Appendix G
Biodiversity Development Assessment Report

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Xenith Consulting Pty Ltd on behalf of Boggabri Coal Operations Pty Ltd

Biodiversity Development Assessment Report

Boggabri Coal Mine MOD 10

Prepared by Deborah Landenberger, BAM Accredited Assessor BAAS18187

WSP

May 2025

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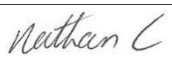
Biodiversity Development Assessment Report
Boggabri Coal Mine MOD 10

Xenith Consulting Pty Ltd on behalf of Boggabri Coal Operations Pty Ltd

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WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

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Summary

Site description

Boggabri Coal Operations Pty Ltd (BCOPL) operates the Boggabri Coal Mine (BCM) on behalf of Idemitsu Australia Pty Ltd (IA) and its joint venture partners. The BCM is an open cut mine located approximately 15 kilometres (km) north-east of the township of Boggabri in the Northwest Region of NSW, wholly within the Narrabri Local Government Area (Figure 15.1). BCM operates within the Leard Forest Mining Precinct and is immediately adjacent to the Tarrawonga Coal Mine (TCM) in the south and Maules Creek Coal Mine (MCCM) to the north. This mining precinct is referred to as the Boggabri Tarrawonga Maules Creek Complex (BTM Complex).

The BCM has operated since 2006 and currently operates in accordance with Project Approval (PA) 09_0182 (now known as State Significant Development (SSD) 09_0182), which was originally granted for the continuation of operations at the BCM on 18 July 2012 under the former Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The continued mining operations project is also undertaken pursuant to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approvals EPBC 2009/5256 and EPBC 2021/8875, granted on 11 February 2013 and 19 December 2024 respectively.

Proposal

BCOPL, on behalf of IA and its joint venture partners, is seeking to modify its approved mining operations at BCM to recover known coal resources within the approved Project Boundary and to extend mining to the northwest beyond the approved Mine Disturbance Boundary. This proposal is referred to as MOD 10. A detailed description of the proposal is provided in Section 1.1.

The Modification Disturbance Footprint (MOD 10), referred to as the subject land is approximately 86.32 hectares (ha) (Figure 15.3). The subject land contains 84.48 ha of native vegetation (Figure 15.12). The remaining 1.84 ha consists of previous disturbance associated with access tracks and borehole exploration pads.

MOD 10 is situated on land that is outside of the approved Mine Disturbance Boundary at BCM but is located entirely within the Project Boundary, as defined in EPBC 2009/5256, EPBC 2021/8875 and SSD 09_0182 (as modified).

Under the Narrabri Local Environment Plan 2012 (Narrabri LEP), the whole of the land on which the components of MOD 10 are proposed to be carried out is zoned RU1 (Primary Production) and RU3 (Forestry). All administration, workshop, coal handling and processing and transport infrastructure associated with the BCM will continue to be relied upon for the four additional years for MOD 10 is located on land zoned RU1 (as currently approved).

The Land Use Table for RU1 land in the Narrabri LEP lists ‘open cut mining’ as permissible with consent. The Land Use Table for RU3 land in the Narrabri LEP states that 'aquaculture’ is permitted with consent. Accordingly, pursuant to clause 2.9(1)(b)(i) of the Resources and Energy SEPP, mining can be carried out with development consent on RU3 land, as ‘aquaculture’ (i.e., ‘agriculture’) is a permissible land use on this land under the Narrabri LEP.

The proposal is therefore consistent with the current land use immediately within and adjacent to the subject land. The proposal is also entirely consistent with the NSW Government’s intended purpose for the land as recognised by the mining authorities held over the entirety of the Modification Mining Area and its land use zoning for development (i.e., Zone 4 – forestry and mining) under the *Brigalow and Nandewar Community Conservation Area Act 2005* (BNC Act).

WSP's involvement in field surveys, monitoring and management of the Boggabri Coal Mine and surrounds

The WSP ecology team (previously Parsons Brinckerhoff) has been undertaking ecology work associated with BCM and the surrounding Leard State Forest since 2006, including annual monitoring of the Leard State Forest as well as biodiversity assessments for previous modifications. As a result of this history of ecology work in the locality, the WSP ecology team have an intimate knowledge of the natural environment in this locality and the specific biodiversity values present. A list of ecological investigations undertaken by WSP and Parsons Brinckerhoff is provided in Table 1.2.

Entry to the Biodiversity Offset Scheme

As the existing mine operations at BCM are approved as a SSD (SSD 09_0182), MOD 10 requires approval under section 4.55 of the EP&A Act. For SSD projects (including modifications of SSD project), the Biodiversity Offset Scheme (BOS) applies unless the Secretary of the Department of Planning Housing and Infrastructure (DPHI)and the environment agency head determine that the project (or modification) is not likely to have a significant impact on threatened biodiversity values.

Plant community types and threatened ecological communities listed under the Commonwealth Environment Protection Biodiversity Conservation Act 1999

Native vegetation within the subject land has been assigned to five Plant Community Types (PCTs) representing two vegetation formations and two vegetation classes, all of which occur within the Brigalow Belt South IBRA bioregion and Liverpool Plains IBRA subregion (Table ES.1). All the identified PCTs were in moderate condition except for PCT 592, which was considered to be in high condition. None of the identified PCTs were associated with a Threatened Ecological Community (TEC) listed under either the NSW *Biodiversity Conservation Act 2016* (BC Act) or Commonwealth EPBC Act (Section 4.3).

Table ES.1 Plant community types identified within the subject land

PCT ID	PCT name	Subject land area (ha)
PCT 462	Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion	16.35
PCT 531	Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion	7.32
PCT 588	White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion	3.59
PCT 592	Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion	51.51
PCT 594	Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion	5.71
	Total area	**84.48**

Threatened species

Ecosystem credit species and species credit species (candidate species) generated by Biodiversity Assessment Method Calculator (BAM-C) and considered likely to occur or use habitat available within the subject land are detailed in Section 5.

The results of an assessment of geographic and habitat constraints and targeted surveys for candidate flora and fauna species is as follows:

- Six candidate flora species were excluded by targeted survey.
- Two candidate flora species, *Tylophora linearis* and *Pomaderris queenslandica* were recorded. Thirty stems of *Tylophora linearis* were recorded, resulting in a species polygon of 1.29 ha (Figure 15.15). A 0.0314 ha clump of *Pomaderris queenslandica* was recorded, resulting in a species polygon of 0.5 ha (Figure 15.16).
- Six candidate fauna species have been excluded by geographic limitations or habitat constraints.
- Ten candidate fauna species were excluded by targeted survey.

Three candidate fauna species, Koala, Pale-headed Snake and Squirrel Glider were assumed present due to their known occurrence in the Leard State Forest and wider locality. Species polygons for each of these three species includes the total 84.48 ha of native vegetation in the subject land (Figure 15.17, Figure 15.18, and Figure 15.19).

In addition, 10 threatened ecosystem credit species (including foraging components of dual credit species) were recorded within the subject land, all of which are listed as Vulnerable under the BC Act. These included:

- Corben's Long-eared Bat (*Nyctophilus corbeni*)
- Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*)
- Eastern Cave Bat (*Vespadelus troughtoni*)
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*)
- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)
- Speckled Warbler (*Chthonicola sagittata*)
- Varied Sittella (*Daphoenositta chrysoptera*)
- Little Lorikeet (*Glossopsitta pusilla*)
- Little Eagle (*Hieraaetus morphnoides*)
- Turquoise Parrot (*Neophema pulchella*).

Two of the recorded species, Corben's Long-eared Bat and *Tylophora linearis* are also listed as Vulnerable and Endangered under the EPBC Act respectively. An assessment of significance against the significant impact criteria for Matters of National Environmental Significance (MNES) is provided in Appendix C.

Matters of National Environmental Significance

An assessment of impacts of MOD 10 to MNES is provided in Appendix C. It is considered that MOD 10 is likely to have a significant impact on the following MNES:

- *Nyctophilus corbeni* (Corben's Long-eared Bat)
- *Anthochaera phrygia* (Regent Honeyeater)
- *Lathamus discolor* (Swift Parrot).

Under the EPBC Act, proposed actions with the potential to significantly impact matters protected by the EPBC Act must be referred to the Australian Minister for the Environment and Water, to determine whether they are controlled actions and require approval from the Minister. A referral (EPBC Referral 2024/09887) was prepared and submitted to the Minister in relation to MOD 10. MOD 10 was deemed a 'controlled action' on 20 August 2024.

The Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) has confirmed that MOD 10 will be assessed under the EPBC Act by way of the Bilateral Agreement.

Measures to avoid and minimise

Areas of biodiversity value could not be avoided for MOD 10; however, the Modification Mining Area has been designed to avoid impacts to threatened biodiversity, allowing for the maintenance of both structural and functional connectivity across the Leard State Forest through the established 500 metre (m) wide Vegetation Corridor. The Vegetation Corridor was established between BCM and MCCM as part of the conditions of consent for SSD 09_ 0182 and EPBC 2009/5256 (Figure 15.1). The Vegetation Corridor allows for the retention of biodiversity values through the protection of threatened species habitats and an essential movement corridor, connecting broader areas of the Leard State Forest to the east and west, and extending through significant adjacent biodiversity offset properties and forming an integral part of the Regional Biodiversity Corridor detailed in BCMs Biodiversity Offset Strategy (WSP, 2018c).

Section 7 of this BDAR provides a detailed explanation of measures to avoid and minimise direct, indirect and prescribed impacts from MOD 10. A summary of measures to avoid and minimise impacts is provided in Table ES.2.

Table ES.2 A summary of measures to avoid and minimise impacts

Action	Outcome	Timing	Responsibility
Locating MOD 10 to avoid areas of high biodiversity	Avoidance of the established 500 m wide Vegetation Corridor between BCM and MCCM (Figure 15.1 and Sections 1.1.3 and 3.2.3). Minimising impacts to a population of *Tylophora linearis* through avoidance of the main population of the threatened species located in the Vegetation Corridor (Section 5.2.1 and Figure 15.15). MOD 10 will impact 30 stems of *Tylophora linearis*. The main population of *Tylophora linearis* will be retained in the adjacent Vegetation Corridor with an estimated population of > 135 individuals. *Tylophora linearis* occurring in the subject land will be managed in accordance with *Appendix J – Tylophora linearis translocation and propagation management plan* as detailed in BCMs approved Biodiversity Management Plan (BMP) (WSP, 2018b).	Design phase	BCOPL
Avoidance of impacts to Threatened Ecological Communities (TECs) or Serious and Irreversible Impact (SAII) species.	No TECs or SAII species were recorded in the subject land.	Design phase	BCOPL
Avoidance of breeding habitat features for threatened fauna species.	Extensive field surveys, involving full site walkovers, targeted transects and nocturnal surveys were completed between 2019 and 2024 (Table 5.9). No karst, caves, crevices, cliffs or other areas of geological significance were observed in the subject land. A total of 46 hollow-bearing trees were recorded in the subject land, that provided at least one large hollow. No evidence of nesting or roosting by threatened fauna species was recorded, following 57.6 person hours of spotlighting surveys and stag watch surveys of 31 hollow-bearing trees. Ninety-	Design phase	BCOPL

