Plants have been found in remnant native grasslands or grassy woodlands that have been intermittently grazed or cultivated. The species may require some disturbance and has been known to occur in paddocks that have been moderately grazed or occasionally cultivated. **Absent - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. Targeted surveys for the species were conducted within the recommended September survey period and the species was not recorded.**	Absent (surveyed)
Swainsona sericea	Silky Swainson-pea	V	V	No	Silky Swainson-pea has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. There is one isolated record from the far north-west of NSW. Its stronghold is on the Monaro. Also found in South Australia, Victoria and Queensland. Found in Natural Temperate Grassland and Snow Gum *Eucalyptus pauciflora* Woodland on the Monaro. Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes. Sometimes found in association with cypress-pines *Callitris* spp. **Absent - Known to occur within the IBRA subregion of the Lower Slopes, within the vegetation type. Targeted surveys for the species were conducted within the recommended September survey period and the species was not recorded.**	Absent (surveyed)

Tylophora linearis	Tylophora linearis	V	E	No	Majority of records occur 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.* **Assumed present - The species is known to occur within the IBRA subregion of the Lower Slopes and this vegetation type and has no geographic restrictions. The species is associated with PCT 70. Targeted flora survey not conducted in the recommended survey timeframe for the species.**	Assumed present
Tyto novaehollandiae	Masked Owl (Breeding)			No	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. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Pairs have a large home-range of 500 to 1000 hectares. **Absent – breeding of the species is restricted by the presence of mature hollow-bearing trees with hollows of greater than 20 cm. One hollow-bearing tree was recorded on the property. However, this tree has since been excluded from the subject land.**	Absent – habitat constraint
Myotis macropus	Southern Myotis	V	-	No	The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface. **Absent – potential recording on SM4 detector (see Appendix H). However, no suitable foraging or roosting habitat on the subject land i.e. hollow-bearing trees, within 200m of a riparian zone/waterbody including rivers, creeks, billabongs, lagoons, and dams or bridges, caves or artificial structures within 200m of a waterbody.**	Absent – habitat constraint

Appendix F: EPBC Act Habitat Assessment

The EPBC Act protects nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as matters of national environmental significance. The EPBC Act policy *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (DoE, 2013) forms the basis of determining if impact to protected matters is significant.

A Protected Matters Search identified five Endangered Ecological Communities, 25 threatened species and 11 migratory species as potentially occurring within 10 km of the subject land.

The following tables give an overview of the assessments of these threatened entities and shows that the Proposed activity:

1. Is not likely to have a significant impact on a matter of national environmental significance. The matters of national environmental significance are:
    i. World heritage properties.
    ii. National heritage places.
    iii. Wetlands of international importance.
    iv. Threatened species and ecological communities.
    v. Migratory species.
    vi. Commonwealth marine areas.
    vii. The Great Barrier Reef Marine Park. And;
    viii. Nuclear actions (including uranium mines).
    ix. A water resource, in relation to coal seam gas development and large coal mining development.
2. Is not likely to have a significant impact on the environment in general (for actions by Commonwealth agencies or actions on Commonwealth land) or the environment on Commonwealth land (for actions outside Commonwealth land).

Notes:

Important Population as determined by the *Environment Protection and Biodiversity Conservation Act 1999*, is one that for a vulnerable species:

a) is likely to be key source populations either for breeding or dispersal
b) is likely to be necessary for maintaining genetic diversity
c) is at or near the limit of the species range.

A ‘significant impact’ is an impact which is important, notable, or of consequence, having regard to its context or intensity (DoE, 2013).

Wetlands of International Importance		
Name	**Proximity**	**Significance of Impact**
Banrock Station wetland complex	500 - 600 km	The proposal is not within close proximity of Banrock Station wetland complex. **No Impact**
Hattah-kulkyne lakes	300 - 400 km	The proposal is not within close proximity of the Hattah-kulkyne lakes **No Impact**
Riverland	500 – 600 km	The proposal is not within close proximity of the Riverland **No Impact**
The coorong, and lakes alexandrina and albert wetland	600 - 700 km	The proposal is not within close proximity of the The Coorong, and lakes Alexandrina and Albert wetland **No Impact**

Threatened Ecological Communities		
Name	**Status**	**Significance of Impact**
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	The community does not occur on the subject land. **No impact**
Weeping Myall Woodlands	Endangered	The community does not occur on the subject land. **No impact**
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	The community does not occur on the subject land. **No impact**

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
Botaurus poiciloptilus	Australasian Bittern	E	The Australasian Bittern favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes and. Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds; there are usually six olive-brown eggs to a clutch. **Absent - No habitat within the subject land for this species. The subject land is within the known distribution of the species. However, associated vegetation communities and habitat (freshwater wetlands) is not present.**	No
Calidris ferruginea	Curlew Sandpiper	CE	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one-year old birds remain in Australia rather than migrating north. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in salt works 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. **Absent - Subject land is within the know species range; however, the site lacks required habitat characteristics (lakes, dams, waterholes etc.).**	No
Falco hypoleucos	Grey Falcon	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 breeding range has contracted since the 1950s with most breeding now confined to arid parts of the range. There are possibly less than 5000 individuals left. Population trends are unclear, though it is believed to be extinct in areas with more than 500mm rainfall in NSW. 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. **Potential – associated with PCT 70 & 80 (2.95 ha), habitat broadly appropriate.**	Yes
Grantiella picta	Painted Honeyeater	V	The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the	Yes

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
			fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema.* **Potential – associated with PCT 185, 80 & 70 (3.93 ha) habitat broadly appropriate, however no mistletoe was recorded within the subject land.**	
Hirundapus caudactus	White-throated Needletail	V	White-throated Needletails are non-breeding migrants, occurring in Australia only between late spring and early autumn, but mostly in summer, when they sometimes form large flocks, appearing as a swirling cloud of birds. Aerial birds however will roost in trees. **Potential – not associated with PCTs present at the site, however habitat is broadly appropriate for foraging**	Yes
Lathamus discolor	Swift Parrot	CE	The species breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. **Potential – associated with PCT 80 (2.91 ha), habitat broadly appropriate, feed trees present.**	Yes
Leipoa ocellata	Malleefowl	V	The stronghold for this species in NSW is the mallee in the south west centred on Mallee Cliffs NP and extending east to near Balranald and scattered records as far north as Mungo NP. West of the Darling River a population also occurs in the Scotia mallee including Tarawi NR and Scotia Sanctuary and is part of a larger population north of the Murray River in South Australia. The population in central NSW has been significantly reduced through land clearance and fox predation and now occurs chiefly in Yathong, Nombinnie and Round Hill NRs and surrounding areas, though birds continue to survive in Loughnan NR. Predominantly inhabit mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300 - 450 mm mean annual rainfall) areas. Utilises mallee with a spinifex understorey, but usually at lower densities than in areas with a shrub understorey. Less frequently found in other eucalypt woodlands, such as Inland Grey Box, Ironbark or Bimble Box Woodlands with thick understorey, or in other woodlands such dominated by Mulga or native Cypress Pine species. 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. **Potential - Associated with PCT 185 (0.98 ha), habitat broadly appropriate**	Yes
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	CE	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. Eastern Curlews are rarely recorded inland. In NSW the species occurs	No

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
			across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond River and ICOLLs of the south coast. **Absent. The site is not within the species known range.**	
Polytelis swainsonii	Superb Parrot	V	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. It is estimated that there are less than 5000 breeding pairs left in the wild. Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. **Confirmed - Foraging habitat but not breeding habitat present, species recorded during field survey. See Appendix D**	Yes
Rostratula australis	Australian Painted-snipe, Australian Painted snipe	E	Most records of the Australian Painted Snipe are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. **Absent. Site does not contain required habitat characteristics (wetlands).**	No
Apus pacificus	Fork-tailed Swift		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. The Fork-tailed Swift is almost exclusively aerial, flying from < 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.	Yes

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
			Potential – Can inhabit dry open habitats, including open farmland.	
Motacilla flava	Yellow Wagtail		**Absent - Minimal information is available on BioNet and SPRAT about the species' habitat requirements. However, the subject land is outside of the species known range (ATLAS of Living Australia) and there are no records of the species within 10km.**	No
Myiagra cyanoleuca	Satin Flycatcher		The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests (Birdlife Australia, 2019a). **Potential – Can inhabit dry open habitats, including open farmland.**	Yes
Actitis hypoleucos	Common Sandpiper		The Common Sandpiper is found along all coastlines of Australia and in many areas inland. 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. **Absent - There is no habitat (coastal or inland wetlands) on the subject land for this species.**	No
Calidris acuminata	Sharp-tailed Sandpiper		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 salt lakes inland. **Absent - There is no habitat on the subject land for this species.**	No
Calidris melanotos	Pectoral Sandpiper		In 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.	No

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
			Absent - There is no habitat on the subject land for this species.	
Gallinago hardwickii	Latham's Snipe		Latham's Snipe is a non-breeding migrant to the south east of Australia including Tasmania, passing through the north and New Guinea on passage. Latham's Snipe breed in Japan and on the east Asian mainland. Latham's Snipe are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture. **Absent – Subject land not in close proximity to a wetland.**	No
Ardea alba	Great Egret		The Eastern Great Egret has been reported in a wide range of wetland habitats (for example inland and coastal, freshwater and saline, permanent and ephemeral, open and vegetated, large and small, natural and artificial). The Eastern Great Egret may retreat to permanent wetlands or coastal areas when other wetlands are dry (Department of Environment, 2019b). **Absent - There is no habitat (wetlands) on the subject land for this species.**	No
Ardea ibis	Cattle Egret		Originally found in Africa, Europe and Asia, the Cattle Egret is now found on nearly every continent, with birds in Australia originating from Asia. In Australia it is most widespread and common in north-eastern Western Australia across the Top End, Northern Territory, and in south-eastern Australia from Bundaberg, Queensland to Port Augusta, South Australia, including Tasmania. The Cattle Egret is found in grasslands, woodlands and wetlands, and is not common in arid areas. It also uses pastures and croplands, especially where drainage is poor. Will also forage at garbage dumps and is often seen with cattle and other stock. **Potential – There is potential marginal foraging habitat for the species, which can utilize pastures.**	Yes
Chrysococcyx osculans	Black-eared Cuckoo		The Black-eared Cuckoo is found in drier country where species such as mulga and mallee form open woodlands and shrublands. It is often found in vegetation along creek beds (Birdlife Australia, 2019b). **Potential – There is potential marginal foraging habitat for the species, which can utilize disturbed open woodlands.**	Yes
Haliaeetus leucogaster	White-bellied Sea-Eagle		The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. In New South Wales it is widespread along the east coast, and along all major inland rivers and	No

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
			waterways. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. **Potential – Associated with PCT 70. 80 & 185 (3.95 ha), habitat broadly appropriate, large water body within range.**	
Merops ornatus	Rainbow Bee-eater		The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation (Higgins 1999). It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water. It also occurs in inland and coastal sand dune systems, and in mangroves in northern Australia, and has been recorded in various other habitat types including heathland, sedgeland, vine forest and vine thicket, and on beaches. The Rainbow Bee-eater occurs in open woodlands and shrublands, including mallee, and in open forests that are usually dominated by eucalypts. It also occurs in grasslands and, especially in arid or semi-arid areas, in riparian, floodplain or wetland vegetation assemblages. **Potential – There is potential marginal foraging habitat for the species, which can utilize pastures and open woodlands**	Yes
Dasyurus maculatus maculatus	Spotted-tail Quoll, Tiger Quoll (SE Mainland population)	E	The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Only in Tasmania is it still considered relatively common. The spotted-tailed Quoll is recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. **Potential – Species not associated with PCTs present at the site however recent records within the species potential range.**	Yes
Nyctophilus corbeni	Corben's Long-eared Bat	V	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. Inhabits a variety of vegetation types, including mallee, Bulloke Allocasuarina leuhmanni 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. Roosts in tree hollows, crevices, and under loose bark. **Potential – Associated with PCT 70. 80 & 185 (3.95 ha), habitat broadly appropriate for foraging.**	Yes