Action	Outcome	Timing	Responsibility
	seven person hours of nest transects resulted in the recording of one stick nest (immediately adjacent to the subject land), confirmed to be used by a Wedge-tailed Eagle.		
Avoiding and minimising prescribed impacts.	A 500 m wide Vegetation Corridor was established between BCM and MCCM (Figure 15.1). The Vegetation Corridor will be maintained and protected, and therefore, connectivity will be maintained between broader sections of the Leard State Forest from the south-west to east through the Vegetation Corridor. The location of the Vegetation Corridor and potential movement corridors maintained as part of the proposal are displayed in Figure 15.1. Avoidance of karst, caves, crevices, cliffs or areas of geological significance. Extensive field surveys, involving full site walkovers and targeted transects were completed between 2019 and 2024 (Table 5.9). No karst, caves, crevices, cliffs or other areas of geological significance were observed in the subject land. Avoidance of water bodies or impacts to hydrological processes. MOD 10 will have no impact on any 3rd order or above streams. Sediment and erosion controls will be implemented to minimise impacts to water quality offsite.	Design phase	BCOPL
Locating ancillary facilities to avoid high biodiversity values.	All the proposed direct impacts are limited to the subject land.	Design phase	BCOPL
Vegetation and habitat removal minimised through implementation of a varied disturbance regime.	Mitigation measures have been developed to address the direct, indirect and prescribed impacts of the modification, outlined in Section 8. Mitigation measures implemented during vegetation clearing works will be undertaken in accordance with *Appendix B – Clearing and fauna management procedure* as detailed in BCMs approved BMP (WSP, 2018b), including: — Tree clearing and habitat removal will be undertaken using a staged process and supervised by experienced ecologists. — Relocation of habitat features (fallen timber, hollow logs) from the subject land into areas identified for retention. — Timing works to avoid critical life cycle events such as breeding or nursing.	Construction phase	BCOPL

Action	Outcome	Timing	Responsibility
Ecological restoration and rehabilitation.	Ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation/ habitat on or adjacent to MOD 10 will continue to be conducted in accordance with BCMs Rehabilitation Management Plan (James Bailey & Associates, 2024) and Biodiversity Management Plan (WSP, 2018b).	Operational phase	BCOPL

Summary of impacts

MOD 10 will have the following impacts:

- Removal of 84.48 ha of moderate to high condition PCTs, none of which are listed as TECs under the BC Act or EPBC Act.
- Removal of approximately 30 stems of *Tylophora linearis*. The main *Tylophora linearis* population will be retained in the adjacent Vegetation Corridor.
- Removal of a 0.0314 ha clump of *Pomaderris queenslandica*.
- Removal of 46 hollow-bearing trees that contained at least one large hollow. No evidence of nesting or roosting by threatened fauna species was recorded in 31 hollow-bearing trees stag watched during targeted survey.
- No direct impact to the established 500 m wide Vegetation Corridor between BCM and MCCM (Figure 15.1).
- No impact to TECs or Serious and Irreversible Impact (SAII) species.
- No impact on any 3rd order or above streams.
- No Groundwater Dependant Ecosystems will be impacted in the subject land (Section 4.6). Cumulative groundwater drawdown impacts associated with current approved BTM complex operations and MOD 10 was assessed in a Terrestrial Groundwater Dependent Ecosystem Assessment (WSP, 2025), which is appended to the MOD 10 Modification Report.
- No karst, caves, crevices, cliffs or other areas of geological significance will be impacted.

Final offset requirements

A total of 2,043 ecosystem credits are required to be offset (Table ES.3). Regarding species credit, a total of 9,209 species credits are required to be offset (Table ES.4).

Table ES.3 Impacts that require an offset – ecosystem credits

Vegetation zone	PCT	TEC/EC	Impact area (ha)	Number of ecosystem credits required
1	PCT 462 – Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion	Not applicable	16.35	394
2	PCT 531 – Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion	Not applicable	7.32	172
3	PCT 588 – White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion	Not applicable	3.59	71

Vegetation zone	PCT	TEC/EC	Impact area (ha)	Number of ecosystem credits required
4	PCT 592 – Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion	Not applicable	51.51	1,258
5	PCT 594 – Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion	Not applicable	5.71	148
		Total	**84.48**	**2,043**

Table ES.4 Impacts that require an offset – species credits

Common name	Scientific name	Loss of habitat (ha) or individuals	Number of species credits required
Koala	*Phascolarctos cinereus*	84.48	3,048
Pale-headed Snake	*Hoplocephalus bitorquatus*	84.48	3,048
Squirrel Glider	*Petaurus norfolcensis*	84.48	3,048
Tylophora linearis	*Tylophora linearis*	1.29 ha	45
Scant Pomaderris	*Pomaderris queenslandica*	0.5 ha	20
		Total	**9,209**

Offsetting strategy

The offset obligations will be met through implementing a combination of the following offset delivery options, being:

- The purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register.
- Establishing a biodiversity stewardship site(s) on lands with like for like biodiversity values to those impacted by MOD 10.
- Through making a payment into the Biodiversity Conservation Fund.

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Appendix C Matters of National Environmental Significance

Appendix D Vegetation survey data

Appendix E Fauna survey results

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Appendix G Correspondence Royal Botanical Gardens

Shortened forms

BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BCM	Boggabri Coal Mine
BCOPL	Boggabri Coal Operations Pty Ltd
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offsets Scheme
BTM Complex	Boggabri, Tarrawonga and Maules Creek Mines
CEEC	Critically Endangered Ecological Community
cm	centimetre
DBH	diameter at breast height over bark
EC	ecological community listed under the EPBC Act
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EEC	Endangered Ecological Community
ha	hectare
HTW	high threat weed
IBRA	Interim Biogeographic Regionalisation for Australia
km	kilometre
km/h	kilometre per hour
LLS Act	*Local Land Services Act 2013* (NSW)
m	metre
MCCM	Maules Creek Coal Mine
ml	millilitre
mm	millimetre
MNES	Matters of National Environmental Significance
Mtpa	Million tonnes per annum
NPW Act	*National Parks and Wildlife Act 1974* (NSW)

NSW	New South Wales
PA	Project Approval granted under the former Part 3A of the EP&A Act
PCT	plant community type
SAII	serious and irreversible impact
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
TCM	Tarrawonga Coal Mine
TBDC	Threatened Biodiversity Data Collection
TEC	threatened ecological community
VEC	vulnerable ecological community

Declarations

i. Certification under clause 6.15 *Biodiversity Conservation Act 2016*

I certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method and clause 6.15 of the *Biodiversity Conservation Act 2016* (BC Act).

Signature: 

Deborah Landenberger

Date: 29/05/2025

BAM Assessor Accreditation no: BAAS18187

This BDAR has been prepared to meet the requirements of BAM 2020. Appendix A provides an assessment of compliance with the minimum information requirements outlined in BAM Appendix K.

ii. Details and experience of author/s and contributors

The contributors and authors of this BDAR, their role and qualifications are listed in the below table.

Authors and contributors

Name	BAM Assessor Accreditation number	Position/role	Tasks performed	Relevant qualifications
Alex Cockerill	BAAS17020	National Executive – Ecology	BAM Accredited Assessor Project director	Bachelor of Science (Hons)
Nathan Cooper	–	Principal Ecologist	Project manager Lead zoologist Technical review Report preparation Field survey – targeted flora and fauna survey	Bachelor of Environmental Science Graduate Diploma (Ornithology)
Nicholas Everitt	BAAS17049	Principal Ecologist	Lead BAM Accredited Assessor Report preparation BAM-C data entry and calculations Lead botanist- BAM plot surveys	Bachelor of Environmental Science
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Deborah Landenberger	BAAS18187	Principal Ecologist	BAM Accredited Assessor Report preparation	Bachelor of Science (Hons)
Allan Richardson	–	Associate Ecologist	Field survey – targeted fauna survey	Bachelor of Environment Science (Hons)
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Name	BAM Assessor Accreditation number	Position/role	Tasks performed	Relevant qualifications
Tori Wilson	–	Professional Ecologist	Field survey – targeted flora and fauna survey	Bachelor of Animal Science Graduate Certificate of Captive Vertebrate Management Graduate Certificate of Environmental Management (Conservation)
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Rob Gration	–	Principal Ecologist (EcoAerial)	Anabat call sequence analysis	Master of Wildlife Management

All work was carried out under the appropriate licences, including scientific licences as required under Clause 22 of the National Parks and Wildlife Regulations 2002, section 132C of the NPW Act (License Number: SL100630) as well as an animal research authority issued by the Department of Primary Industries and Regional Development.

iii. Conflict of interest

I wish to openly declare the following actual, perceived or potential conflict of interest and the management strategies employed:

Tanya Bangel (refer to authors and contributors table above) is the owner of a property within the Peel IBRA subregion, adjacent to the Liverpool Plains IBRA subregion. Preparations are in progress for a Biodiversity Stewardship Agreement (BSA) over this property. Given its location, biodiversity credits generated from a BSA could potentially be purchased to offset impacts from the Boggabri Coal Mine MOD 10 subject land. As a results, this is considered to be a perceived conflict of interest.

This perceived conflict of interest has been managed as follows:

- Utilising field teams of two ecologist for the collection of all BAM plot data and targeted surveys.
- The use of a large team, including eight ecologists for the collection of field data.
- Data collation and review of BAM plot data utilising the three alternative Accredited Assessors involved in the project.
- The final BAM-C calculations have been undertaken by an alternative Accredited Assessor, Nicholas Everitt (BAAS17049).
- The BSA will be prepared by an independent Accredited Assessor.

This declaration has been made in the interests of full disclosure to the decision-maker. Full disclosure has also been provided to the client.

Signature: _____

Date: _____

BAM Assessor Accreditation no: _____

Stage 1: Biodiversity assessment

1 Introduction

1.1 Proposed development

1.1.1 Development overview

Boggabri Coal Operations Pty Ltd (BCOPL) operates the Boggabri Coal Mine (BCM) on behalf of Idemitsu Australia Pty Ltd (IA) and its joint venture partners. The BCM is an open cut mine located approximately 15 kilometres (km) north-east of the township of Boggabri in the North West Region of NSW, wholly within the Narrabri Local Government Area (Figure 15.1). BCM operates within the Leard Forest Mining Precinct and is immediately adjacent to the Tarrawonga Coal Mine (TCM) in the south and Maules Creek Coal Mine (MCCM) to the north. This mining precinct is referred to as the Boggabri, Tarrawonga, Maules Creek Complex (BTM Complex).

The BCM has operated since 2006 and currently operates in accordance with Project Approval PA 09_0182 (now known as State Significant Development (SSD) 09_0182), which was originally granted for the continuation of operations at the BCM on 18 July 2012 under the former Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The continued mining operations project is also undertaken pursuant to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approvals EPBC 2009/5256 and EPBC 2021/8875, granted on 11 February 2013 and 19 December 2024 respectively.

Figure 15.4 shows the currently approved mining operations, the approved Mine Disturbance Boundary within the Project Boundary, which encompasses all aspects of the mining operations and associated activities which are currently approved under SSD 09_0182 (as modified) for the BCM.

BCOPL (on behalf of IA and its joint venture partners) is seeking to modify its approved mining operations at BCM to recover known coal resources within the approved Project Boundary and to extend mining to the northwest beyond the approved Mine Disturbance Boundary. This will entail the recovery of an additional 30 Million tonne (Mt) of Run of Mine (ROM) coal to the base of the Templemore Coal Seam (MOD 10). If approved this will extend the life of the mine from 2036 to 2040.

As the existing mine operations are approved as a SSD (SSD 09_0182), MOD 10 requires approval from the NSW Minister for Planning under section 4.55 of the EP&A Act. Under this provision, the Biodiversity Offset Scheme (BOS) is triggered and offsets are required for MOD 10. MOD 10 has the same meaning as ‘the project’ as defined in the Biodiversity Assessment Method (BAM).

1.1.1.1 Previous modification approvals

SSD 09_0182 has been modified on nine separate occasions to date with one modification (Modification 1) being withdrawn. These modifications are described as follows:

- Modification 1 – sought approval for emergency trucking operations, however, this application was subsequently withdrawn.
- Modification 2 – facilitated the processing and associated transport of up to 3 Mtpa of ROM coal from the adjacent TCM as approved in February 2015.
- Modification 3 – enabled construction of a permanent mine access road, use of overburden as a base material for the rail spur embankment, use of an offsite laydown area and use of in pit fuel storage facilities. Modification 3 was approved in March 2014.

- Modification 4 – adjustment of the project boundary, alterations to existing infrastructure within the mine, facilitate the construction of a security fence and firebreak and use of additional portable fuel storages within operational area. Modification 4 was approved in March 2015.
- Modification 5 – enabled the construction of six bores, two that would supply water for use in the coal process and mining operations and four contingency production bores that would supply water for use at the mine. Modification 5 included ancillary infrastructure required for the bores, such as powerlines, access tracks and water transfer pipelines. Modification 5 was approved in August 2016.
- Modification 6 – facilitated a minor administrative amendment to condition 12, schedule 2 to address the current under-utilisation of the Boggabri Rail Spur Line. Modification 6 was approved in July 2017.
- Modification 7 – for the realignment of a small section of the project boundary with TCM, enabled the transport of small tonnages of coal by road for testing and marketing purposes, enabled BCOPL to undertake exploration activities within the approved disturbance area, enabled the use of an approved stockpile dedicated to TCM for its own product coal and allowed biodiversity offsets to be secured through alternative mechanisms. Modification 7 was approved in May 2019.
- Modification 8 – was granted on 22 January 2024 and provided approval a stepdown in mining operations below the Merriown Coal Seam from 2025 to recover an additional 28.1 Mt of ROM coal, a three-year mine life extension (until the end of 2036), increase in the peak workforce at BCM to be 876 full time equivalent employees, and variations to the previously approved Final Landform Design.
- Modification 9 – was granted on 2 March 2023 to construct new Pre-Shift Infrastructure at a location closer to the active mining area, to utilise a mobile rock crushing facility within the approved Mine Disturbance Boundary and for minor administrative changes.
- Modification 11 – was granted on 19 July 2024 to extend the existing Workshop and Store Facilities at BCM within the approved Mine Infrastructure Area.

1.1.2 Location

The BCM is an open cut mine located approximately 15 km north-east of the township of Boggabri in the North West Region of NSW, wholly within the Narrabri Local Government Area (Figure 15.1 and Figure 15.2). BCM operates within the Leard Forest Mining Precinct (BTM Complex) and is immediately adjacent to TCM in the south and MCCM to the north (Figure 15.3).

MOD 10 is located within the Leard State Forest within Lot 38 DP1211027 and Lot 30 DP754940.

1.1.3 Vegetation corridor

To the north of the subject land is a vegetated corridor between BCM's lease boundary and the adjacent MCCM that links areas of existing native vegetation to the east and west of the Leard State Forest (Figure 15.3). The corridor was required as part of BCM's State (SSD 09_0182) and Commonwealth (EPBC 2009/5256) Conditions of Approval (CoA). BCOPL is required to maintain and protect a viable vegetated corridor between its lease boundary and the adjacent MCCM that links areas of existing native vegetation to the east and west of Leard State Forest. The CoA for the retention and maintenance of a 500-metre-wide corridor is currently split, with 250 metres being retained within BCM lease boundary and a further 250 metres within the neighbouring MCCM lease boundary. MOD 10 will not directly impact on the Vegetation Corridor and all direct impacts will be confined to the subject land.

1.1.4 Proposed development and the subject land

The subject land is illustrated on Figure 15.2 and encompasses the additional 86.32 ha area that is located outside the currently approved Mine Disturbance Boundary. The subject land is situated on the south-eastern side of a broad ridge containing mostly first order ephemeral drainage lines which flow initially south and south-east, and then to the west through unnamed drainage lines into the Nagero Creek and Namoi River.

MOD 10 includes the following changes to mine operations and surface infrastructure that have the potential to result in impacts to threatened species and their habitats:

- An additional 84.48 ha of disturbance to native vegetation which does not conform to any listed threatened ecological community, although may comprise habitat for a range of threatened species that are known to occur within the region.
- Revised final landform and rehabilitation areas to integrate with the adjacent Leard State Forest and the Maules Creek and Tarrawonga mining areas.

1.1.5 Other documentation

This BDAR is part of the MOD 10 Modification Report. This BDAR should be read in conjunction with the MOD 10 Modification Report and associated technical studies.

1.2 Biodiversity Offsets Scheme entry

Entry to the BOS is triggered by developments, projects and activities that meet certain thresholds for significant impacts on biodiversity, or on an opt-in basis.

For SSD and state significant infrastructure (SSI) projects, the BOS applies unless the Secretary of the Department of Planning and Environment (now Department of Planning Housing and Infrastructure (DPHI)) and the environment agency head determine that MOD 10 is not likely to have a significant impact on biodiversity values.

1.3 Excluded impacts

Clause 6.8(3) of the *Biodiversity Conservation Act 2016* (BC Act) specifies that the BAM is to exclude the assessment of the impacts of any clearing of native vegetation and loss of habitat on category 1-exempt land (as defined in Part 5A of the *Local Land Services Act 2013* (LLS Act), other than prescribed impacts (as defined in clause 6.1 of the Biodiversity Conservation Regulation 2017 (BC Regulation)). Prescribed impacts must therefore be assessed for category 1-exempt land.

The subject land contains cleared areas that are not comprised of any native vegetation (approximately 1.84 ha). These areas are illustrated in Figure 15.6 and have been excluded from the assessment of impacts and classified as Category 1 Exempt Land. These areas that include the following:

- access tracks.
- borehole exploration pads.

1.4 Matters of National Environmental Significance

Under the EPBC Act, proposed actions with the potential to significantly impact matters protected by the EPBC Act must be referred to the Australian Minister for the Environment and Water, to determine whether they are controlled actions and require approval from the Minister. This includes an action that is likely to have a significant impact on Matters of National Environmental Significance (MNES), such as Commonwealth listed threatened species and ecological communities.

Following submission of a referral for MOD 10 under the EPBC Act (EPBC 2024/09887), a delegate for the Australian Minister for the Environment and Water, determined on 20 August 2024 that MOD 10 was a controlled action that required approved under the EPBC Act. The delegate also confirmed that MOD 10 would be subject to an assessment in accordance with the bilateral agreement with the NSW Government under section 45 of the EPBC Act.

The NSW Assessment Bilateral Agreement provides for certain actions that are SSD or SSI within the meaning of the EP&A Act, to be accredited for the purposes of meeting the requirements for assessment and public exhibition of an action under the provisions of the EPBC Act. However, a separate EPBC Act approval is still required.

Supplementary Secretary's Environmental Assessment Requirements (SEARs) were issued for MOD 10 on 25 September 2024 to include the relevant Commonwealth requirements under the NSW Assessment Bilateral Agreement. Appendix C of this BDAR has been prepared to address these requirements. MNES under the EPBC Act have been identified or considered likely to occur in the subject land and these are identified in the BDAR in Section 4, Section 5, Appendix B and Appendix C.

In addition to the threatened entities listed under the BC Act, the BAM requires discussion of threatened ecological communities and species listed under the EPBC Act. The SEARs also require that MNES, listed under the EPBC Act, are considered. Details of MNES (related to biodiversity values) in the subject land along with discussion of impacts, mitigations and offset requirements are provided in Appendix C.

1.5 Information sources

1.5.1 Database searches

The aim of the background research was to identify threatened flora and fauna species, populations and ecological communities, Commonwealth listed migratory species or critical habitat recorded previously or predicted to occur in the locality of the subject land.

This allowed for known habitat characteristics to be compared with those present in the MOD 10 subject land to determine the habitat suitability of each species or population. It further enabled justification for inclusion of any additional predicted or candidate threatened flora and fauna species not identified by the Biodiversity Assessment Method Calculator (BAM-C).

Records of threatened species, populations and ecological communities known or predicted to occur in the locality of the MOD 10 subject land were obtained from a range of databases as detailed in Table 1.1. A summary of threatened entities captured by these database searches is provided in Appendix B.

Table 1.1 Database searches

Database	Search date	Area searches	Reference
PlantNet Database	28/08/2023, 17/11/2023	Narrabri LGA	Royal Botanic Gardens, Sydney.
BioNet Atlas of NSW Wildlife	21/08/2023, 17/11/2023	10 km x 10 km centred on the subject land	NSW Office of Environment and Heritage.
EPBC Act Protected Matters Search Tool (PMST)	21/08/2023, 15/11/2023, 13/06/2024	10 km x 10 km centred on the subject land	Department of Climate Change, Energy, the Environment and Water
Biodiversity Assessment Calculator (BAM-C)	24/06/2024	Based on IBRA Bioregion/ Subregions and PCT VI plot data collected and imported.	NSW Biodiversity Accredited Assessor System.
Fisheries Spatial Data Portal	19/03/2023	10 km x 10 km centred on the subject land	NSW Department of Primary Industries and Regional Development

Database	Search date	Area searches	Reference
Biodiversity Values Map	24/06/2024	Viewing of the subject land to confirm the absence of Biodiversity Values	Biodiversity Value Map and Threshold Tool, NSW Department of Climate Change, Energy, the Environment and Water
Atlas of Living Australia (ALA)	13/06/2024	Narrabri LGA	CSIRO
Areas of Outstanding Biodiversity Value register	16/01/2024	Viewing of register for listing in the locality of the subject land.	NSW Office of Environment and Heritage.

1.5.2 *Sources of information used in this assessment*

The following information sources used to inform the preparation of this report:

- Aerial photographic imagery.
- BioNet (NSW) Mitchell Landscapes – Version 3.1 (NSW Department of Climate Change Energy the Environment and Water, 2016).
- NSW Interim Biogeographic Regionalisation of Australia (IBRA region and subregion) – Version 7.0) (Commonwealth Department of Climate Change Energy the Environment and Water, 2024b).
- Atlas of Groundwater Dependent Ecosystems (GDE) (Bureau of Meteorology, 2023).
- Directory of Important Wetlands of Australia (Department of Climate Change Energy the Environment and Water, 2024b).
- Register of Declared Areas of Outstanding Biodiversity Value – Critical habitat declarations in NSW (Environment and Heritage, 2024).
- BioNet Threatened Biodiversity Data Collection (TBDC) (DCCEEW, 2024b).
- BioNet Vegetation Classification (Department of Planning and Environment, 2023b).
- Native Vegetation Regulatory Map (NSW Office of Environment and Heritage).
- Commonwealth Species Profiles and Threats Database (Commonwealth Department of Climate Change Energy the Environment and Water, 2024c).
- BAM Important Area Maps for threatened species (Department of Planning, 2020b).
- Biodiversity Assessment Method 2020 (Department of Planning Industry and Environment, 2020a).
- BAM survey guidelines, including:
  - Threatened reptiles: Biodiversity Assessment Method survey guide (Department of Planning and Environment, 2022b).
  - Koala (*Phascolarctos cinereus*): Biodiversity Assessment Method Survey Guide (Department of Planning and Environment, 2022a).
  - Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method (Department for Planning Industry and Environment, 2020).
  - Flora Species with Specific Survey Requirement.
  - 'Species credit' threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method (Office of Environment & Heritage, 2018b).
  - NSW Survey Guide for Threatened Frogs: A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (Department of Planning Industry and Environment, 2020b).
  - Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (Department of Environment and Conservation, 2004).

The following geology and soil mapping datasets and reports were reviewed:

- Soil and Land Resources of the Liverpool Plains Catchment (Office for Environment & Heritage, 2012).
- Site verification assessment (Landloch Pty Ltd, 2020).