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
Phascolarctoc cinereus	Koala	V	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. **Potential – Associated with PCT 70. 80 & 185 (3.95 ha), habitat broadly appropriate, feed trees present.**	Yes
Pteropus poliocephalus	Grey-headed Flying Fox	V	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. **Potential – Associated with PCT 70 (0.04 ha), habitat broadly appropriate, feed trees present.**	Yes
Aprasia parapulchella	Pink-tailed Worm-lizard	V	The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands, and the South Western Slopes. There is a concentration of populations in the Canberra/Queanbeyan Region. Other populations have been recorded near Cooma, Yass, Bathurst, Albury and West Wyalong. This species is also found in the Australian Capital Territory. Inhabits sloping, open woodland areas with predominantly native grassy ground layers, particularly those dominated by Kangaroo Grass (*Themeda australis*). **Potential – Species not associated with PCTs recorded at the site, habitat (exposed bushrock) present.**	Yes
Litoria raniformis	Growling Grass Frog	V	This species is found mostly amongst emergent vegetation, including Typha sp. (bullrush), Phragmites sp. (reeds) and Eleocharis sp.(sedges), in or at the edges of still or slow-flowing water bodies such as lagoons, swamps, lakes, ponds and farm dams. The Growling Grass Frog can be found floating in warmer waters in temperatures between 18–25°C. **Unlikely – largely outside of the species range, habitat marginal at best.**	No
Galaxias rostratus	Flathead Galaxias	CE	**Absent – no appropriate habitat within study area.**	No
Maccullochella macquariensis	Trout Cod	E	**Absent – no appropriate habitat within study area.**	No

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
Maccullochella peelii	Murray Cod	V	**Absent – no appropriate habitat within study area.**	No
Macquaria australasica	Macquarie Perch	E	**Absent – no appropriate habitat within study area.**	No
Amphibromus fluitans	River Swamp Wallaby-grass	V	There are many historic collections in the City of Greater Albury. It has been recorded recently in lagoons beside the Murray River near Cooks Lagoon (Shire of Greater Hume), Mungabarina Reserve, East Albury, at Ettamogah, Thurgoona (Charles Sturt University Campus), near Narranderra, and also further west along the Murray River (near Mathoura) and in Victoria. There is a recent record of this species near Laggan in Upper Lachlan Shire. It is also found in Victoria and in Tasmania. *Amphibromus fluitans* grows mostly in permanent swamps. The species needs wetlands which are at least moderately fertile and which have some bare ground, conditions which are produced by seasonally-fluctuating water levels. **Absent – Species requires significant water bodies, not present within study area.**	No
Austrostipa wakoolica		E	Confined to the floodplains of the Murray River tributaries of central-western and south-western NSW, with localities including Manna State Forest, Matong, Lake Tooim, Merran Creek, Tulla, Cunninyeuk and Mairjimmy State Forest (now part of South West Woodland Nature Reserve). Grows on floodplains of the Murray River tributaries, 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. **Potential – Associated with PCT 70 & 80 (2.95 ha), habitat broadly appropriate for the species**	Yes
Brachyscome muelleroides	Mueller Daisy	V	The Claypan Daisy occurs in the Wagga Wagga, Narranderra, Tocumwal and Walbundrie areas. Also occurs in north-central Victoria (only along the Murray from Tocumwal to the Ovens River). **Potential – Not associated with PCTs recorded at the site, however habitat is broadly appropriate.**	Yes
Caladenia arenaria	Sand-hill Spider-orchid	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	Yes

Species name	Common Name	Status	Habitat Assessment	Assessment of Significance required (Yes/No)
			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). **Potential – Associated with PCT 80 (2.19 ha), habitat broadly appropriate, has been recorded within 10km.**	
Caladenia xanthochila	Yellow-lip Spider-orchid	E	The species is known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. It was also recorded in the Huskisson area in the 1930s. The species occurs on the coast in Victoria from east of Melbourne to almost the NSW border. **Absent – Outside of species range.**	No
Sclerolaena napiformis	Turnip Copperburr	E	Known from only a few small populations in remnant grassland in the southern Riverina of NSW and north-central Victoria. NSW populations are confined to the area between Jerilderie and Moama on travelling stock routes and road reserves. Confined to remnant grassland habitats on clay-loam soils. Grows on level plains in tussock grassland of Austrostipa nodosa and Chloris truncata, in grey cracking clay to red-brown loamy clay. **Absent – No associated PCT, habitat inappropriate.**	No
Swainsona murrayana	Slender Darling-pea	V	Found throughout NSW , it has been recorded in the Jerilderie and Deniliquin areas of the southern riverine plain, the Hay plain as far north as Willandra National Park, near Broken Hill and in various localities between Dubbo and Moree. The species has been collected from clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams. **Potential – Associated with PCT 80 (2.91 ha), habitat broadly appropriate.**	Yes

EPBC Listed Critically Endangered Species

Swift Parrot	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of a population	The proposal will impact up to 2.91 ha of potential Swift Parrot habitat (PCT 80). As the species is highly mobile and does not breed on mainland Australia, the proposal is unlikely to have a deleterious impact on the population leading to a long-term decrease in the size of the population at a regional scale.
Reduce the area of occupancy of the species	Yes. The proposal will remove 2.91 ha of habitat for this species, which represents ~4.5% of the local occurrence within the wider study area. The proposal will reduce the occupancy of the species, however due to its large-scale nomadic movements across the landscape, this decrease in occupancy is unlikely to have a significant impact.
Fragment an existing population into two or more populations	The proposal will exacerbate existing fragmentation of available habitat for the species by removing areas of potential foraging habitat. However, this fragmentation is unlikely to isolate the population into two or more populations at the regional scale due to the highly mobile nature of the species. Mitigation measures will be implemented to reduce habitat fragmentation wherever possible (see Section 6).
Adversely affect habitat critical to the survival of a species	The subject land is unlikely to constitute habitat critical to the survival of the species, as the site offers marginal foraging habitat only.
Disrupt the breeding cycle of a population	The species dose not breed on mainland Australia.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 2.91 ha of suitable habitat for the species. The proposal will exacerbate existing fragmentation of foraging habitat for this species, as previously discussed. This reduction and fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the species. Additionally, one priority weed was recorded on the subject land. The proposal may spread these weeds or lead to the establishment of new weeds via earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery. However, environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).

Swift Parrot	
Introduce disease that may cause the species to decline, or	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Interfere with the recovery of the species.	The subject land does not occur within the identified Priority habitat for conservation management of foraging recourses for the species. Exacerbation of Key Threatening Processes such as the proliferation of competitive bird species as a result of disturbance is listed as a threat to the species. The proposal is unlikely to directly interfere with the recovery of the species within the region, though some associated threats will be exacerbated as a result.
Conclusion	**Non-significant impact**

Spot-tailed Quoll	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of a population	The species is not associated with any PCT recorded at the site however due to their large territories (up to 4000 ha) they may utilize the site as a foraging resource intermittently. The species is highly susceptible to mortality particularly car strikes and poisoning, as neither of these impacts will be significantly exacerbated by this proposal no long-term reduction in the species population is expected.
Reduce the area of occupancy of the species	No significant reduction to habitat appropriate to this species is expected.
Fragment an existing population into two or more populations	The proposal will reduce overall habitat connectivity however it will not isolate patches of dissect habitat features to the degree that any population of this species will be split into two.
Adversely affect habitat critical to the survival of a species	This project will not affect habitat critical to the survival of this species.
Disrupt the breeding cycle of a population	No potential breeding habitat for this species will be impacted by this proposal.

Spot-tailed Quoll	
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	As the species is wide-ranging, determining potential impacts to a population is difficult. The proposal will remove up to 45.55 ha of available habitat for the species, representing a decrease of ~1.96% occupancy. As previously discussed, the proposal will transect four remnant patches of PCT 379, one large remnant patch of PCT 401 adjacent to Purlewaugh Road, resulting in isolation of habitat for the species. This couple with the high dispersal of the species is likely to result in a decline in the population of the species at a local but not a regional scale.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the Regent Honeyeater. Additionally, one priority weed was recorded on the subject land. The proposal may spread these weeds or lead to the establishment of new weeds via earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery. However, environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Introduce disease that may cause the species to decline, or	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see Section 6).
Interfere with the recovery of the species.	The National Recovery Plan for the species lists habitat fragmentation and isolation as key threats to the species, with the species predominately occurring in NSW within large areas of contiguous forested habitat. While other threats are listed (such as deliberate baiting), further fragmentation of known Spotted-Tailed Quoll habitat is in opposition to the recovery plan objectives.
Conclusion	**Non-significant impact**

Austrostipa wakoolica	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of a population	The proposal will impact up to 2.95 ha of potential habitat (PCT 70 & 80). The proposal is unlikely to have a deleterious impact on the population leading to a long-term decrease in the size of the population at a regional scale.

Austrostipa wakoolica	
Reduce the area of occupancy of the species	Yes. The proposal will remove 2.95 ha of habitat for this species, which represents ~3.5% of the local occurrence within the wider study area. The proposal will reduce the occupancy of the species, however due to its large-scale nomadic movements across the landscape, this decrease in occupancy is unlikely to have a significant impact.
Fragment an existing population into two or more populations	The proposal will reduce overall habitat connectivity however it will not isolate patches of dissect habitat features to the degree that any population of this species will be split into two. Mitigation measures will be implemented to reduce habitat fragmentation wherever possible and the viability of planting this and other threated flora species as part of revegetation works will be investigated (see Section 6).
Adversely affect habitat critical to the survival of a species	The subject land is not listed as critical habitat for the species and is unlikely to act as such, therefore the proposal is unlikely to adversely affect critical habitat for the species.
Disrupt the breeding cycle of a population	If present, the number of individuals and the proportion of the local population affected is likely to be relatively small. The proposal is unlikely to impact the breeding cycle of the species at a regional population scale.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove, isolate and fragment habitat for the species as discussed in previous sections. However, this is unlikely to impact the species so as it is likely to decline at a regional population scale.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	One priority weed was recorded on the subject land. The proposal may spread these weeds or lead to the establishment of new weeds via earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery. However, environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Introduce disease that may cause the species to decline, or	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see Section 6).
Interfere with the recovery of the species.	Current conservation actions for this species list the main threats to the species as forestry activities, disturbance such as grazing and fire, and invasion of habitat by weeds such as Lantana (*Lantana camara*). The proposal will not exacerbate the listed threats to the species and will not impact the species recovery at a regional population scale.
Conclusion	**Non-significant impact**

Sand-hill Spider-orchid	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of a population	The proposal will impact up to 2.91 ha of potential habitat (PCT 80). the proposal is unlikely to have a deleterious impact on the population leading to a long-term decrease in the size of the population at a regional scale.
Reduce the area of occupancy of the species	Yes. The proposal will remove 2.91 ha of habitat for this species, which represents ~4.5% of the local occurrence within the wider study area. The proposal will reduce the occupancy of the species, however due to its large-scale nomadic movements across the landscape, this decrease in occupancy is unlikely to have a significant impact.
Fragment an existing population into two or more populations	The proposal will reduce overall habitat connectivity however it will not isolate patches of dissect habitat features to the degree that any population of this species will be split into two. Mitigation measures will be implemented to reduce habitat fragmentation wherever possible and the viability of planting this and other threated flora species as part of revegetation works will be investigated (see Section 6).
Adversely affect habitat critical to the survival of a species	The subject land is not listed as critical habitat for the species and is unlikely to act as such, therefore the proposal is unlikely to adversely affect critical habitat for the species.
Disrupt the breeding cycle of a population	If present, the number of individuals and the proportion of the local population affected is likely to be relatively small. The proposal is unlikely to impact the breeding cycle of the species at a regional population scale.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove, isolate and fragment habitat for the species as discussed in previous sections. However, this is unlikely to impact the species so as it is likely to decline at a regional population scale.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	One priority weed was recorded on the subject land. The proposal may spread these weeds or lead to the establishment of new weeds via earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery. However, environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Introduce disease that may cause the species to decline, or	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see Section 6).
Interfere with the recovery of the species.	Current conservation actions for this species list the main threats to the species as forestry activities, disturbance such as grazing and fire, and invasion of habitat by weeds such as Lantana (*Lantana camara*). The proposal will not exacerbate the listed threats to the species and will not impact the species recovery at a regional population scale.