1.5.3 Previous surveys and assessments

Biodiversity values within and immediately surrounding the subject land have been subject to an array of previous survey and assessment as part of the establishment and ongoing operation of the BCM, TCM and MCCM projects. Previous ecological survey and assessment that have been considered in the preparation of this report are provided in Table 1.2.

Table 1.2 Previous ecological investigations

Ecological investigation	Year	Reference
Annual Biodiversity Monitoring of Leard State Forest	2006 to 2024	WSP (2020a); WSP (2019a); WSP (2018a); WSP Parsons Brinckerhoff (2017a); WSP Parsons Brinckerhoff (2016b); Parsons Brinckerhoff (2014c); Parsons Brinckerhoff (2014b); Parsons Brinckerhoff (2013b)
Annual Monitoring of Leard State Forest Biodiversity Corridor (Vegetation Corridor)	2013 to 2024	WSP (2020c); WSP (2019b); WSP (2017); WSP Parsons Brinckerhoff (2016a); Parsons Brinckerhoff (2015a); Parsons Brinckerhoff (2014a); Parsons Brinckerhoff (2013a)
Continuation of Boggabri Coal Mine – Biodiversity Impact Assessment	2009 to 2010	Parsons Brinckerhoff (2010a)
Biodiversity surveys of BCM mine lease within Leard State Forest	2018 to 2020	WSP (2019d)
BCM Tree Clearing Reports	2013 to 2024	WSP (2020b); WSP (2019c); WSP (2018d); WSP Parsons Brinckerhoff (2017b); Parsons Brinckerhoff (2016); Parsons Brinckerhoff (2015c); Parsons Brinckerhoff (2015b); Parsons Brinckerhoff (2014d)
Alternative Biodiversity Corridor Strategy	2016	WSP | Parsons Brinckerhoff (2016)
Maules Creek Coal Mine Biodiversity Impact Assessment	2011	Cumberland Ecology (2011)
Tarrawonga Coal Project Environmental Assessment – Appendix E (Fauna Assessment) and Appendix F (Flora Assessment)	2011	Bower (2011); Resource Strategies and Cenwest Environmental Services (2011)

1.5.4 Summary of management plans

Biodiversity Management Plan

BCM operates under a Biodiversity Management Plan (BMP) (WSP, 2018b). This BMP addresses Schedule 3, Condition 49 of PA 09_0182, which requires BCM to prepare and implement a BMP. Management measures, performance criteria and procedures contained in this BMP provide a framework for managing biodiversity values within the BCM and Biodiversity Offset Areas (BOAs) throughout the operational life of the mine. These are included in Appendices of the BMP as follows:

- Appendix A – Monitoring, inspection and reporting program
- Appendix B – Clearing and fauna management procedure
- Appendix C – Weed and pest management strategy
- Appendix D – Threatened species recorded or predicted to occur within 20 km of the BCM Project Boundary
- Appendix E – BOA management plans
- Appendix F – Threatened biodiversity implementation plans

- Appendix G – Agriculture suitability assessment
- Appendix H – Soil management protocol
- Appendix I – Biodiversity corridor plan
- Appendix J – Tylophora linearis translocation and propagation management plan.

The BMP is a working document and may need revision to incorporate specific management requirements related to MOD 10.

Rehabilitation Management Plan

The Rehabilitation Management Plan (RMP) provides practical instruction for managing rehabilitation activities and works for MOD 10. Specifically, the RMP addresses the Commonwealth Conditions of Approval issued for the Boggabri Coal Mine Extension (EPBC 2009/5256) on 11 February 2013 under section 130(1) and 133 of the EPBC Act and the former State Conditions of Approval (PA 09_0182) (prior to approval of MOD 9), now addressed by the Rehabilitation Reforms under *Mining Regulation 2016*, Schedule 8A, Part 2, Division 3. Relevant managing practices outlined in the RMP include:

- statutory requirements
- baseline data
- rehabilitation objectives and criteria
- final landform and land use
- rehabilitation management
- monitoring
- intervention and adaptive management
- environmental Incident Management Protocol reporting.

2 Methods

2.1 Site context methods

This chapter describes the approach to identifying and assessing the landscape context in accordance with Chapter 3 of the BAM, and the requirements set out in Part 1 of the BAM 2020 Operational Manual – Stage 1 (Department of Planning, 2020a). It provides information on a range of landscape features that occur on the subject land and in surrounding areas. The landscape features are used to inform the habitat suitability for threatened species and the potential movement of species across the landscape. This information is used in the landscape context component of BAM-C.

2.1.1 Landscape features

Section 3 of the BAM sets out the requirement to assess landscape features and to establish the site context of the subject land in the surrounding landscape. The landscape features include:

- IBRA bioregions and IBRA subregions
- rivers, streams, estuaries and wetlands
- habitat connectivity
- karst, caves, crevices, cliffs, rocks and other geological features of significance
- areas of outstanding biodiversity value
- NSW (Mitchell) landscape
- any additional features that are required to be assessed according to any applicable SEARs.

Landscape features within the subject land were identified using regional vegetation mapping resources, aerial photographic interpretation and field survey. Landscape features were observed as part of the field surveys. Details on the assessment of landscape features are provided in Section 3.2.

2.1.2 Native vegetation cover

Determination of native vegetation cover within the subject land was undertaken using regional vegetation mapping resources, aerial photograph interpretation, existing reports, knowledge of the subject land and field survey. Details of methods used to determine native vegetation cover are provided in Section 4.1.

2.2 Native vegetation, threatened ecological communities and vegetation integrity methods

2.2.1 Review of existing information

Mapping of native vegetation extent within the subject land is required under section 4.1 of the BAM with detailed requirements outlined in section 3.2 of the BAM 2020 Operational Manual.

Existing information was used where available to assist in the identification of PCTs and TECs within the subject land, and map vegetation boundaries. This existing information included regional vegetation mapping resources, aerial photograph interpretation, existing reports and knowledge of the subject land.

Vegetation within the subject land and locality has been mapped at the regional scale by the following:

- NSW State Vegetation Type Map (Department of Climate Change Energy the Environment and Water, 2023b).
- State Vegetation Type Map: Border Rivers Gwydir / Namoi Region Version 2.0 VIS_ID 4467 (Office of Environment & Heritage, 2016).
- Refinement of Vegetation Mapping in the Namoi Catchment: Extant and pre-European (Eco Logical Australia, 2013).
- Report on the botany, wildlife and ecology of the Leard State Forest (James B. Croft and Associates, 1983) which was further refined within the subject land as part of biodiversity surveys completed for the Continuation of Boggabri Coal Mine Biodiversity Impact Assessment (Parsons Brinckerhoff, 2010b).

2.2.2 Mapping native vegetation extent

Mapping of native vegetation extent within the subject land was undertaken using regional vegetation mapping resources, aerial photograph interpretation, existing reports, knowledge of the subject land and field survey.

Vegetation within the subject land and locality has been most recently mapped at the regional scale in the NSW State Vegetation Type Map (SVTM) release C2.0M2.0 and SVTM: Border Rivers Gwydir / Namoi Region Version 2.0. This mapping data provided a guide to the occurrence and distribution of PCTs, Vegetation Classes, and Vegetation Formations. The SVTM was used as an aid in mapping native vegetation extent within the subject land and greater assessment area.

Preliminary mapping of vegetation community boundaries was undertaken through analysis of existing vegetation mapping identified in Section 2.2.1 and aerial photograph interpretation. Native vegetation extent within the subject land was further refined via field validation surveys completed by WSP between September 2019 and February 2024 which involved the completion of random meanders, BAM vegetation integrity plots and rapid data assessments. Boundaries of PCTs were digitised using the aerial photos provided on the ArcGIS online World Imagery map server.

Data on geology, dominant canopy species, native species richness, vegetation structure and condition was collected from areas able to be accessed during field surveys to validate and refine this existing vegetation mapping to determine their associated PCT as outlined the BioNet Vegetation Classification Database (Department of Climate Change Energy the Environment and Water, 2024a).

2.2.2.1 Rapid data point survey

To support the mapping of native vegetation extents within the subject land, rapid data point surveys were undertaken to indicate distinctive changes within the vegetation communities. These points provided, at a minimum, the condition of the community and the dominant species within the canopy. This data was utilised to reduce any uncertainty in the boundaries of each of the plant community types and their subsequent vegetation zones.

These rapid data points were also used to identify areas for the habitat constraints assessment for threatened fauna (see Table 2.2). This was achieved by identifying key vegetation habitat for particular threatened species, such as determining mistletoe occurrence to identify key Painted Honeyeater habitat. Other key habitat features, such as hollows and rocky areas, were also recorded during these surveys to support these assessments.

2.2.3 Plot-based vegetation survey

Field validation (ground-truthing) of the existing vegetation classifications was completed based on random meander surveys and BAM vegetation integrity plots.

Field verification was undertaken to confirm the vegetation structure, dominant and characteristic species of each stratum, landscape position, native diversity, condition, presence of threatened ecological communities and other diagnostic features. Field data was compared and analysed against the regional vegetation mapping key diagnostic species to confirm each vegetation type. Where a vegetation type did not strictly meet all characteristics of a single PCT, the PCT which best fit the vegetation on site was allocated.

There were 16 vegetation integrity plots completed within the subject land in 2024 to meet the minimum plots required for each vegetation zone mapped (Table 2.1). The locations of vegetation integrity plots completed are illustrated in Figure 15.7. The data collected during the survey program is provided in Appendix D.

Table 2.1 Minimum number of plots required per vegetation zone

Vegetation zone area (ha)	Minimum number of plots
<2	1 plot
>2-5	2 plots
>5-20	3 plots
>20-50	4 plots
>50-100	5 plots
>100-250	6 plots
>250-1,000	7 plots, more plots may be needed if the condition of vegetation is variable across the zone
>1,000	8 plots, more plots may be needed if the condition of vegetation is variable across the zone

2.2.3.1 Use of BAM plots that are outside the subject land

Plot-based vegetation surveys informing this BDAR were completed in the subject land.

2.2.3.2 Vegetation integrity survey

Vegetation integrity plot – methodology

Vegetation integrity plots were completed in accordance with section 4.3.3 of the BAM. A schematic diagram illustrating the layout of each vegetation integrity plot is provided in Figure 2.1.