Sand-hill Spider-orchid	
Conclusion	**Non-significant impact**

EPBC Listed Vulnerable Species

Painted Honeyeater	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • Key source populations either for breeding or dispersal • Populations that are necessary for maintaining genetic diversity, and/or • Populations that are near the limit of the species range. The subject land is identified as occurring within a Priority Management Area for this species. However, the species is nomadic and no mistletoe was recorded at the site. Therefore, the subject land is unlikely to support an important population of the species.
Reduce the area of occupancy of an important population	No. The subject land is unlikely an important population (see above).
Fragment an existing important population into two or more populations	No. The subject land is unlikely an important population (see above).
Adversely affect habitat critical to the survival of a species	The proposal will remove up to 3.93 ha of habitat for the species. This habitat occurs within an identified Priority Management Area for the species. However, the site does not contain a suitable abundance of mistletoe for the species and is therefore unlikely to provide habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	No. The subject land is unlikely an important population (see above).
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove 3.93 ha of associated native habitat for this species. The vegetation proposed for removal does not represent high quality habitat for the species as such the overall quality of the potential habitat for this species will not be significantly reduced. The proposal will reduce overall habitat connectivity however it will not isolate patches of dissect habitat features to the degree that the species may decline.

Painted Honeyeater	
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the species. Additionally, one priority weed was recorded on the subject land. The proposal may spread these weeds or lead to the establishment of new weeds via earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery. However, environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Introduce disease that may cause the species to decline, or	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see Section 6).
Interfere with the recovery of the species.	There are no current recovery plans for this species, however a NSW 'Saving our Species' Strategy has been published, which lists clearing of woodlands and open forests as a threat to the species. The proposal is unlikely to impact the species recovery at a regional population scale.
Conclusion	**Non-significant impact**

White-throated Needletail	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • Key source populations either for breeding or dispersal • Populations that are necessary for maintaining genetic diversity, and/or • Populations that are near the limit of the species range. No. The subject land is unlikely an important population.
Reduce the area of occupancy of an important population	No. The subject land is unlikely an important population.

White-throated Needletail	
Fragment an existing important population into two or more populations	No. The subject land is unlikely an important population.
Adversely affect habitat critical to the survival of a species	The species is a non-breeding migrant to Australia. No associated PCTs for the species occur on the subject land. The species may utilise the site for aerial foraging. However, it is unlikely to provide roosting habitat.
Disrupt the breeding cycle of an important population	No. The species is a non-breeding migrant to Australia.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The White-throated Needletail does not breed in Australia. There are no significant threats to White-throated Needletail in Australia. Potential threats include habitat destruction and predation by feral animals. Due to the wide range and potential mobility of this species the potential impacts will likely not be significant.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the species. Additionally, one priority weed was recorded on the subject land. The proposal may spread these weeds or lead to the establishment of new weeds via earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery. However, environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Introduce disease that may cause the species to decline, or	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see Section 6).
Interfere with the recovery of the species.	There is no recovery plan for the species. The species does not breed in Australia and there are no serious threats to the species in Australia. The species is almost exclusively aerial and is unlikely to use the subject land for roosting. Therefore, the proposal is unlikely to interfere with the recovery of this species.
Conclusion	Non-significant impact

Grey Falcon	
Significant Impact Guideline	**Assessment**

Grey Falcon	
Lead to a long-term decrease in the size of an important population of a species	An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • Key source populations either for breeding or dispersal • Populations that are necessary for maintaining genetic diversity, and/or • Populations that are near the limit of the species range. No. The subject land is unlikely an important population.
Reduce the area of occupancy of an important population	No. The subject land is unlikely an important population.
Fragment an existing important population into two or more populations	No. The subject land is unlikely an important population.
Adversely affect habitat critical to the survival of a species	The proposal will remove up to 2.95 ha of habitat for the species. This habitat does not occur within an identified Priority Management Area for the species.
Disrupt the breeding cycle of an important population	No. The subject land is unlikely an important population (see above).
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove 2.95 ha of associated native habitat for this species. The vegetation proposed for removal does not represent high quality habitat for the species as such the overall quality of the potential habitat for this species will not be significantly reduced. The proposal will reduce overall habitat connectivity however it will not isolate patches of dissect habitat features to the degree that the species may decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the species. Additionally, one priority weed was recorded on the subject land. The proposal may spread these weeds or lead to the establishment of new weeds via earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery. However, environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Introduce disease that may cause the species to decline, or	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see Section 6).

Grey Falcon	
Interfere with the recovery of the species.	There are no current recovery plans for this species, however a NSW 'Saving our Species' Strategy has been published, which lists clearing of woodlands and open forests as a threat to the species. The proposal is unlikely to impact the species recovery at a regional population scale.
Conclusion	Non-significant impact

Malleefowl	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • Key source populations either for breeding or dispersal • Populations that are necessary for maintaining genetic diversity, and/or • Populations that are near the limit of the species range. The subject land is not identified as occurring within a Priority Management Area for this species. Important populations are not likely to occur within the subject land.
Reduce the area of occupancy of an important population	No. The subject land is unlikely an important population (see above).
Fragment an existing important population into two or more populations	No. The subject land is unlikely an important population (see above).
Adversely affect habitat critical to the survival of a species	The proposal will remove up to 0.98 ha of habitat for the species. This habitat does not occur within an identified Priority Management Area for the species.
Disrupt the breeding cycle of an important population	No. The subject land is unlikely an important population (see above).
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove 0.98 ha of associated native habitat for this species. The vegetation proposed for removal does not represent high quality habitat for the species as such the overall quality of the potential habitat for this species will not be significantly reduced. The proposal will reduce overall habitat connectivity however it will not isolate patches of dissect habitat features to the degree that the species may decline.

Malleefowl	
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the species. Additionally, one priority weed was recorded on the subject land. The proposal may spread these weeds or lead to the establishment of new weeds via earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery. However, environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Introduce disease that may cause the species to decline, or	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see Section 6).
Interfere with the recovery of the species.	There are no current recovery plans for this species, however a NSW 'Saving our Species' Strategy has been published, which lists clearing of habitat, habitat fragmentation and altered fire regimes. None of these threats will be significantly exacerbated by this proposal. The proposal is unlikely to impact the species recovery at a regional population scale.
Conclusion	**Non-significant impact**

Superb Parrot	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • Key source populations either for breeding or dispersal • Populations that are necessary for maintaining genetic diversity, and/or • Populations that are near the limit of the species range. The subject land is identified as occurring within a Priority Management Area for this species. The site is also situated between two priority management sites and may offer connectivity between them. Populations currently utilizing the site could be considered an important population.

Superb Parrot	
Reduce the area of occupancy of an important population	Up to 2.95 ha of potential habitat for this species will be removed as a result of this proposal reducing the available habitat of the local important population accordingly.
Fragment an existing important population into two or more populations	The proposal will reduce overall habitat connectivity however it will not isolate patches of dissect habitat features to the degree that the important population of this species will be split into two. Mitigation measures will be implemented to reduce habitat fragmentation wherever possible
Adversely affect habitat critical to the survival of a species	The proposal will remove up to 2.95 ha of habitat for the species. This habitat occurs within an identified Priority Management Area for the species. However, the overall poor quality of this habitat mean that the proposal will not likely adversely affect habitat critical to the survival of a species
Disrupt the breeding cycle of an important population	No appropriate breeding habitat was recorded at the site.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove 2.95 ha of associated native habitat for this species. Part of the habitat is already fragmented, and the proposal will not degrade the available habitat for the species to the point that the species will decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (Oryctolagus cuniculus), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the species. Additionally, one priority weed was recorded on the subject land. The proposal may spread these weeds or lead to the establishment of new weeds via earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery. However, environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Introduce disease that may cause the species to decline, or	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see Section 6).
Interfere with the recovery of the species.	There is National Recovery Plan for the Superb Parrot (*Polytelis swainsonii*) lists clearing and degradation of nesting and foraging habitat, nest site disturbance, competition for nest hollows, and road collisions as the key threats to this species. This will not be exacerbated by this proposal.
Conclusion	**Non-significant impact**

Corben's Long-eared Bat	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • Key source populations either for breeding or dispersal • Populations that are necessary for maintaining genetic diversity, and/or • Populations that are near the limit of the species range. The subject land is not identified as occurring within a Priority Management Area for this species. Important populations are not likely to occur within the subject land.
Reduce the area of occupancy of an important population	No. The subject land is unlikely an important population (see above).
Fragment an existing important population into two or more populations	No. The subject land is unlikely an important population (see above).
Adversely affect habitat critical to the survival of a species	The proposal will remove up to 3.93 ha of habitat for the species. This habitat does not occur within an identified Priority Management Area for the species.
Disrupt the breeding cycle of an important population	No. The subject land is unlikely an important population (see above).
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove 3.93 ha of associated native habitat for this species. The vegetation proposed for removal does not represent high quality habitat for the species as such the overall quality of the potential habitat for this species will not be significantly reduced. The proposal will reduce overall habitat connectivity however it will not isolate patches of dissect habitat features to the degree that the species may decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (Oryctolagus cuniculus), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the species. Additionally, one priority weed was recorded on the subject land. The proposal may spread these weeds or lead to the establishment of new weeds via earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery. However, environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).

Corben's Long-eared Bat	
Introduce disease that may cause the species to decline, or	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see Section 6).
Interfere with the recovery of the species.	There are no current recovery plans for this species, however a NSW 'Saving our Species' Strategy has been published, which lists clearing of habitat, habitat fragmentation and altered fire regimes. None of these threats will be significantly exacerbated by this proposal. The proposal is unlikely to impact the species recovery at a regional population scale.
Conclusion	**Non-significant impact**

Koala	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • Key source populations either for breeding or dispersal • Populations that are necessary for maintaining genetic diversity, and/or • Populations that are near the limit of the species range. The site is located within a mapped koala ark and a large local population of koalas is known. However, no Koalas were recorded during field surveys and under SEPP 2020 there is considered to be no potential Koala habitat on the subject land. Therefore, an important population is unlikely to occur on the subject land.
Reduce the area of occupancy of an important population	No. The subject land is unlikely an important population (see above).
Fragment an existing important population into two or more populations	No. The subject land is unlikely an important population (see above).

Koala	
Adversely affect habitat critical to the survival of a species	In accordance with the EPBC Referral Guidelines, the habitat assessment tool was applied to determine whether the subject land contains critical habitat for the survival of the koala (see below). A score of 5 points was determined, indicating that part of the habitat on the subject land (specifically PCT 80) is critical. The EPBC Referral Guidelines state that "a significant impact would not be expected if 5 hectares of habitat scoring 9 or 10, or 10 ha scoring 7 or 8 was selectively cleared. Therefore, as only 2.91 ha of critical habitat (PCT 82) scoring 5 will be removed, it is considered unlikely that the proposal will adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	No. The subject land is unlikely an important population (see above).
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove 3.93 ha of associated native habitat for this species (PCT 70, 82 and 185). Part of the habitat is already fragmented by the existing quarry and the proposal will not degrade the available habitat for the species to the point that the species will decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The subject land is likely already habitat for a range of pest species, including foxes (Vulpes vulpes), rabbits (Oryctolagus cuniculus), cats (Felis catus), goats (Capra hircus) and wild dogs (Canis lupus). The proposal would be unlikely to result in new invasive species becoming established. Environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Introduce disease that may cause the species to decline, or	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see Section 6).
Interfere with the recovery of the species.	Impacts which are likely to substantially interfere with the recovery of the koala may include one or more of the following: • Increasing koala fatalities in habitat critical to the survival of the koala due to dog attacks to a level that is likely to result in multiple, ongoing mortalities. • Increasing koala fatalities in habitat critical to the survival of the koala due to vehicle-strikes to a level that is likely to result in multiple, ongoing mortalities. • Facilitating the introduction or spread of disease or pathogens for example Chlamydia or *Phytophthora cinnamomi*, to habitat critical to the survival of the koala, that are likely to significantly reduce the reproductive output of koalas or reduce the carrying capacity of the habitat. • Creating a barrier to movement to, between or within habitat critical to the survival of the koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the koala. • Changing hydrology which degrades habitat critical to the survival of the koala to the extent that the carrying capacity of the habitat is reduced in the long-term. Based on the above, the proposal is unlikely to interfere with the recovery of the species.
Conclusion	**Non-significant impact**

Grey-headed Flying-fox	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The subject land is not identified as occurring within a Priority Management Area for this species. Important populations are not likely to occur within the subject land.
Reduce the area of occupancy of an important population	No. The subject land is unlikely an important population (see above).
Fragment an existing important population into two or more populations	No. The subject land is unlikely an important population (see above).
Adversely affect habitat critical to the survival of a species	The proposal will remove up to 0.04 ha of habitat for the species. This habitat does not occur within an identified Priority Management Area for the species.
Disrupt the breeding cycle of an important population	No. The subject land is unlikely an important population (see above).
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove 0.04 ha of associated native habitat for this species. The vegetation proposed for removal does not represent high quality habitat for the species as such the overall quality of the potential habitat for this species will not be significantly reduced. The proposal will reduce overall habitat connectivity however it will not isolate patches of dissect habitat features to the degree that the species may decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the species. Additionally, one priority weed was recorded on the subject land. The proposal may spread these weeds or lead to the establishment of new weeds via earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery. However, environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Introduce disease that may cause the species to decline, or	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see Section 6).

Grey-headed Flying-fox	
Interfere with the recovery of the species.	There are no current recovery plans for this species, however a NSW 'Saving our Species' Strategy has been published, which lists clearing of habitat, habitat fragmentation and altered fire regimes. None of these threats will be significantly exacerbated by this proposal. The proposal is unlikely to impact the species recovery at a regional population scale.
Conclusion	**Non-significant impact**

Pink-tailed Worm-lizard	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The subject land is not identified as occurring within a Priority Management Area for this species. Important populations are not likely to occur within the subject land.
Reduce the area of occupancy of an important population	No. The subject land is unlikely an important population (see above).
Fragment an existing important population into two or more populations	No. The subject land is unlikely an important population (see above).
Adversely affect habitat critical to the survival of a species	The species is not associated with any PCT recorded at the site. This habitat does not occur within an identified Priority Management Area for the species. Several areas of bushrock (critical habitat features for the species) will be removed as a result of this proposal, however surrounding bushrock will be retained and the impact to the species will likely be limited.
Disrupt the breeding cycle of an important population	No. The subject land is unlikely an important population (see above).
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will reduce overall habitat connectivity however it will not isolate patches of dissect habitat features to the degree that the species may decline.

Pink-tailed Worm-lizard	
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the species. Additionally, one priority weed was recorded on the subject land. The proposal may spread these weeds or lead to the establishment of new weeds via earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery. However, environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Introduce disease that may cause the species to decline, or	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see Section 6).
Interfere with the recovery of the species.	There are no current recovery plans for this species, however a NSW 'Saving our Species' Strategy has been published, which lists clearing of habitat, habitat fragmentation and altered fire regimes. None of these threats will be significantly exacerbated by this proposal. The proposal is unlikely to impact the species recovery at a regional population scale.
Conclusion	**Non-significant impact**

Mueller Daisy	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	No. The subject land is unlikely an important population, however the site is close to the only priority management site for this species.
Reduce the area of occupancy of an important population	No. The subject land is unlikely an important population (see above).
Fragment an existing important population into two or more populations	No. The subject land is unlikely an important population (see above).
Adversely affect habitat critical to the survival of a species	The species is not associated with any PCT recorded at the site, however it is known to utilize disturbed areas such as pastures and claypans. The proposal will remove up to 3.93 ha or potential habitat for this species.

Mueller Daisy	
Disrupt the breeding cycle of an important population	No. The subject land is unlikely an important population (see above).
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The removal of 3.93 ha of marginal habitat is not likely to cause the local population of this species to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the species. Additionally, one priority weed was recorded on the subject land. The proposal may spread these weeds or lead to the establishment of new weeds via earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery. However, environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Introduce disease that may cause the species to decline, or	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see Section 6).
Interfere with the recovery of the species.	There are no current recovery plans for this species, however a NSW 'Saving our Species' Strategy has been published, which lists clearing of woodlands and open forests as a threat to the species. The proposal is unlikely to impact the species recovery at a regional population scale.
Conclusion	**Non-significant impact**

Slender Darling-pea	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The subject land is not identified as occurring within a Priority Management Area for this species, however dense populations of the species occur close to the site. Important populations are not likely to occur within the subject land.
Reduce the area of occupancy of an important population	No. The subject land is unlikely an important population (see above).

Slender Darling-pea	
Fragment an existing important population into two or more populations	No. The subject land is unlikely an important population (see above).
Adversely affect habitat critical to the survival of a species	The proposal will remove up to 2.91 ha of habitat for the species. This habitat does not occur within an identified Priority Management Area for the species.
Disrupt the breeding cycle of an important population	No. The subject land is unlikely an important population (see above).
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove 2.91 ha of associated native habitat for this species. The proposal will reduce overall habitat connectivity however it will not isolate patches of dissect habitat features to the degree that the species may decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the species. Additionally, one priority weed was recorded on the subject land. The proposal may spread these weeds or lead to the establishment of new weeds via earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery. However, environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Introduce disease that may cause the species to decline, or	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see Section 6).
Interfere with the recovery of the species.	There are no current recovery plans for this species, however a NSW 'Saving our Species' Strategy has been published, which lists clearing of habitat, habitat fragmentation and altered fire regimes. None of these threats will be significantly exacerbated by this proposal. The proposal is unlikely to impact the species recovery at a regional population scale.
Conclusion	**Non-significant impact**

EPBC listed migratory and marine species

Fork-tailed Swift	
Significant Impact Guideline	**Assessment**
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	The Fork-tailed Swift does not breed in Australia. There are no significant threats to the Fork-tailed Swift in Australia. Potential threats include habitat destruction and predation by feral animals. Due to the wide range and potential mobility of this species the potential impacts will likely not be significant.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the Fork-tailed Swift. Environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	See 1 above. The species does not breed in Australia and there are no serious threats to the species in Australia. The species is almost exclusively aerial. Therefore, the proposal is unlikely to disrupt/impact this species.
Conclusion	**Non-significant impact**

White-throated Needletail	
Significant Impact Guideline	**Assessment**
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	The White-throated Needletail does not breed in Australia. There are no significant threats to White-throated Needletail in Australia. Potential threats include habitat destruction and predation by feral animals. Due to the wide range and potential mobility of this species the potential impacts will likely not be significant.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (Oryctolagus cuniculus), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the White-throated Needletail. Environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).

White-throated Needletail	
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	See 1 above. The species does not breed in Australia and there are no serious threats to the species in Australia. The species is almost exclusively aerial. Therefore, the proposal is unlikely to disrupt/impact this species.
Conclusion	**Non-significant impact**

Satin Flycatcher	
Significant Impact Guideline	**Assessment**
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	Satin Flycatchers primarily inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, they are also generally associated with waterways and waterway adjacent wooded vegetation communities. The proposal is not likely to have a significant impact on this species when it is present during its spring/summer breeding season and is not likely to impact the migratory nature of this species.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the Satin Flycatcher. Environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	Satin Flycatchers breed in Southern Australia during spring / summer, migrating to northern Australia and New Guinea during autumn and winter. It is possible that the species is present and potentially breeding on the subject land, as it is within their known distribution and contains the necessary habitat features. However, it is unlikely that the proposal would seriously disrupt the species, as the impacts to water adjacent, mature, wooded vegetation communities will be minimal.
Conclusion	**Non-significant impact**

Cattle Egret	
Significant Impact Guideline	**Assessment**

Cattle Egret	
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	Cattle Egrets are now primarily associated with anthropogenic disturbance, particularly livestock grazing, following their rapid range expansion in the early 20th century. The study area contains a large amount or pastural area and cattle were recorded during the field survey, so it is likely that the species is using the subject land as a foraging resource. Due to the gregarious nature, large size and mobility of this species it is not likely to be significantly impacted by the proposal.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the Cattle Egret. Environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	See 1 above. The species does not breed in Australia and there are no serious threats to the species in Australia. The species is strongly associated with disturbed areas and cattle which will not be affected by this proposal. Therefore, the proposal is very unlikely to disrupt/impact this species.
Conclusion	**Non-significant impact**

Black-eared Cuckoo	
Significant Impact Guideline	**Assessment**
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	The Black-eared Cuckoo widespread throughout Australia and is primarily associated with drier habitat where species such as mulga and mallee form open woodlands and shrublands. It is often found in vegetation along creek beds. The species avoids dense vegetation, preferring open and disturbed wooded areas, as such the proposal is not likely to have a significant impact on this species when it is present during its spring/summer breeding season and is not likely to impact the migratory nature of this species.

Black-eared Cuckoo	
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus).* The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the Black-eared Cuckoo. Environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The Black-eared Cuckoo breeds throughout Australia (but particularly in southern areas) during the summer. As with most cuckoos the species is a nest parasite relying on the presence of dome-nesting host species such as Speckled Warbler in order to breed. It is likely that the species is at least occasionally present on the subject land; however, it is unlikely that the proposal will have a significant impact on the lifecycle of this species.
Conclusion	**Non-significant impact**

Swift Parrot	
Significant Impact Guideline	**Assessment**
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	The Swift Parrot is highly mobile occurring in areas where eucalypts are flowering profusely or where there is abundant lerp (from sap-sucking bugs) infestations. The subject land likely provides periodic foraging habitat for the species. However, it is unlikely that the proposal will destroy or isolate an area of important habitat for the species.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the Swift Parrot. Environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The Swift Parrot breeds in Tasmania during the summer, as such no breeding habitat will be impacted by this proposal. The species may periodically utilise the subject land to forage. However, the subject land is not within a priority management area for the species. Therefore, it is considered unlikely that the proposal will have a significant impact on the lifecycle of this species.