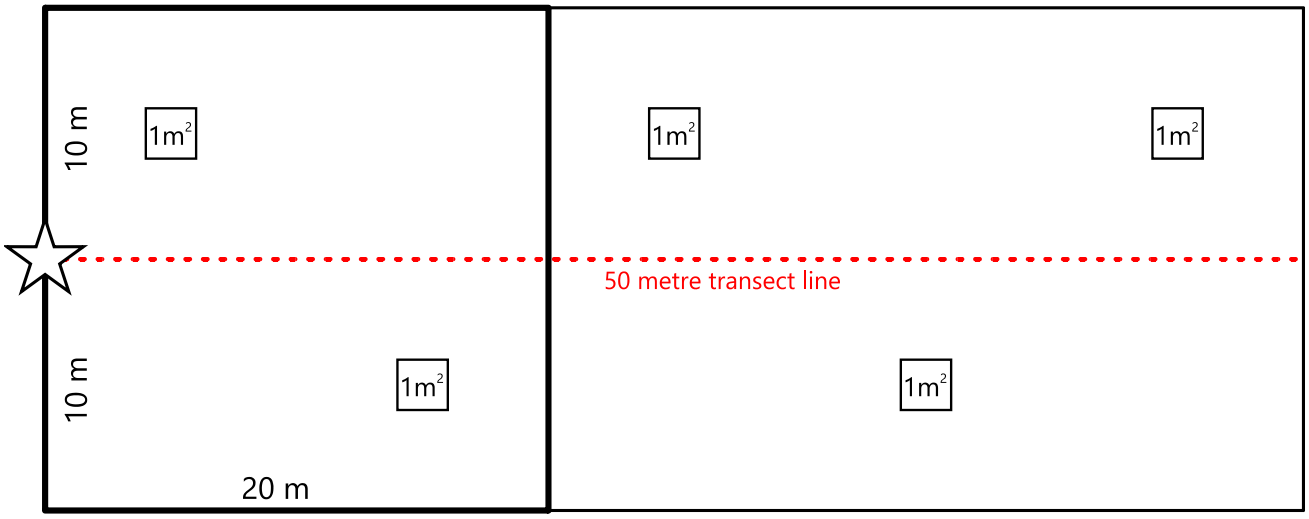


Figure 2.1 Vegetation integrity plot layout

The following site attributes were recorded at each vegetation integrity plot location:

- **Location:** (easting – northing grid type MGA 94, Zone 56).
- **Vegetation structure and dominant species and vegetation condition:** Vegetation structure was recorded through estimates of percentage foliage cover, average height and height range for each vegetation layer.
- **Native and exotic species richness** (within a 400-metre squared quadrat): This consisted of recording all species by systematically walking through each 20 x 20 m plot. The cover and abundance (percentage of area of quadrat covered) of each species was estimated. The growth form, stratum/layer and whether each species was native/exotic/high threat weed was also recorded.
- **Number of trees with hollows** (1,000 metre squared quadrat): This was the frequency of hollows within living and dead trees within each 50 x 20 m plot. A hollow was only recorded if (a) the entrance could be seen: (b) the estimated entrance width was at least five centimetres across: (c) the hollow appeared to have depth: (d) the hollow was at least one metre above the ground and the centre of the tree was located within the sampled quadrat.
- **Number of large trees and stem size diversity** (1,000 metre squared quadrat): tree stem size diversity was calculated by measuring the diameter at breast height (DBH) (i.e., 1.3 m from the ground) of all living trees (greater than 5 cm DBH) within each 50 x 20 m plot. For multi-stemmed living trees, only the largest stem was included in the count. Number of large trees was determined by comparing living tree stem DBH against the PCTs benchmarks.
- **Total length of fallen logs** (1,000 m squared quadrat): This was the cumulative total of logs within each 50 x 20 m plot with a diameter of at least 10 cm and a length of at least 0.5 m.
- **Litter cover:** This comprised estimating the average percentage groundcover of litter (i.e., leaves, seeds, twigs, branchlets and branches with a diameter less than 10 cm, which is detached from a living plant) from within five 1 x1 m sub-plots spaced evenly either side of the 50-m central transect.
- **Evaluation of regeneration:** This was estimated as the presence/absence of overstorey species present at the site that was regenerating (i.e., saplings with a diameter at breast height less than or equal to five cm).

Prior to establishing plot survey locations, vegetation stratification was undertaken to provide a representative vegetation zone for sampling. Stratification involved marking waypoints and bearings randomly to provide a representative assessment of the vegetation integrity of the vegetation zone in the subject land and establishing the required number of plots at some of these waypoints.

Vegetation integrity score calculations

As outlined in BAM section 4.3.3, vegetation integrity is a metric-based assessment used to measure the condition of native vegetation against a benchmark, based on survey data collected by the assessor. Within each vegetation zone in the subject land, a quantitative measure of the composition, structure and function attributes is obtained from the survey. The composition, structure and relevant function attributes for each vegetation zone are then assessed against the benchmark data for the relevant PCT.

The plot survey data was used to determine the vegetation integrity scores for a vegetation zone. Equations 16–24 from Appendix H of the BAM (housed within the BAM-C) were used to determine the current vegetation integrity score for each vegetation zone.

2.2.4 Random meander surveys

Random meander surveys are a variation of the transect type survey and were completed in accordance with the technique described by (Cropper, 1993), whereby the recorder walks in a random meander throughout the subject land recording dominant and key plant species (e.g., threatened species, noxious weeds), boundaries between various vegetation communities and condition of vegetation. The time spent in each vegetation community was generally proportional to the size of the community and its species richness. This survey technique was used to verify vegetation boundaries and stratification from the desktop analysis.

2.3 Threatened flora survey methods

2.3.1 Review of existing information

Existing information was used to identify habitat constraints and microhabitats for threatened species within the subject land. A review of habitat constraints, geographic limitations and microhabitats for candidate threatened flora (species credit) species as listed within the NSW Threatened Biodiversity Data Collection (TBDC) was undertaken prior to survey.

In addition to the information available within the TBDC, survey results completed within the Leard State Forest and the immediate surrounds as part of annual biodiversity monitoring and mine operations of the BCM were used to inform habitat constraints and microhabitats for candidate threatened flora species.

2.3.2 Field surveys

Targeted surveys were undertaken for the candidate flora species credit species (including EPBC Act listed species) within the subject land.

Targeted threatened flora surveys were planned with a phased approach:

- Survey was designed to maximise the likelihood of detection of targeted threatened plant species by grouping those species considered likely to be reliably detected through survey according to optimal months of survey and their specific associated habitat.
- Field survey techniques were assigned to areas of associated habitat based on number of associated candidate species, likelihood to support candidate species, condition and presence of associated microhabitats.

The following field survey techniques were used to undertake targeted seasonal surveys in general accordance with *Surveying threatened plants and their habitats; NSW guide for the Biodiversity Assessment Method* (Department of Planning Industry and Environment, 2020c):

- two-phase grid-based systematic survey
- parallel field traverses of microhabitats or where the area of suitable habitat was less than 50 ha in size.

It is noted that the initial targeted surveyed for candidate flora species credit species conducted throughout the subject land between September 2018 and January 2020 were completed prior to the release of the *Surveying threatened plants and their habitats; NSW guide for the Biodiversity Assessment Method*. As such, the survey methods employed during these survey programs fail to meet the minimum requirements of the current method. Nevertheless, all surveys completed in 2023 and 2024 for the candidate threatened flora species cover the minimum threatened flora survey requirements in accordance current BAM guidelines. Therefore, the surveys completed between 2018 and 2020 simply provide supplementary effort to that required under the current guidelines.

Section 5.3 outlines the threatened species survey effort in detail.

The location of targeted threatened flora survey effort is shown in Figure 15.7 and Figure 15.8.

2.3.2.1 Two-phase grid-based systematic survey

It is recognised that the parallel field traverses survey method is impractical for large scale projects, including the current project, which has an assessment area of >50 ha. The two-phase grid-based systematic survey method has been developed for large areas of suitable potential threatened species habitat that generally exceed 50 ha in area. The method involves phase-one establishing a grid spaced at 100 square metres (m^2) that is nested within a 1 square kilometre (km^2) grid. Surveys are then conducted at each survey location (100 metre (m) grid intersect or greater if open woodland structure occurred), where a 40-m diameter search area is undertaken (1,256 m^2 circular area).

If a target threatened species is located, finer-scale grid surveys (phase-two) is used to locate population extent, which allows a species polygon to be defined. This subsequent phase ensures a greater intensity of survey effort in locations where the target threatened species occurs (Department of Planning Industry and Environment, 2020c).

These pre-determined survey locations were pre-loaded onto ArcGIS Field Maps to enable an accurate approach to the survey effort. If a target threatened species was located, a finer-scale grid survey (phase-two) was undertaken to locate population extent and enable a species polygon to be defined.

Where a potential threatened species was suspected a voucher specimen was collected and preserved for later identification. These samples were sent to the Royal Botanic Gardens in Sydney for confirmation of identification. Samples of *Tylophora linearis* and *Pomaderris queenslandica* were sent to the Royal Botanic Gardens for positive identification in 2018 and 2024 respectively. Correspondence from the Royal Botanic Gardens relating to species identifications is provided in Appendix G. All plant samples were collected under NSW Scientific Licence number 100630.

Finer-scale grid survey

When a target species was located, finer-scale grid surveys (parallel traverses) were used to locate population extent and develop the species polygon. The extent of the area covered by the finer-scale grid was determined on site directly after locating a target species. The habitat type, vegetation type and condition, and landscape attributes surrounding the locations where the target species was first detected were considered. Timing and land access constraints also played a large role in the extent of the area covered by the finer-scale grid.

2.4 Threatened fauna survey methods

2.4.1 Review of existing information

Existing information was used to identify habitat constraints and microhabitats for threatened fauna species within the subject land. A review of habitat constraints, geographic limitations, and microhabitats for candidate threatened fauna (species credit) species as listed within the NSW Threatened Biodiversity Data Collection was undertaken prior to survey.

Several existing BDARs and other biodiversity reports were reviewed to obtain existing information on biodiversity in the locality. The reports reviewed are included in Table 1.2.

2.4.2 Field surveys

Targeted seasonal surveys were completed for threatened fauna species, species credit species and EPBC Act listed species in potential habitat within the subject land. Threatened fauna surveys completed in the subject land were carried out as described below and where applicable, considering the methodology detailed in the:

- NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (Department of Environment and Conservation, 2004).
- Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide (Department of Planning and Environment, 2022a).
- NSW Survey Guide for Threatened Frogs (Department of Planning Industry and Environment, 2020b).
- 'Species credit' Threatened Bats and their Habitats. NSW Survey Guide for the Biodiversity Assessment Method (Office of Environment & Heritage, 2018b).
- Survey Guidelines for Australia's Threatened Birds (Department of the Environment Water Heritage and the Arts, 2010a).
- Threatened Reptiles Biodiversity Assessment Method Survey Guide (Department of Planning and Environment, 2022b).
- Threatened Species Profile Database (Office of Environment & Heritage, 2024).

This section outlines the fauna survey effort completed for candidate species which were predicted to have a moderate to high likelihood of occurrence in the subject land based on the BAM-C, database searches and habitat assessments. The location of field surveys are displayed in Figure 15.9, Figure 15.10 and Figure 15.11. Field surveys undertaken for the assessment of habitat constraints is provided in Table 2.2. A detailed summary of field survey effort for each candidate species is provided in Table 5.9.

Rapid data points and habitat assessments

Rapid data point surveys and habitat assessments were undertaken throughout the subject land to record the location and type of habitats present within each PCT and / or vegetation zone. The type of data collected included the presence or absence of caves, outcropping and rocky areas, the densities of leaf litter and shrub layers as well as the dominant species in each stratum, noting the presence of important species such as mistletoes or Allocasuarina species, which was used to assist with habitat constraints assessments for threatened fauna, such as Painted Honeyeater or Glossy Black-cockatoo (see Table 2.2).

Diurnal bird surveys

Formal 20-minute diurnal bird searches were completed within the investigation area through the winter and spring of 2023 and the summer and winter of 2024. Diurnal bird surveys were completed by actively walking through the nominated site over a period of 20 minutes. All birds were identified to the species level, either through direct observation or identification of calls. Diurnal bird surveys were completed during different times of the day, but generally occurred during morning or late afternoon hours. Birds were also recorded opportunistically during other on-site surveys. Forty-seven formal 20-minute diurnal bird searches were undertaken across the subject land between August 2023 and August 2024. The location of diurnal bird survey sites are displayed in Figure 15.9, Figure 15.10, and Figure 15.11, with survey dates and effort outlined in Table 5.9.