Swift Parrot	
Conclusion	**Non-significant impact**

Rainbow Bee-eater	
Significant Impact Guideline	**Assessment**
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	The Rainbow Bee-eater is widespread throughout Australia and occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. The proposal is not likely to have a significant impact on this species when it is present during its spring/summer breeding season and is not likely to impact the migratory nature of this species.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*), goats (*Capra hircus*) and wild dogs (*Canis lupus*). The proposal would likely facilitate the movement of some of these species, which are known to use road corridors while traversing landscapes; however, not to the extent that it would impact the Rainbow Bee-eater. Environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see Section 6).
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The Rainbow Bee-eater breeds throughout Australia (but particularly in southern areas) during the summer. The species is ground nesting, burrowing into dry soils often on slopes. The species is regularly recorded within the search area and likely utilizes the site as a foraging area. However, it is unlikely that the proposal will have a significant impact on the lifecycle of this species.
Conclusion	**Non-significant impact**

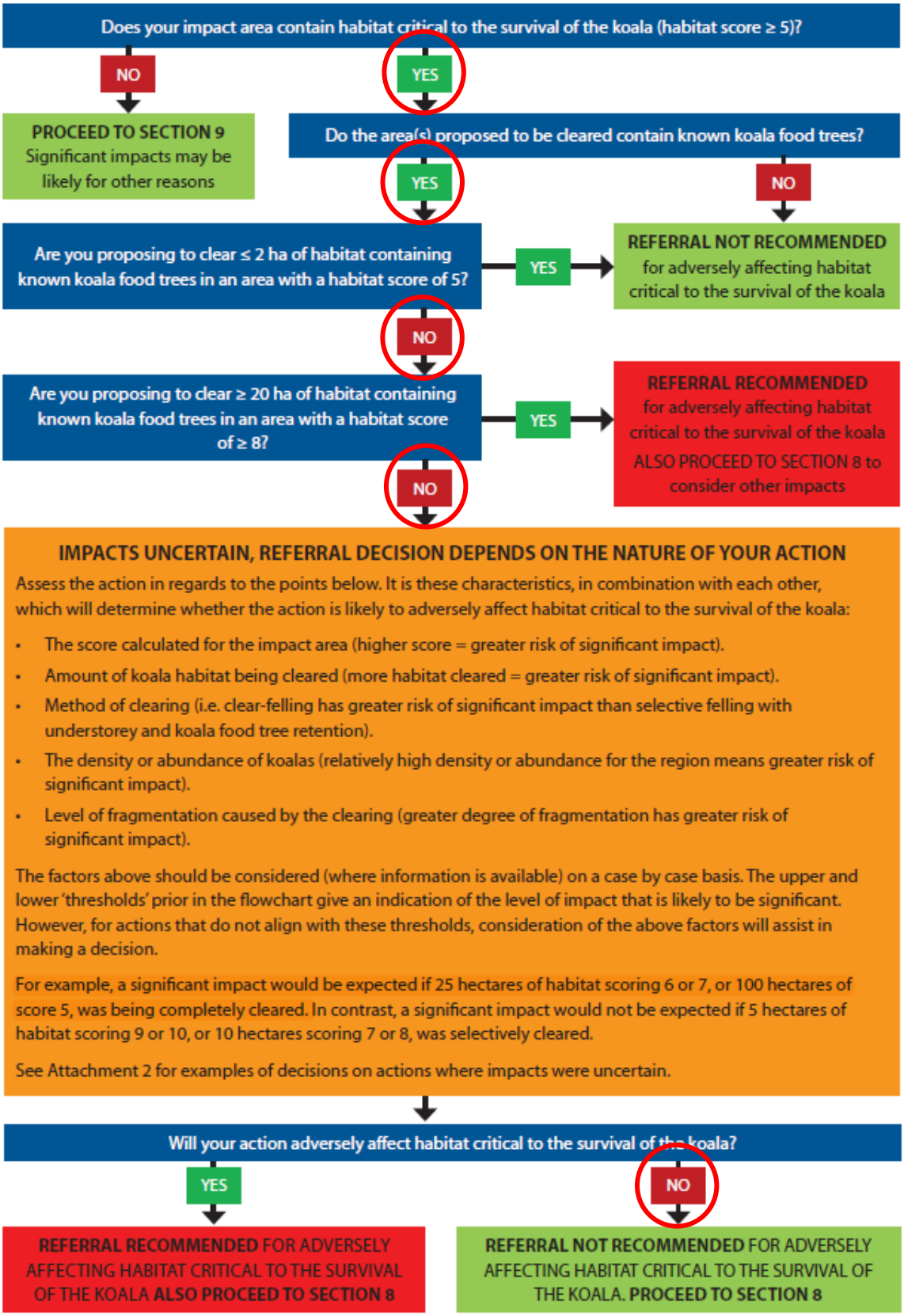
EPBC Act Koala Habitat Assessment Tool

Attribute	Score	Inland	Coastal
Koala occurrence	+2 (high)	Evidence of one or more koalas within the last 5 years.	Evidence of one or more koalas within the last 2 years.
	+1 (medium)	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 10 years.	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 5 years.
	0 (low)	None of the above.	None of the above.
Vegetation composition	+2 (high)	Has forest, woodland or shrubland with emerging trees with 2 or more known koala food tree species, **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	Has forest or woodland with 2 or more known koala food tree species, **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.
	+1 (medium)	Has forest, woodland or shrubland with emerging trees with only 1 species of known koala food tree present.	Has forest or woodland with only 1 species of known koala food tree present.
	0 (low)	None of the above.	None of the above.
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 1000 ha.	Area is part of a contiguous landscape ≥ 500 ha.
	+1 (medium)	Area is part of a **contiguous landscape** < 1000 ha, but ≥ 500 ha.	Area is part of a contiguous landscape < 500 ha, but ≥ 300 ha.
	0 (low)	None of the above.	None of the above.
Key existing threats	+2 (high)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence. Areas which score 0 for koala occurrence and have no dog or vehicle threat present	
	+1 (medium)	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence, **OR** Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.	
	0 (low)	Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present, **OR** Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.	
Recovery value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	+1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	

Note: There are no Koala food tree species on the subject land under Schedule 2 of SEPP 2020. However, Western Grey Box, which was recorded on the subject land, is included as a secondary food tree species under the approved recovery plan. Therefore, Western Grey Box has been included as a food species here.

Total score = 5

Koala habitat assessment referral determination tool



Appendix G: Key Threatening Processes

Key Threatening Processes (KTP) predicted as acting on the study area that may be exacerbated by the proposal.

Class	Name	NSW status	Comm. status	Likelihood of Occurrence	Exacerbated by Proposal
Threat	Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	KTP		**NO** There are no mapped watercourses within the subject land. There will be no waterway crossings.	NO IMPACT
Threat	Anthropogenic Climate Change	KTP	KTP	**YES** Some unavoidable emissions that contribute to climate change will occur from construction machinery	NEGLIGIBLE
Threat	Bushrock removal	KTP		**YES** Bush rocks occur within the subject land.	POTENTIAL
Threat	Clearing of native vegetation	KTP	KTP	**Yes** Up to 3.93 ha of native vegetation will be cleared.	IMPACT
Threat	Competition and grazing by the feral European Rabbit, *Oryctolagus cuniculus*	KTP	KTP	**NO** The proposal does not include any activities that might spread feral rabbits.	NO IMPACT
Threat	Competition and habitat degradation by Feral Goats, *Capra hircus*	KTP	KTP	**NO** Feral goats will not be introduced to the site as a result of the proposal	NO IMPACT
Threat	Competition from feral honey bees, *Apis mellifera*	KTP		**NO** The proposal does not include any activities that might introduce feral honey bees.	NO IMPACT
Threat	Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners	KTP		**NO** The proposal does not include any activities that would exasperate this threat.	NO IMPACT
Threat	Herbivory and environmental degradation caused by feral deer	KTP		**NO** The proposal does not include any activities that would exasperate this threat.	NO IMPACT
Threat	High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	KTP		**NO** Fire frequency will not increase due to activities undertaken as part of the proposal.	NO IMPACT
Threat	Importation of Red Fire Ants *Solenopsis invicta*	KTP	KTP	**POTENTIAL** Machinery used on site can potentially act as a transport for biosecurity risks	POTENTIAL
Threat	Infection by *Psittacine Circoviral* (beak and feather) Disease affecting endangered psittacine species and populations	KTP	KTP	**NO**	NO IMPACT

				The proposal does not include any activities that would exacerbate this threat.	
Threat	Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	KTP	KTP	**NO** No threatened frogs or habitat for threatened frogs exists on site.	NO IMPACT
Threat	Infection of native plants by *Phytophthora cinnamomi*	KTP	KTP	**POTENTIAL** Machinery used on site can potentially act as a transport for biosecurity risks	POTENTIAL
Threat	Introduction of the Large Earth Bumblebee *Bombus terrestris*	KTP		**NO** The proposal does not include any activities that might introduce the Large Earth Bumblebee	NO IMPACT
Threat	Invasion and establishment of exotic vines and scramblers	KTP		**POTENTIAL** Machinery used on site can potentially act as a transport for biosecurity risks	POTENTIAL
Threat	Invasion and establishment of Scotch Broom (*Cytisus scoparius*)	KTP		**POTENTIAL** Machinery used on site can potentially act as a transport for biosecurity risks	POTENTIAL
Threat	Invasion and establishment of the Cane Toad (*Bufo marinus*)	KTP	KTP	**NO** The proposal does not include any activities that might introduce this species.	NO IMPACT
Threat	Invasion of native plant communities by African Olive *Olea europaea* subsp. *cuspidata*	KTP		**POTENTIAL** Machinery used on site can potentially act as a transport for biosecurity risks	POTENTIAL
Threat	Invasion of native plant communities by *Chrysanthemoides monilifera*	KTP		**POTENTIAL** Machinery used on site can potentially act as a transport for biosecurity risks	POTENTIAL
Threat	Invasion of native plant communities by exotic perennial grasses	KTP		**POTENTIAL** Machinery used on site can potentially act as a transport for biosecurity risks	POTENTIAL
Threat	Invasion of the Yellow Crazy Ant, *Anoplolepis gracilipes* into NSW	KTP		**POTENTIAL** Machinery used on site can potentially act as a transport for biosecurity risks	NO IMPACT
Threat	Invasion, establishment and spread of Lantana	KTP		**NO** The subject land is not suitable habitat for Lantana	NO IMPACT
Threat	Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	KTP	KTP	**NO** The proposal does not include any activities that might cause garden plants to escape.	NO IMPACT
Threat	Loss of Hollow-bearing Trees	KTP		**NO**	NO IMPACT

				No hollow-bearing trees were recorded on site.	
Threat	Loss or degradation (or both) of sites used for hill-topping by butterflies	KTP		**NO** No sites present.	NO IMPACT
Threat	Predation and hybridisation by Feral Dogs, *Canis lupus familiaris*	KTP		**NO** Ease of access for Feral Dogs will not be increased by the proposal.	NO IMPACT
Threat	Predation by *Gambusia holbrooki* (Plague Minnow or Mosquito Fish)	KTP		**NO** No watercourses on subject land.	NO IMPACT
Threat	Predation by the European Red Fox (*Vulpes vulpes)*	KTP	KTP	**NO** Ease of access for foxes will not be increased by the proposal.	NO IMPACT
Threat	Predation by the Feral Cat *Felis catus*	KTP	KTP	**NO** Ease of access for cats will not be increased by the proposal.	NO IMPACT
Threat	Predation, habitat degradation, competition and disease transmission by Feral Pigs	KTP	KTP	**NO** Ease of access for pigs will not be increased by the proposal.	NO IMPACT
Threat	Removal of dead wood and dead trees	KTP		**POTENTIAL** Some dead wood may be removed, although no dead wood and fallen trees were recorded on the subject land.	POTENTIAL

Appendix H: Microbat Call Identification Report

balance!
ENVIRONMENTAL

Microbat Call Identification Report

Prepared for ("Client"):	OzArk Environment & Heritage
Survey location/project name:	Strontian Quarry, Narrandera, NSW
Survey dates:	31 October – 12 November 2019
Client project reference:	
Job no.:	OZA-2001
Report date:	7 February 2020

Methods

Data received

Balance! Environmental received 3086 zero-crossing analysis bat-call sequence files (ZC files), which had been converted from full-spectrum ultrasonic audio format (.WAV files) by the client, using *Kaleidoscope* (Wildlife Acoustics, Maynard MA, USA). The data were collected using a single Song Meter detector deployed for 13 consecutive nights (31 October to 12 November 2019) in the Strontian Quarry area, near Narrandera, in the Riverina region of New South Wales.

Bat-call analysis

Call analyses were performed using *Anabat Insight* (Version 1.9.1; Titley Scientific, Brisbane). All ZC files (including those that had been assigned to "Noise" folders by *Kaleidoscope*) were processed with a Decision Tree Analysis to group similar calls, based largely on frequency characteristics, and assign tentative species labels. All groups were then reviewed manually to confirm and/or reassign correct species identities. Files with no obvious bat calls or fewer than three unambiguous bat-call pulses were not identified and labelled as "noise".

Species identification

Call identification was achieved by comparing call spectrograms and derived metrics with those of regionally relevant reference calls and published call descriptions (Pennay et al. 2004). Consideration was also given to the probability of species' occurrence based on published distribution information (e.g. Churchill 2008; van Dyck *et al.* 2013) and on-line database records (e.g. http://www.ala.org.au).

Reporting standard

The format and content of this report follows Australasian Bat Society standards for the interpretation and reporting of bat call data (Reardon 2003), available on-line at http://www.ausbats.org.au/.

Species nomenclature follows Jackson & Groves (2015).

Results & Discussion

Seventy of the ZC files were found to contain only noise or unidentifiable bat calls and were excluded from further analysis. The other 3016 files yielded 3287 identifiable bat calls.

At least 12 and up to 14 species were recorded (see **Table 1**).

More than three-quarters (2543) of the calls were attributable to the three free-tailed bat species: *Ozimops petersi; O. planiceps;* and *O. ridei*.

Some 53% of the identified calls were reliably attributed to individual species, while the remainder had characteristics potentially attributable to two or more species. These "unresolved" calls were allocated to several multi-species groups. Where calls were assigned to these groups, all group members are shown as "possible" in **Table 1** for the relevant detector-night, unless more typical calls of one or more species were also positively identified for the same night.

Comparative activity levels (number of calls recorded per detector-night) for each species and unresolved group are presented in **Table 2**.

Call descriptions and unresolved group membership

Technical terms used in the following descriptions are explained in the Glossary.

Chalinolobus gouldii, Scotorepens balstoni and *Ozimops* spp. calls overlap in characteristic frequency (Fc) through the range 26-35 kHz. Most calls are easily identified, with *C. gouldii* and *S. balstoni* generally producing broad-band, steep FM-qCF (hockey-stick-shaped) calls, distinguished by inter-pulse frequency alternation (*C. gouldii*) *cf.* uniform pulse frequency (*S. balstoni*). The *Ozimops* spp. produce mainly narrow-band, shallow FM or qCF pulses, with calls allocated to species or pairs as follows:

- *O. planiceps* Fc~24-26 kHz
- *O. planiceps / O. petersi* Fc~26-28 kHz
- *O.petersi* Fc~28-30 kHz
- *O. petersi / O. ridei* Fc~30-32 kHz
- *O. ridei* Fc~32-35 kHz

A number of broader band-width calls with steeper, but variable pulse shapes may have represented *Ozimops* spp. flying close to clutter or over water, but could equally have been atypical calls from *C. gouldii* or *S. balstoni*.

Chalinolobus morio calls overlap with those of *Vespadelus vulturnus* (at Fc~47-51 kHz) and *V. regulus*, which apparently calls at Fc>51 kHz in the Riverina region rather than the Fc<46 kHz calls used throughout the remainder of its geographic range (Pennay *et al.* 2004). *V. vulturnus* was distinguished on the basis of shorter-duration pulses with more curved pulse-bodies and upward sweeping tails, compared with slanted pulse-bodies with down-swept tails from *C. morio*. No calls with Fc>51 kHz were encountered, so *V. regulus* appears to have not been recorded during this survey.

At the lower end of its frequency range (Fc~44.5 kHz), *V. vulturnus* calls may also overlap with those of *V. darlingtoni* (Fc~40-44 kHz), so typical *Vespadelus* calls (steep, broad-band, FM-qCF pulses with hooked bodies) at Fc~43.5-44.5 kHz were allocated to the unresolved species pair, while those with Fc<43.5 were positively attributed to *V. darlingtoni* and those at Fc>44.5 were attributed to *V. vulturnus*. *Miniopterus orianae oceanensis* also produces calls within this range (Fc~43-48 kHz) and *Vespadelus* spp. (especially *V. darlingtoni*) sometimes produce calls with broader, flatter pulse-bodies that are very similar to those of *M. o. oceanensis*. Several calls of this type from the present study were allocated to the unresolved group of *Vespadelus* spp./*M. o. oceanensis*; however, it is considered very unlikely that the latter species is present in the study area. Rather, the calls in question probably represent one or both *Vespadelus* spp. foraging in open, uncluttered space.

Nyctophilus species and *Myotis macropus* produce broad-band FM calls with a steep, near-linear pulse-shape and are difficult to differentiate. Calls of this type in the present dataset were not reliably identifiable beyond the combined group of *M. macropus/Nyctophilus* spp. *M. macropus* is known to occur along the Murrumbidgee River and associated streams and could have been responsible for some of these calls, especially if the detector was deployed near a waterbody. Three *Nyctophilus* species potentially occur in the study area, including: *N. geoffroyi*; *N. gouldi*; and the threatened *N. corbeni*.

References

Churchill, S. (2008). *Australian Bats*. Jacana Books, Allen & Unwin; Sydney.

Pennay, M., Law, B. and Reinhold, L. (2004). *Bat Calls of New South Wales*. Department of Environment and Conservation, Hurstville.

Jackson, S. and Groves, C. (2015). *Taxonomy of Australian Mammals*. CSIRO Publishing, Melbourne.

Reardon, T. (2003). Standards in bat detector based surveys. *Australasian Bat Society Newsletter* **20**, 41-43.

van Dyck, S., Gynther, I. and Baker, A. (ed.) (2013). *Field Companion to the Mammals of Australia*. New Holland; Sydney.

Table 1 Microbat species recorded during the Strontian Quarry survey, 31 October – 12 November 2019.

♦ = 'definite' - at least one call was attributed unequivocally to the species at the site
□ = 'possible' - calls like those of the species were recorded, but were not reliably identified

Date:	31/10	01/11	02/11	03/11	04/11	05/11	06/11	07/11	08/11	09/11	10/11	11/11	12/11
Chalinolobus gouldii	♦	♦	♦	♦	♦	♦	♦	♦		□	♦	♦	♦
Chalinolobus morio	♦		♦		♦	♦	♦	♦	♦	♦	♦	♦	
Myotis macropus	□		□		□	□		□		□	□	□	
Nyctophilus sp.	□		□		□	□		□		□	□	□	
Scotorepens balstoni	♦	♦	□	♦			♦					♦	□
Scotorepens greyii		♦									♦		
Scotorepens orion	♦												
Vespadelus darlingtoni	□	□	□	□		□	□	□		□	□	♦	
Vespadelus vulturnus	♦	♦	♦	♦		♦	♦	♦		♦	♦	♦	♦
Miniopterus orianae oceanensis	□	□	□	□		□	□	□		□	□	□	
Austronomus australis	♦	♦	♦		♦		♦	♦	♦	♦		♦	♦
Ozimops petersi	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Ozimops planiceps	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Ozimops ridei	♦	♦	♦	♦	□	♦	♦	♦			♦	♦	♦

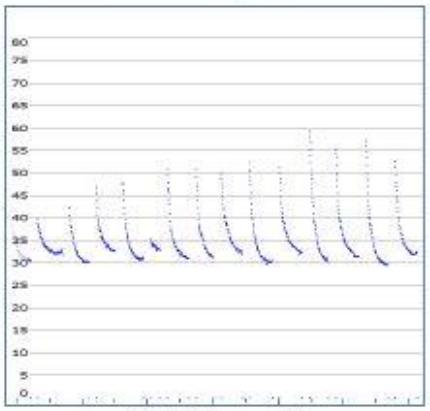
Table 2 Comparative activity levels (number of calls detected) for bats recorded during the Strontian Quarry survey, 31 October – 12 November 2019.

Date:	31/10	01/11	02/11	03/11	04/11	05/11	06/11	07/11	08/11	09/11	10/11	11/11	12/11	Species Total
Positively identified calls														
Chalinolobus gouldii	18	41	42	59	1	1	31	9			11	36	11	260
Chalinolobus morio	1		1		1	6	3	1	1	2	3	2		21
Scotorepens balstoni	4	3		1			3					3		14
Scotorepens greyii		1									1			2
Scotorepens orion	1													1
Vespadelus darlingtoni												4		4
Vespadelus vulturnus	10	3	12	2		2	7	4		1	6	13	2	62
Austronomus australis	1	24	24		2		21	7	2	8		8	9	106
Ozimops petersi	29	106	205	133	6	12	48	43	7	9	25	141	72	836
Ozimops planiceps	17	44	21	26	3	2	64	15	1	4	13	25	5	240
Ozimops ridei	9	43	27	60		1	3	12			2	43	3	203
Unresolved calls														
C. gouldii / O. petersi / O. ridei	14	21	16	40		3	10	5		1	8	23	9	150
C. gouldii / S. balstoni	1	1	3	1			2					2	1	11
Miniopterus orianae oceanensis / Vespadelus sp.	4	10	3	14		6	3	10		1	4	16		71
Myotis macropus / Nyctophilus sp.	1		1		1	4		4		3	4	8		26
O. petersi / O. ridei	37	78	65	36	3	9	12	24			6	62	12	344
O. planiceps / O. petersi	51	182	129	74	7	4	149	56	8	13	35	124	88	920
V. darlingtoni / V. vulturnus	2	4	2	7				1						16
Detector-night Total	200	561	551	453	24	50	356	191	19	42	118	510	212	3287