Targeted seasonal survey for blossom nomads (i.e., Swift Parrot and Regent Honeyeater), Little Eagle and Glossy Black-Cockatoo was completed over two separate one-week surveys in August 2023. These surveys occurred when White Box was flowering in the Leard State Forest and following the observation of Swift Parrots in a White Box dominated patch in the north-east portion of the forest in early August 2023. A total of 45 person hours of parallel transects (at approximate 40 metre intervals) and timed 20-minute area searches were completed in the MOD 10 subject land. These surveys were used to identify the presence of blossoming eucalypts and nectar resources, along with potential habitat use by threatened blossom nomads.

Targeted hollow transects for bird species

A large tree hollow survey was undertaken in the subject land to identify trees with hollow resources potentially suitable for Barking Owl, Masked Owl and Glossy Black-Cockatoo. Trees with large hollows were recorded from parallel transects at approximate 40-m intervals (Figure 15.9). The hollow-bearing tree location was marked using a handheld GPS unit (Garmin GPSMAP 67/67i) or Field Maps, which is an ArcGIS based mapping product. The following information was recorded for each tree with a large hollow observed:

- GPS location
- tree species
- diameter at breast height (DBH)
- number of large hollows
- hollow size class
- large forest owl suitability
- photograph.

Due to their importance as a potential breeding resource for Barking Owl, Masked Owl and Glossy Black-Cockatoo, special consideration was afforded to trees that retained large hollows (i.e., those hollows greater than 25 centimetres (cm) in diameter). For this study, however, hollows greater than 17 cm diameter were recorded, being the minimum hollow size entrance recorded for Powerful Owl (Birdlife Australia, 2023). A total of 45 hours (including two ecologists) of targeted hollow transects were completed. The location of trees with large hollows is displayed on Figure 15.9, with survey dates and effort outlined in Table 5.9.

Targeted raptor nest transects

A raptor nest survey was undertaken throughout the subject land in August, September and October 2023 to identify the presence of nests and/ or nesting activity for targeted species, including Little Eagle, White-bellied Sea-eagle and Square-tailed Kite. Raptor nest surveys were completed from parallel transects at approximate 40-m intervals. A total of 97 hours (including two ecologists) of targeted nest transects were completed in the subject land (Figure 15.9, Figure 15.10), with survey dates and effort outlined in Table 5.9.

Insectivorous bat survey

Ultrasonic Anabat bat detection (Titley Electronics) was used to record and identify the echolocation calls of insectivorous bats foraging across native vegetation communities in the subject land. Passive monitoring of survey sites was achieved by setting Anabat bat detectors to record continuously overnight with a total of 32 Anabat nights recorded. Passive Anabat bat call analysis was completed with consideration of the Australasian Bat Society guidelines, with *Bat calls of New South Wales* (PennayLaw and Reinhold, 2004) used as a reference collection for bat call identification.

Although many insectivorous bat species are detectable through use of Anabat call detection methodologies, the vocal differences between some species are too subtle to reliably differentiate between the various species occurring in a particular locality (e.g., Corben's Long-eared Bat). Therefore, targeted harp trapping was completed for capture and release of insectivorous bats. Site selection for the setting of harp traps included a number of rationales, such as, targeting of those habitat areas where hollow-bearing trees provide potential roosting sites and where suitable flyways were detected in forest and woodland settings. Harp traps were set at each location for up to two nights in January 2024. Surveys were generally completed in calm and warm weather conditions to increase the likelihood of bat activity. Captured bats were identified to species level, sexed, measured and weighed. Bats were released immediately after processing during dark conditions.

Eight nights of harp trapping (16 harp trap nights) and 32 nights of passive Anabat recording were undertaken across the subject land. The location of insectivorous bat survey sites are displayed in Figure 15.9, Figure 15.10, and Figure 15.11, with survey dates and effort outlined in Table 5.9.

Koala spot assessments

Spot Assessment Technique (SAT) was undertaken within the subject land to identify the presence of Koala usage within native vegetation in accordance with the NSW Koala (*Phascolarctos cinereus*) Biodiversity Assessment Method Survey Guide, 2022 (Department of Planning and Environment, 2022a). As well as identifying presence, the SAT also has the potential to identify local Koala tree species preferences, by measuring the rate at which each species is utilised by Koalas.

To initiate the SAT a centre tree, of any species, was located and marked. Moving outward from the centre tree, a minimum of 29 surrounding trees were systematically searched for Koala faecal pellets. A radial search area of 1 m around the base of each tree was inspected for a minimum of 2 minutes/tree. Initial inspection of undisturbed ground cover was followed by disturbance of the ground cover as required.

Twenty-five Koala SAT's, 57.6 person hours of spotlighting surveys and 27 Koala call-playbacks were undertaken across the subject land. The location of SAT sites are displayed in Figure 15.9, Figure 15.10, and Figure 15.11, with survey dates and effort outlined in Table 5.9.

Herpetofauna active searches

Herpetofauna active searches were undertaken both diurnally and nocturnally, within focused and opportunistic surveys. Diurnal reptile searches involved walking slowly (2 km per hour (km/h)) through suitable habitat, searching visually for active individuals while stopping, and waiting quietly at intervals (10 minutes (min)) to observe moving and basking individuals. In-active individual searches involved turning over suitable ground shelter, including appropriately sized rocks (e.g., Pink-tailed Legless Lizard) as well as crevice inspections with a torch. Species-specific survey requirements included in-active searches while the temperature was below 25°C, with the flipping of a minimum of 200 rocks per 5 ha of suitable habitat for Pink-tailed Legless Lizards.

Other searched shelter materials included fallen timber and sheets of iron, as well as the gentle raking of loose surface material and peeling of decorticating bark, with all material returned to original position where possible.

Nocturnal amphibian and reptile surveys involved spotlight search for eyeshine or observable movement. Searches were focused on species-specific habitat features including large live trees with hollows and shedding bark which are potentially used for nocturnal foraging (e.g., Pale-headed Snake) (Department of Planning and Environment, 2022) or rocky outcropping (e.g., Border Thick-tailed Gecko) (Department of Planning, Industry and Environment, 2020).

Twenty-one active herpetofauna searches (including 16.3 person hours) and 57.6 person hours of spotlighting surveys have been undertaken across the subject land. The location of active herpetofauna searches are displayed in Figure 15.9, Figure 15.10, and Figure 15.11, with survey dates and effort outlined in Table 5.9.

Stag watching and auditory survey

A total of 31 hollow-bearing trees considered potentially suitable for Barking Owl, Masked Owl or Glossy Black-Cockatoo breeding were stag watched in August 2023. Stag watching consisted of an observer watching a pre-determined potential nesting hollow(s) (based on targeted hollow transects) for an approximate 1.25-hour period, encompassing 0.25 hours prior to sunset and 0.5 hours after last light. Trees were also inspected for the presence of owl pellets and whitewash to determine if the identified hollow tree was being used for breeding.

Stag watching surveys were also used for auditory survey of target species vocalisations during the crepuscular to early evening period when large forest owls typically vocalise. A total of 15.75 person hours of auditory survey was completed in August 2023, with an additional six hours completed in August 2024. Following stag watching/ auditory surveys, spotlight transects were completed. The location of stag watching (and auditory surveys) are illustrated on Figure 15.9, Figure 15.10 and Figure 15.11, with survey dates and effort outlined in Table 5.9.

Spotlighting

Spotlighting was used to target threatened nocturnal arboreal, flying and ground-dwelling mammals, birds, reptiles and amphibians. Spotlighting was completed after dusk generally following the targeted nocturnal searches and was undertaken for at least one hour at each survey spot. Surveys were completed on foot using high-powered headlamps and hand torches. Sighted animals were identified to the species level.

Fifty-seven person hours of spotlighting surveys were undertaken across the subject land. The location of spotlighting transects are displayed in Figure 15.9, Figure 15.10, and Figure 15.11, with survey dates and effort outlined in Table 5.9.

Call playback (large forest owls)

Call playback was used to survey for large forest owls, including Barking Owl, Masked Owl and Powerful Owl using standard methods of Kavanagh and Peake (1993) and Debus (1995). Call playback for large forest owls was completed after dusk at the completion of stag watching at one location per evening to minimise stress to individuals potentially breeding within or adjacent to the subject land. A total of seven different locations were sampled (one location per night over seven nights) during the August 2023 survey period. For these surveys, an initial listening period of approximately 1.25 hours was undertaken, being the approximate extent of each stag watch sampling event, followed by a spotlight search for 10 minutes to detect any animals in the immediate vicinity. The calls of the target species were then played intermittently for approximately five minutes for each species. After the calls were played, a minimum 0.5-hour spotlighting transect was completed in the vicinity to check for animals attracted by the calls and not vocalising. Calls were broadcast from a phone and amplified through a speaker. An additional call playback event using the above methodology was completed on 21 November 2023 and 11 January 2024.

In March 2024, the NSW Government modified the survey requirements for large forest owls. With respect to modification to the survey approach, when the area of suitable habitat is 100 ha or less (MOD 10 subject land is approximately 85 ha), the call playback station is to be located as centrally as possible within suitable habitat. Call playback must be conducted at night during calm conditions.

The following procedure is then employed:

- Allow 10 minutes listening and observation time prior to broadcasting. If the target owl(s) is observed or call is heard during this period, call playback is not required.
- Broadcast pre-recorded calls for no more than 15 seconds followed by at least 30 seconds of listening time. Listen for the response or appearance of the target owl(s) during the listening time. Watch/listen for an owl that may be circling overhead.
- At each station repeat the broadcast and listening sequence for 15 minutes for each target owl, unless the target owl is detected before 15 minutes expires. Increase the volume from 20% of natural volume up to 200% of natural volume with each repeated broadcast.
- Search for owls drawn in by the broadcast within a 1 ha circular plot around each broadcast station at the end of the 15-minute repeated broadcast and listening sequence. Look and listen for the target species using a spotlight for 15 minutes, unless the target owl is detected before 15 minutes expires. Watch/listen for an owl that may be circling overhead.
- Repeatedly sample at each survey station with up to 15 minutes of broadcast calls and listening sequences (as above), until an owl responds, or for at least six nights.

This updated sampling method was applied at three sites between 19-28 August 2024, with each site sampled for six nights (Table 5.9). The three sampling sites were positioned in suitable habitat, with one located as centrally as possible in the subject land. The location of large forest owl call playback survey sites is displayed on Figure 15.9, Figure 15.10, and Figure 15.11, with survey dates and effort outlined in Table 5.9.

Call playback (nocturnal birds and mammals)

Nocturnal call playback was undertaken in appropriate habitat for nocturnal mammals (e.g., Koala, Squirrel Glider, and Spotted-tailed Quoll) and birds (Bush Stone-curlew). For each survey, an initial listening period of 10 minutes was undertaken. The calls of the target species were then played intermittently for 5 minutes followed by another 10-minute listening period. Upon completion of the second listening period, spotlighting surveys in the vicinity were undertaken to determine if any species were attracted by the calls, without vocalising in return. Calls from Stewart (Stewart, 1998) were broadcast using a portable media player and megaphone from 14-17 and 28-31 of August 2023, 21 November 2023, 11 January 2024, 19-22 August 2024 and 27-28 August 2024.

A total of twenty-six call playback surveys were undertaken across the subject land for nocturnal mammals. The location of call playback survey sites is displayed in Figure 15.9, Figure 15.10, and Figure 15.11, with survey dates and effort outlined in Table 5.9.

Remote camera

Remote motion sensing infra-red cameras were used as a survey method, in place of arboreal traps, due to increased potential for fauna to be attracted to baited traps with a high likelihood of the specimen being photographed (unharmed), as compared to the lesser successful and more dangerous traditional trapping methods. Should a cryptic animal species appear similar to a target species, but not be clearly identified by camera, the species could then be further targeted with traps at the specific locations where they had been recorded.