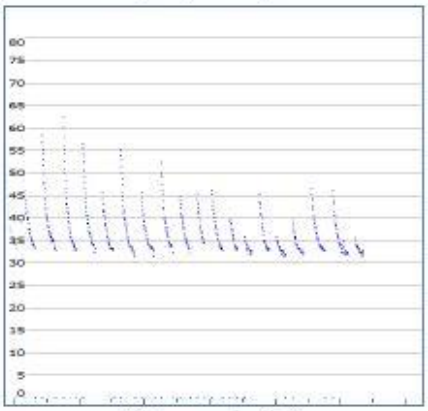
Glossary

Approach phase	The part of a bat *call* emitted as the bat starts to home in on a detected prey item; a transitional series of *pulses* between the *search phase* and *feeding buzz*, that become progressively steeper and shorter in duration.
Call	Refers to a single bat call, made up of a series of individual sound *pulses* in one or more *phases* (*search*, *approach*, *feeding buzz*).
CF (=Constant Frequency)	A type of *pulse* in which the dominant component consists of a more-or-less 'pure tone' of sound at a Constant Frequency; with *shape* appearing flat on the sonogram. Often also contains a brief *FM* component at the beginning and/or end of the CF component (*viz.* FM-CF-FM).
Characteristic frequency (Fc)	The frequency of the flattest part of a *pulse*; usually the lowest frequency reached in the *qCF* component of a pulse. This is often the primary diagnostic feature for species identification.
Duration	The time period from the beginning of a *pulse* to the end of the pulse.
Feeding buzz	The terminal part of a *call*, following the *approach phase*, emitted as the bat catches a prey item; a distinctive, rapid series of very steep, very short-duration pulses.
FM (=Frequency Modulated)	A type of *pulse* in which there is substantial change in frequency from beginning to end; *shape* ranges from almost vertical and linear through varying degrees of curvature.
FC range	Refers to the range of frequencies occupied by the *characteristic frequency* section of *pulses* within a call or set of calls.
Frequency sweep or "band-width"	The range of frequencies through which a *pulse* sweeps from beginning to end; Maximum frequency (Fmax) – minimum frequency (Fmin).
Knee	The transitional part of a *pulse* between the initial (usually steeper) frequency sweep and the *characteristic frequency* section (usually flatter); time to knee (Tk) and frequency of knee (Fk) can be diagnostic for some species.
Pulse	An individual pulse of sound within a bat *call*; the *shape*, *duration* and *characteristic frequency* of a pulse are the key diagnostic features used to differentiate species.
Pulse body	The part of the *pulse* between the *knee* and *tail* and containing the *characteristic frequency* section.
Pulse shape	The general appearance of a *pulse* on the sonogram, described using relative terms related to features such as slope and degree of curvature. See also *CF*, *qCF* and *FM*.
qCF (=quasi Constant Frequency)	A type of *pulse* in which there is very little change in frequency from beginning to end; *shape* appears to be almost flat. Some pulses also contain an *FM* component at the beginning and/or end of the qCF component (*viz.* FM-qCF).
Search phase	The part of a bat *call* generally required for reliable species diagnosis. A consistent series of *pulses* emitted by a bat that is searching for prey or and/or navigating through its habitat. Search phase pulses generally have longer duration, flatter slope and more consistent shape than *approach phase* and *feeding buzz* pulses.
Sequence	Literally, a sequence of *pulses* that may be from one or more bats; but generally refers to a *call* or part (e.g. *phase*) of a call.
Tail	The final component of a *pulse*, following the *characteristic frequency* section; may consist of a short or long sweep of frequencies either upward or downward from the Fc; or may be absent.

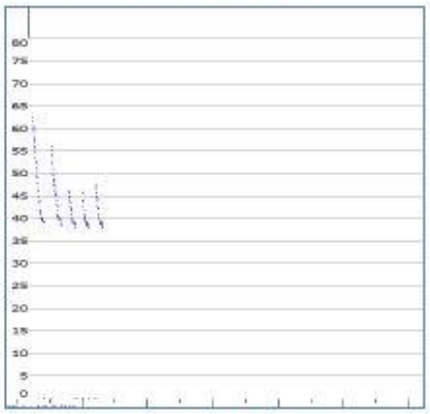
Appendix 1 Representative call sequences recorded at Hillview, 19-27 September 2019.
x-axis = 10 ms per tick-mark; time between pulses removed ("compressed")



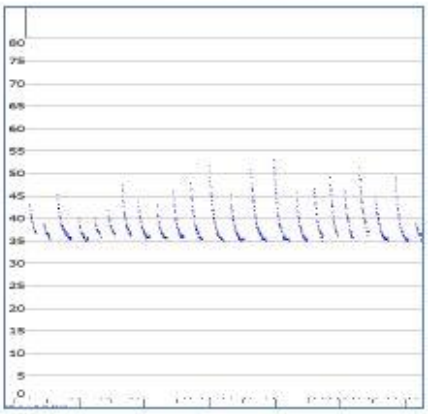
Chalinolobus gouldii



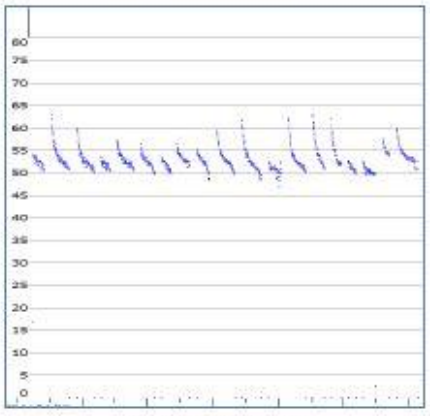
Scotorepens balstoni



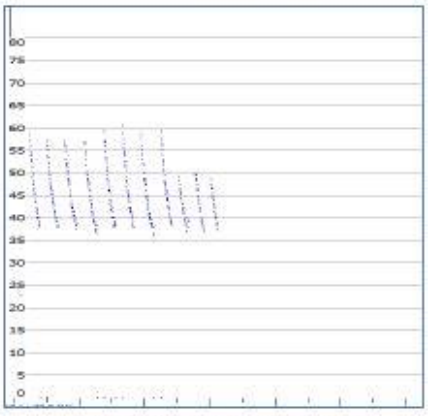
Scotorepens greyii



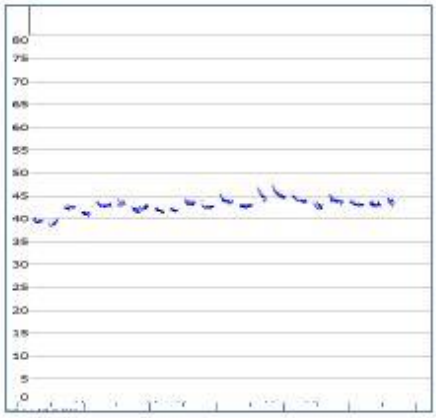
Scotorepens orion



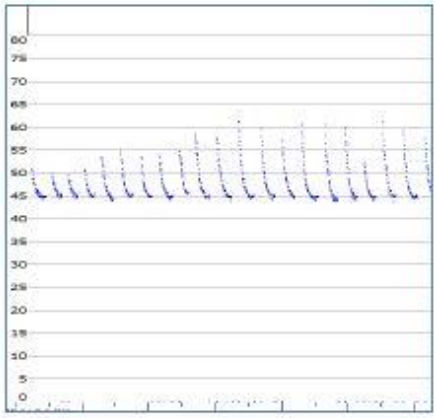
Chalinolobus morio



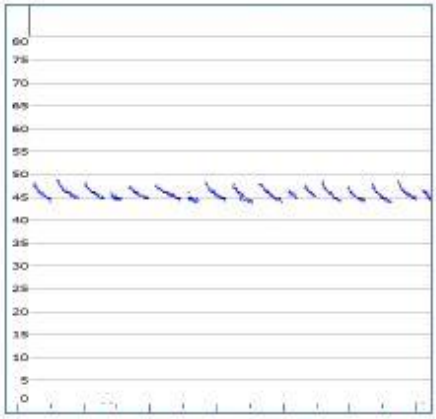
Myotis macropus / Nyctophilus sp.



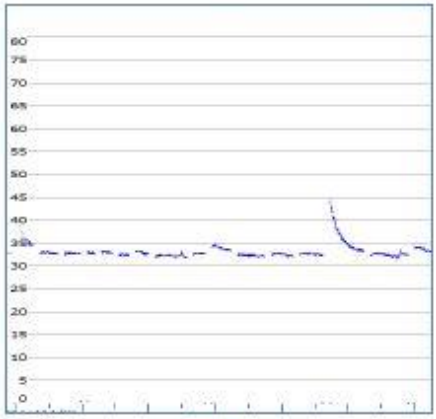
Vespadelus darlingtoni



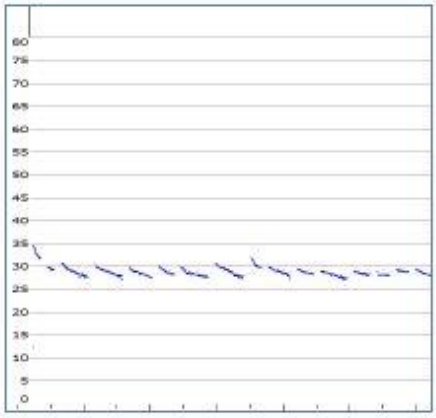
Vespadelus vulturnus



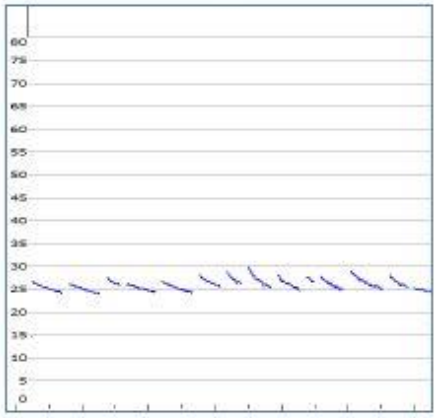
Miniopterus orianae oceanensis / Vespadelus sp.



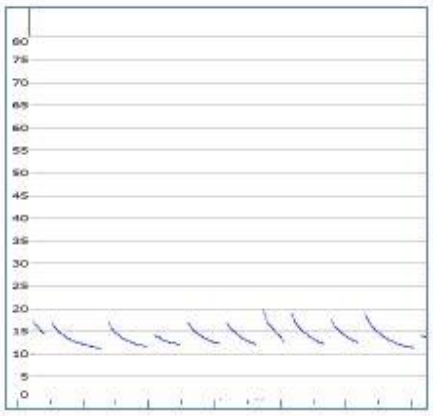
Ozimops ridei



Ozimops petersi



Ozimops planiceps



Austronomus australis

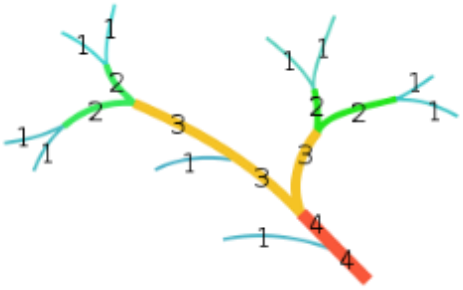
Appendix I: Terms and abbreviations

Terms and abbreviations used in this report

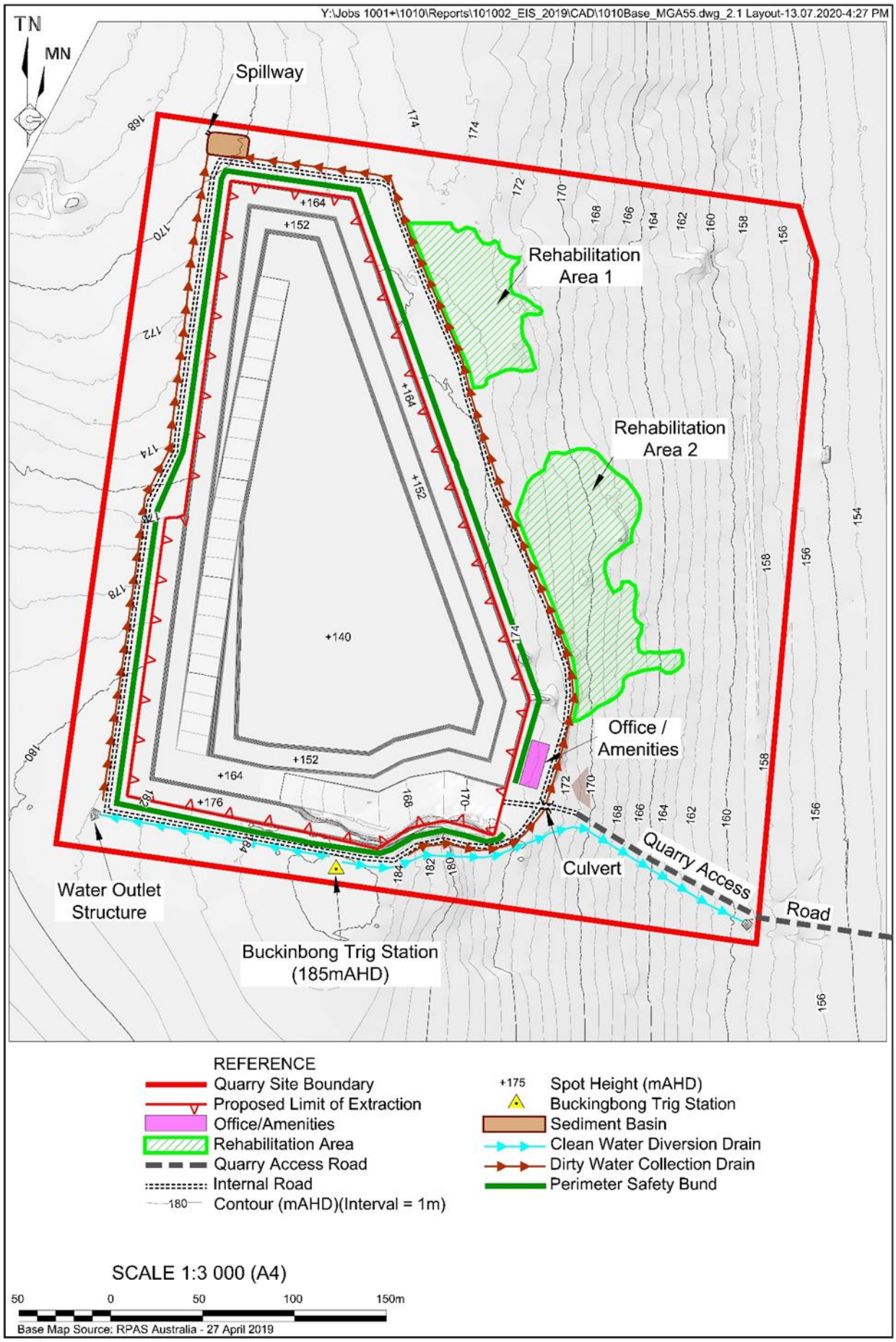
Abbreviation	Terminology	Description
BC Act	*Biodiversity Conservation Act 2016* (NSW)	The purpose of this Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. This Act contains schedules relating to the listing of threatened species, populations and communities in NSW. It also outlines the framework regulating development impact assessments in relation to biodiversity.
	Biosecurity Act 2015 (NSW)	The broad objectives for biosecurity in NSW are to manage biosecurity risks from animal and plant pests and diseases, weeds and contaminants by • Preventing their entry into NSW • Quickly finding, containing and eradicating any new entries • Effectively minimising the impacts of those pests, diseases, weeds and contaminants that cannot be eradicated through robust management arrangements. The *Biosecurity Act 2015* provides a statutory framework to help achieve these objectives.
CAMBA	China-Australia Migratory Bird Agreement	A bilateral migratory bird agreement with China entered into in 1986. It provides an important mechanism for pursuing conservation outcomes for migratory birds, including migratory waterbirds.
	Cumulative impacts	Impacts, when considered together, lead to a stronger impact than any impact in isolation.
	Direct impacts	Directly affect the habitat and individuals. They include, but are not limited to, death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat. When applying each factor, consideration must be given to all of the likely direct impacts of the proposed activity or development.
DoEE	Australian Government Department of Environment and Energy	The Department of the Environment designs and implements the Australian Government's policies and programmes to protect and conserve the environment, water and heritage and promote climate action.
DP	Deposited Plan	A plan of land deposited in Land and Property Information (part of the Land Management Authority) and used for legal identification purposes. They most commonly depict a subdivision of a parcel of land.
DPIE	Department of Planning, Industry and Environment	The New South Wales Department of Planning, Industry and Environment is a department of the New South Wales Government responsible for effective and sustainable planning and the development of industry to support the growth in the state of New South Wales, Australia
EEC	Endangered Ecological Community	An ecological community identified by relevant legislation likely to become extinct or is in immediate danger of extinction.
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW).	Provides the legislative framework for land use planning and development assessment in NSW.
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth).	Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
FM Act	*Fisheries Management Act 1994* (NSW)	The objects of this Act are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. This Act protects aquatic habitats and species which are not protected under the BC Act.

IBRA	Interim Biogeographic Regionalisation of Australia	The Interim Biogeographic Regionalisation for Australia (IBRA) is a biogeographic regionalisation of Australia developed by the Australian Government's Department of the Environment. Each region is a land area made up of a group of interacting ecosystems repeated in similar form across the landscape.
	Indirect impacts	Occur when project-related activities affect species, populations or ecological communities in a manner other than direct loss. Indirect impacts can include loss of individuals through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious hydrological changes, increased soil salinity, erosion, inhibition of nitrogen fixation, weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas. As with direct impacts, consideration must be given, when applying each factor, to all of the likely indirect impacts of the proposed activity or development.
JAMBA	Japan-Australia Migratory Bird Agreement	A bilateral migratory bird agreement with Japan entered into in 1974. It provides an important mechanism for pursuing conservation outcomes for migratory birds, including migratory waterbirds.
KTP	Key Threatening Process	A key threatening process is defined as a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities. A requirement of their listing on the TSC Act is that the process adversely affects two or more threatened species, populations or ecological communities, or may cause species, populations or ecological communities not threatened to become threatened.
	Local population (species)	A local population of a threatened plant species comprises those individuals occurring in a defined area or a cluster of individuals extend into habitat adjoining and contiguous with the study area where the individuals could reasonably be expected to cross-pollinate. A local population of fauna species comprises those individuals known or likely to occur in in a defined area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area. The local population of migratory or nomadic fauna species comprises those individuals likely to occur in the study area from time to time.
	Local occurrence (EEC)	The ecological community present within the study area. However, the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of the ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.
	Low condition (vegetation)	Vegetation in low condition means: a) woody native vegetation with native over-storey percent foliage cover less than 50% of the lower value of the over-storey percent foliage cover benchmark for that vegetation type, and where either: – less than 50% of ground cover vegetation is indigenous species, or – greater than 90% of ground cover vegetation is cleared OR b) native grassland, wetland or herbfield where either: – less than 50% of ground cover vegetation is indigenous species, or – more than 90% of ground cover vegetation is cleared If native vegetation is not in low condition, it is in moderate to good condition. The percentages for the ground cover calculations must be made in a season when the proportion of native ground cover vegetation compared to non-native ground cover vegetation in the area is likely to be at its maximum. NOTE: Clearing the habitat of threatened species, populations or communities for the purposes of reducing its condition prior to assessment under the methodology may be a breach of environmental legislation, including sections 118A and 118D of the *National Parks and Wildlife Act 1974* (NPW Act), the *Native Vegetation Act 2003* (NV Act) and/or the *Environmental Planning and Assessment Act 1979* (EP&A Act).

MNES	Matters of national environmental significance	Refers to the seven matters of national environmental significance outlined under the EPBC Act.
NPW Act	*National Parks and Wildlife Act 1974* (NSW)	The objects of this Act are as follows: • The conservation of nature, including, but not limited to, the conservation of: • habitat, ecosystems and ecosystem processes, and • biological diversity at the community, species and genetic levels, and • landforms of significance, including geological features and processes, and • landscapes and natural features of significance including wilderness and wild rivers, The conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including, but not limited to: • places, objects and features of significance to Aboriginal people, and • places of social value to the people of New South Wales, and • places of historic, architectural or scientific significance, • Fostering public appreciation, understanding and enjoyment of nature and cultural heritage and their conservation, • Providing for the management of land reserved under this Act in accordance with the management principles applicable for each type of reservation. The objects of this Act are to be achieved by applying the principles of ecologically sustainable development.
PoEO Act	*Protection of the Environment Operations Act 1997*	The objects of this Act are as follows: • to protect, restore and enhance the quality of the environment in New South Wales, having regard to the need to maintain ecologically sustainable development, • to provide increased opportunities for public involvement and participation in environment protection, • to ensure the community has access to relevant and meaningful information about pollution, • to reduce risks to human health and prevent the degradation of the environment by the use of mechanisms promoting: • pollution prevention and cleaner production, • the reduction to harmless levels of the discharge of substances likely to cause harm to the environment, • the elimination of harmful wastes, • the reduction in the use of materials and the re-use, recovery or recycling of materials, • the making of progressive environmental improvements, including the reduction of pollution at source, • the monitoring and reporting of environmental quality on a regular basis, • to rationalise, simplify and strengthen the regulatory framework for environment protection, • to improve the efficiency of administration of the environment protection legislation, • to assist in the achievement of the objectives of the *Waste Avoidance and Resource Recovery Act 2001*.
RAMSAR	Convention on Wetlands of International Importance	The Ramsar Convention's broad aims are to halt the worldwide loss of wetlands and to conserve, through wise use and management, those remaining. This requires international cooperation, policy making, capacity building and technology transfer.
	Risk of extinction	The likelihood that the local population will become extinct either in the short-term or in the long-term as a result of direct or indirect impacts on the viability of that population.
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement	A bilateral migratory bird agreement with the Republic of Korea entered into in 2007. It provides an important mechanism for pursuing conservation outcomes for migratory birds, including migratory waterbirds.

RF Act	*Rural Fires Act 1997*	The objects of this Act are to provide: • for the prevention, mitigation and suppression of bush and other fires in local government areas (or parts of areas) and other parts of the State constituted as rural fire districts, and • for the co-ordination of bush firefighting and bush fire prevention throughout the State, and • for the protection of persons from injury or death, and property from damage, arising from fires, and • for the protection of infrastructure and environmental, economic, cultural, agricultural and community assets from damage arising from fires, and • for the protection of the environment by requiring certain activities referred to in paragraphs (a)-(c1) to be carried out having regard to the principles of ecologically sustainable development described in section 6 (2) of the *Protection of the Environment Administration Act 1991*.
SEPP 44	State Environmental Planning Policy No.44 – Koala Habitat	This Policy aims to encourage the proper conservation and management of areas of natural vegetation with habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline: • by requiring the preparation of plans of management before development consent can be granted in relation to areas of core koala habitat, and • by encouraging the identification of areas of core koala habitat, and • by encouraging the inclusion of areas of core koala habitat in environment protection zones.
Significant impact		A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity.
SIS	Species Impact Statement	A document included with an Environmental Impact Statement which details a full description of the action proposed, including its nature, extent, location, timing and layout and, to the fullest extent reasonably practicable, the information referred to in this section. The requirements as to the contents of an SIS for different categories of protected species are given in section 110 of the TSC Act.
Strahler stream order		Strahler stream order and are used to define stream size based on a hierarchy of tributaries. 

Appendix J: Proposed quarry layout


Y:\Jobs 1001+\1010\Reports\101002_EIS_2019\CAD\1010Base_MGA55.dwg_2.1 Layout-13.07.2020-4:27 PM
TN
MN
Spillway
Rehabilitation Area 1
Rehabilitation Area 2
Office / Amenities
Quarry Access Road
Culvert
Water Outlet Structure
Buckinbong Trig Station (185mAHD)
REFERENCE
Quarry Site Boundary
Proposed Limit of Extraction
Office/Amenities
Rehabilitation Area
Quarry Access Road
Internal Road
Contour (mAHD)(Interval = 1m)
Spot Height (mAHD)
Buckingbong Trig Station
Sediment Basin
Clean Water Diversion Drain
Dirty Water Collection Drain
Perimeter Safety Bund
SCALE 1:3 000 (A4)
50 0 50 100 150m
Base Map Source: RPAS Australia - 27 April 2019