Remote camera traps were set in trees and large shrubs (at minimum height of 1.5–2 m) with a suitable baited food source used to entice target species. For example, a mix of rolled oats, peanut butter, honey and vanilla essence was used to target Eastern Pygmy-possum and Squirrel Glider within the appropriate microhabitat and the trees were sprayed with a strong honey water mixture. Baits were refreshed and honey water solution was reapplied to the host tree during the camera trap deployment.

Remote camera surveys were undertaken at 36 sites with a total of 1,074 trap nights across the subject land. The location of remote camera survey sites is displayed in Figure 15.9, Figure 15.10, and Figure 15.11, with survey dates and effort outlined in Table 5.9.

Opportunistic sightings

Opportunistic sightings of animals were recorded including birds, mammals, frogs, and reptiles throughout all survey periods. Evidence of animal activity, such as scats, diggings, scratch marks, nests/dreys, burrows etc., were also noted. This provided indirect information on animal presence and activity.

2.4.3 Habitat constraints assessment

Field surveys undertaken to assess habitat constraints and microhabitats (Section 5.1) for threatened species within the subject land are detailed in Table 2.2:

Table 2.2 Field surveys for assessment of habitat constraints

Habitat constraint	Target species	Survey methodology	Survey effort
Presence of Allocasuarina and Casuarina species.	South-eastern Glossy Black Cockatoo (Foraging)	BAM plot surveys. Fauna habitat assessments. Two-phased grid surveys and parallel transects.	A total of 16 BAM plots were undertaken throughout the subject land and the immediate surrounds (refer to Figure 15.7 and Figure 15.8). Five fauna habitat assessments. A total of 180 hours with two ecologist undertaking two-phase grid surveys and parallel transects.
Mistletoes present at a density of greater than five mistletoes per hectare.	Painted Honeyeater	BAM plot surveys providing abundance of mistletoe plants per 400 m^2 area of a 20x20m. Fauna habitat assessments. Two-phased grid surveys and parallel transects	A total of 16 BAM plots were undertaken throughout the subject land (refer to Figure 15.7 and Figure 15.8). Five fauna habitat assessment. A total of 180 hours with two ecologist undertaking two-phase grid surveys and parallel transects.
Important Habitat Map.	Swift Parrot and Regent Honeyeater	Desktop review of Important Areas viewer (NSW Dept. of Planning, Industry & Environment).	Last viewed on 11 March 2025.
Rocky areas or within 50 m of rocky areas.	Pink-tailed Legless Lizard	Fauna habitat assessments. Identification of the density of rocky areas during active searches.	Five fauna habitat assessment. 16.3 hours of active searches with 2 ecologists. A total of 1,941 rocks searched.
Hollow bearing trees. Living or dead trees with hollows greater than 15 cm diameter and higher than 8 m above ground.	South-eastern Glossy Black Cockatoo (Breeding)	Fauna habitat assessments. Targeted hollow transects.	Five fauna habitat assessments. Targeted parallel hollow transects (approximate 40 m intervals) with a total of 45 hours of survey with 2 ecologists. Thirty-one hollow-bearing trees considered potentially suitable for South-eastern Glossy Black Cockatoo were stag watched.

Habitat constraint	Target species	Survey methodology	Survey effort
Cliffs and within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within 2 km of old mines or tunnels.	Large-eared Pied Bat	A review of existing information of the locality (refer to Section 1.5). Extensive field surveys, involving full subject land walkovers, between 2019 and 2024 Analysis of satellite imagery. Viewing of mining legacy historic mine maps (Institute, 2024).	Previous surveys by WSP within the Leard State Forest as summarised in Table 1.2. Parallel transects (approximate 40 m intervals) with a total of 45 hours of survey with 2 ecologists. Analysis of satellite imagery utilising the latest imagery from Nearmap. Mining legacy map viewed 4 July 2024.
Living or dead mature trees within suitable vegetation within 1km of rivers, lakes, large dams or creeks, wetlands and coastlines.	White-bellied Sea-Eagle (Breeding)	Desktop analysis of hydroline and stream order GIS data.	Mapping of water bodies and stream orders using GIS data for the Assessment Area. Third order streams (or greater) are considered to provide potential foraging habitat for the target species.
Nest trees Live (occasionally dead) large old trees within vegetation.	Little Eagle (Breeding)	Targeted nest transects. Fauna habitat assessments. Opportunistic recording of nest trees during other surveys.	Targeted parallel nest transects (approximate 40 m intervals) including a total of 97 hours of survey with 2 ecologists. Five fauna habitat assessments. Recording of nest trees during other surveys.
Nest trees Live (occasionally dead) large old trees within vegetation.	Square-tailed Kite (Breeding)	Targeted nest transects. Fauna habitat assessments. Opportunistic recording of nest trees during other surveys.	Targeted nest transects including a total of 52 hours of survey with 2 ecologists. Five fauna habitat assessments. Recording of nest trees during other surveys.
Hollow bearing trees. A living or dead tree with a hollow >20 cm diameter that occurs >4 m above the ground.	Barking Owl (Breeding) Masked Owl (Breeding)	Targeted nest transects. Fauna habitat assessments. Opportunistic recording of hollow-bearing trees during other surveys.	Targeted parallel nest transects (approximate 40 m intervals) including a total of 45 hours of survey with 2 ecologists. Five fauna habitat assessments. Recording of hollow-bearing trees during other surveys.

Habitat constraint	Target species	Survey methodology	Survey effort
Land within 1km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines.	Brush-tailed Rock-wallaby	A review of existing information of the locality (refer to Section 1.5). Extensive field surveys, involving full site walkovers, between 2019 and 2024 Analysis of satellite imagery.	Previous surveys by WSP within the Leard State Forest as summarised in Table 1.2. Parallel transects (approximate 40 m intervals) including a total of 45 hours of survey with 2 ecologists. Analysis of satellite imagery utilising the latest imagery from Nearmaps.
Presence of koala use trees as per the Koala Biodiversity Assessment Method Survey Guide.	Koala	Identification of Koala use tree species listed for the North West Slopes Koala modelling region using: BAM plot surveys. Fauna habitat assessments. Two-phased grid surveys and parallel transects	A total of 16 BAM plot were undertaken throughout the subject land and the immediate surrounds (refer to Figure 15.7 and Figure 15.8). Five fauna habitat assessments. A total of 180 hours with two ecologist undertaking two-phase grid surveys and parallel transects. Twenty-four Koala SAT's.
Breeding camps.	Grey-headed Flying-fox	Targeted transects. Fauna habitat assessments and opportunistic observation for evidence of breeding camps such as damage to foliage and smaller branches or diurnal roosting of large groups of bats.	Targeted nest transects including a total of 14 hours of survey with 2 ecologists. Fifty-six hours of opportunistic diurnal survey with 2 ecologists. Five fauna habitat assessments. Recording of evidence of diurnal roosting during other surveys.
Within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within two kilometres of old mines, tunnels, old buildings or sheds.	Eastern Cave Bat	A review of existing information of the locality (refer to Section 1.5). Extensive field surveys, involving full subject land walkovers, between 2019 and 2024. Analysis of satellite imagery. Viewing of mining legacy historic mine maps (Institute, 2024).	Previous surveys by WSP within the Leard State Forest as summarised in Table 1.2. Analysis of satellite imagery utilising the latest imagery from Nearmaps. Parallel transects (approximate 40 m intervals) with a total of 45 hours of survey with 2 ecologists. Mining legacy map viewed 11 March 2025.

2.5 Weather conditions

Environmental conditions during threatened species surveys are provided in Table 2.3.

Table 2.3 Environmental conditions during threatened species surveys

Survey period	Date	Survey undertaken (e.g., method/targeted species)	Temperature (°C)		Wind direction and speed (km/h) at 9 am	Rainfall since 9 am (millilitre)
			Min.	Max.		
August 2023						
Diurnal	14/08/2023	Bird survey, targeted nest searches	8.1	23.7	SE 11	0
Nocturnal		Call playback, spotlighting, stag watch				
Diurnal	15/08/2023	Bird survey, targeted nest searches	7.2	20.5	SSE 20	0
Nocturnal		Call playback, spotlighting, stag watch				
Diurnal	16/08/2023	Bird survey, targeted nest searches	2.5	21.1	SE 17	0
Nocturnal		Call playback, spotlighting, stag watch				
Diurnal	17/08/2023	Bird survey, targeted nest searches	3.6	22.6	SE 6	0
Nocturnal		Call playback, spotlighting, stag watch				
Diurnal	18/08/2023	Bird survey, targeted nest searches	9.1	18.9	W 28	2.6
Diurnal	28/08/2023	Bird survey, targeted nest searches	8.7	24.5	SE 9	1.8
Nocturnal		Call playback, spotlighting, stag watch				
Diurnal	29/08/2023	Bird survey, targeted nest searches	4.2	23.9	ESE 9	1.2
Nocturnal		Call playback, spotlighting, stag watch				
Diurnal	30/08/2023	Bird survey, targeted nest searches	4.3	25.6	SE 13	0
Nocturnal		Call playback, spotlighting, stag watch				
Diurnal	31/08/2023	Bird survey, targeted nest searches, Koala SAT	7.0	23.6	W 2	4.2
Nocturnal		Call playback, spotlighting, stag watch				
September 2023						
Diurnal	04/09/2023	Bird survey, fauna transects	8.0	28.0	SE 15	0
Spring flora		Flora two-phased grid surveys				
Diurnal	05/09/2023	Bird survey, fauna transects	7.9	26.8	W 13	0
Spring flora		Flora two-phased grid surveys				

Survey period	Date	Survey undertaken (e.g., method/targeted species)	Temperature (°C)		Wind direction and speed (km/h) at 9 am	Rainfall since 9 am (millilitre)
			Min.	Max.		
Diurnal	06/09/2023	Bird survey, fauna transects	0.3	26.0	ESE 11	0
Spring flora		Flora two-phased grid surveys				
Diurnal	07/09/2023	Bird survey, Koala SAT	5.9	30.1	NE 11	0
Spring flora		Flora two-phased grid surveys				
October 2023						
Diurnal	09/10/2023	Cameras installed, bird survey, targeted nest searches, reptile search	8.7	26.9	E 9	0
Diurnal	10/10/2023	Bird survey, targeted nest searches, reptile search	7.6	29.5	0	0
Diurnal	11/10/2023	Bird survey, targeted nest searches, reptile search	9.3	30.1	SE 17	0
Diurnal	12/10/2023	Bird survey, targeted nest searches, reptile search, koala SAT	6.2	32.0	ENE 6	0
Diurnal	13/10/2023	Bird survey, cameras rebaited	5.6	26.1	WSW 17	0
Diurnal	22/10/2023	Bird survey, reptile search	11.7	34.3	NW 15	0
Diurnal	23/10/2023	Reptile search, nest transects	6.3	30.8	NE 7	0
Diurnal	24/10/2023	Cameras moved, reptile search, nest transects, bird survey	6.1	34.6	ESE 11	0
Diurnal	25/10/2023	Reptile search, nest transects, bird survey	8.7	36.4	ESE 2	0
Diurnal	26/10/2023	Reptile search, nest transects, bird survey	13.7	23.1	SSW 19	0
Diurnal	27/10/2023	Cameras rebaited, reptile search, nest transects, bird survey	10.0	22.0	SSE 31	0
November 2023						
Nocturnal	21/11/2023	Call playback, spotlighting, stag watch, harp trap, targeted Border Thick-tailed Gecko search	16.1	28.9	SSE 9	21.2
December 2023						
Diurnal	06/12/2023	Camera deinstallation	16.2	38.8	ENE 4	0

Survey period	Date	Survey undertaken (e.g., method/targeted species)	Temperature (°C)		Wind direction and speed (km/h) at 9 am	Rainfall since 9 am (millilitre)
			Min.	Max.		
January 2024						
Nocturnal	08/01/2024	Harp trap, call playback, spotlighting, targeted Border Thick-tailed Gecko search	22.2	28.8	NE 13	0
Nocturnal	09/01/2024	Harp trap, call playback, spotlighting, targeted Border Thick-tailed Gecko search	19.8	35.1	0	2.6
Nocturnal	10/01/2024	Harp trap, call playback, spotlighting, targeted Border Thick-tailed Gecko search	19.9	34.4	ESE 9	0.2
Nocturnal	11/01/2024	Harp trap, call playback, spotlighting, targeted Border Thick-tailed Gecko search	20.9	36.6	ESE 11	14.6
Summer flora	15/01/2024	Flora two-phased grid surveys and parallel transects	18.8	35.3	SE 24	0
Summer flora	16/01/2024	Flora two-phased grid surveys and parallel transects	18.6	32.6	SE 22	0
Summer flora	17/01/2024	Flora two-phased grid surveys and parallel transects	18.4	34.6	N 9	0
Summer flora	18/01/2024	Flora two-phased grid surveys and parallel transects	20.7	32.3	W 9	18.8
Summer flora	19/01/2024	Flora two-phased grid surveys and parallel transects	12.1	33.5	SW 6	4.0
Diurnal	21/01/2024	Anabat installation	21.4	39.4	NW 7	0
Nocturnal		Harp trap, spotlighting, call playback, Targeted Border Thick-tailed Gecko search				
Summer flora	22/01/2024	Flora parallel transects	19.2	41.5	WSW 7	0
Diurnal		Bird survey				
Nocturnal		Harp trap, spotlighting, call playback, Targeted Border Thick-tailed Gecko search				
Diurnal	23/01/2024	Anabat collection and reinstallation	18.3	35.2	SE 19	0
Nocturnal		Harp trap, spotlighting, call playback, Targeted Border Thick-tailed Gecko search	18.3	35.2	SE 19	0

Survey period	Date	Survey undertaken (e.g., method/targeted species)	Temperature (°C)		Wind direction and speed (km/h) at 9 am	Rainfall since 9 am (millilitre)
			Min.	Max.		
Summer flora	24/01/2024	Flora parallel transects	17.6	37.5	SE 9	0
Diurnal		Bird survey				
Nocturnal		Harp trap, spotlighting, call playback, Anabat collection and reinstallation				
February 2024						
Diurnal	09/02/2024	Anabat deinstallation	18.4	32.2	SSE 20	0
August 2024						
Diurnal	19/08/2024	BAM plots, Koala SAT	3.9	21.0	SE 11	0
Nocturnal		Large forest owl call playback, spotlighting				
Diurnal	20/08/2024	BAM plots, Koala SAT	5.3	23.1	E 13	0.2
Nocturnal		Large forest owl call playback, spotlighting				
Diurnal	21/08/2024	BAM plots, Koala SAT	8.9	22.7	NNW 11	0.2
Nocturnal		Large forest owl call playback, spotlighting				
Diurnal	22/08/2024	BAM plots, Koala SAT	6.9	22.4	NE 6	0
Nocturnal		Large forest owl call playback, spotlighting				
Diurnal	27/08/2024	Bird survey, habitat assessment	2.5	24.1	SE 13	0
Nocturnal		Large forest owl call playback, spotlighting				
Diurnal	28/08/2024	Bird survey, Koala SAT, habitat assessment	4.7	28.1	ENE 6	0
Nocturnal		Large forest owl call playback, spotlighting				

Source: Bureau of Meteorology – Gunnedah Resource Centre (Automatic Weather Station (AWS) 055024) and Gunnedah Airport (AWS 055202).

2.6 Limitations

Ecological impact assessment is based extensively on judgment and opinion. It is far less exact than other scientific or engineering disciplines. This report has been prepared to meet the specific needs of the BAM. This report is based on investigations which were designed for project-specific factors, including the nature of the proposal, its size and configuration (subject land), the location of any development on the site and its orientation. This report cannot be applied to an adjacent site or areas outside of the subject land.

2.6.1 Plant Community Type allocation and mapping

Plant communities are naturally variable. The boundaries between different PCTs in the subject land overlap considerably with a gradual transition from one community to another. Broad ecotones are present in many cases and sharp boundaries between PCTs and vegetation zones rarely exist. However, to map PCTs and vegetation zones a choice must be made as a hard boundary must be drawn to separate PCTs and vegetation zones. The PCTs and vegetation zones presented in this BDAR have been mapped as best as possible based on patterns observed on aerial photography and verified by observations made during the field survey (where possible).

In considering the PCT allocations it should be noted that the Plot to PCT Assignment Tool is not currently available within the NSW north-west slopes, where the subject land occurs. As such the PCT filter tool has been relied upon to identify a candidate PCT shortlist for this assessment. It is acknowledged that the PCT profile for some PCTs are poorly described in the BioNet Vegetation Classification Database and have been identified with a very low to medium classification confidence level and/or provide few species from each structural layer to aid in identification of the PCT. Other described PCTs provide a single broad definition that encompasses several distinct vegetation types. Some PCTs are very similar in structure, species composition, and landscape position and in this case the vegetation was assigned to a PCT based on the judgement of the assessor based on in field observations. Some PCTs represent different interpretations of what is fundamentally the same vegetation type in different IBRA regions and have been developed based off discrete local mapping projects. In reality, the differences in vegetation assigned to the same PCT in different adjacent bioregions are not visible on the ground in terms of species or structure. In many cases there is no distinct linear boundary to assist in determining the distribution of different PCTs within the subject land, so a line of best fit has been applied. The difficulty in assigning native vegetation to PCTs is compounded by the broad ecotones that are present between PCTs.

Vegetation within the subject land and locality has been mapped at the regional scale in the NSW State Vegetation Type Map (SVTM) release C2.0M2.0. This mapping data provides a guide to the occurrence and distribution of Plant Community Types, Vegetation Classes, and Vegetation Formations. As with all maps, the SVTM is subject to error including:

- PCT attribution errors
- spatial errors or omissions (e.g., gaps and slithers or mapping linework inaccuracies)
- eastern NSW PCT classification topologies differ from central and western NSW classification topologies
- some PCTs mapped as part of earlier regional coverages have since been discontinued.

These limitations were taken into account when using the SVTM to aid in mapping native vegetation extent within the assessment area.

2.6.2 Biodiversity surveys

No sampling technique can eliminate the possibility that a species is present on a site. For example, some species of plant may be present in the soil seed bank and some fauna species use habitats on a sporadic or seasonal basis and may not be present on site during surveys. The conclusions in this report are based upon previous studies, data acquired for the subject land and the biodiversity field surveys and are, therefore, indicative of the environmental condition of the subject land at the time of preparing the report, including the presence or otherwise of species. Also, it should be recognised that site conditions, including the presence of threatened species, can change with time.

Ecological conditions may be modified by changing natural forces or man-made influences. This report is based on conditions which existed at the time of survey.

When assessing the subject land from a limited number of samples there is the possibility that variations may occur between sample locations. The surveys undertaken provide a professional estimate of the scope of investigation required to provide a general profile of the biodiversity within the subject land. The data derived from the site investigation program and any later laboratory testing are extrapolated across the subject land to form an overview and scientific opinion is made about overall conditions and their likely behaviour with regard to the proposed development. Despite the work that has been undertaken within the subject land, the actual conditions on ground might differ from those inferred to exist, since no survey program, no matter how comprehensive, can reveal all ecological details and anomalies. The mapping of plant community types and species polygons is a subjective interpretation of on ground conditions at a particular location, made by trained personnel. The interpretation may be limited by the method of investigation and cannot always be definitive.

2.6.3 Access limitations and constraints

Survey effort in part was restricted by compliance with mining regulations, including safety protocols for blasts and supervisor directives from BCM and MCCM. The necessity to adhere to blast schedules required surveyors to vacate certain areas during designated times, leading to disruptions in planned survey schedules. Furthermore, supervisors' instructions, based on real-time assessments of mining operations, often dictated changes to survey plans to ensure safety and regulatory compliance. These mining-related constraints compounded the complexity of survey planning and execution, necessitating frequent adjustments and, in some cases, postponements of survey activities.

2.6.4 Reliance on data

This report assumes threatened species data published in the TBDC, BioNet Atlas, BioNet Vegetation Information System, SPRAT database, and any other Government databases is correct and current.

In preparing this report, WSP has relied upon data, surveys, analyses, designs, plans and other information provided by other individuals and organisations, most of which are referred to in the report (the data). Except as otherwise stated in the report, WSP has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (conclusions) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data.

WSP will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

2.6.5 Weather conditions

Weather conditions during scheduled survey periods limited the survey capacity, typically during periods where extreme weather is more common, such as summer. Heat-based survey effort limitations are more complex than those of a temperature-based standdown, as factors such as humidity and wind speed play a role in determining risk to field staff. Risks include but are not limited to, bushfires and heat stress. Additionally, high heat or rainfall can limit access to site locations typically accessed via vehicle. Access to these sites via vehicles during periods of high heat or after long periods of rain risks starting grass fires or permanently impacting the site’s topsoil, respectively. Substantial rainfall and prolonged heat wave events occurred in the locality throughout the survey. This also impacted the ability to complete surveys and resulted in some surveys being shortened and postponed.

3 Site context

3.1 Assessment area

As outlined in the BAM, the assessment area includes:

- the subject land and a 1,500 m buffer surrounding the outside edge of the boundary of the subject land, or
- 500 m along each side of the centre line of a linear-shaped proposal.

The assessor must establish the assessment area using GIS software.

As this is a site-based proposal, a buffer of 1,500 m around the subject land has been applied to demarcate the assessment area for this BDAR.

The Site Map (Figure 15.1) and Location Map (see Figure 15.2) illustrate the boundary of the subject land, the assessment area, landscape features identified below in Section 3.2 of this BDAR, and any other relevant details such as local government boundaries or other based data relevant to the scale of each map.

3.2 Landscape features

Landscape features identified within the subject land and assessment area are shown on Figure 15.1 Site Map and Figure 15.2 Location Map, respectively. A discussion of relevant landscape features is provided below.

Field reconnaissance was used to confirm the extent and condition of landscape features on the subject land. This was particularly important for geological features of significance (e.g., karst, caves, crevices, cliffs, rocks) or the presence of non-native vegetation that is difficult to interpret from remote imagery. This ground-truthed information was used to adjust maps and percent native vegetation cover estimates. Field reconnaissance for landscape features was undertaken during all survey sessions.

3.2.1 IBRA bioregions and IBRA subregions

The subject land and assessment area occur in the Brigalow Belt South IBRA bioregion, within the Liverpool Plains subregion. This was determined using the Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Regions) and Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Subregions) mapping.

An overview of the extent of the IBRA region and subregion in the subject land and assessment area is presented in Table 3.1 and illustrated in the Site Map (Figure 15.1) and Location Map (Figure 15.2).

Table 3.1 IBRA regions and subregions

IBRA region	IBRA subregion	Subject land (ha)	Assessment area (ha)
Brigalow Belt South	Liverpool Plains	86.32	1,666.99

3.2.2 Rivers, streams, estuaries, and wetlands

A series of ephemeral unnamed first and second order streams which form tributaries of Nagero Creek occur in the subject land. Most of these streams are dry drainage lines at the head of the Nagero Creek catchment and may flow during heavy rainfall events only. All these streams flow directly through the subject land.

Numerous other varying order streams and waterways occur within the broader assessment area. These form part of the Namoi River catchment which sits within the Murray-Darling Basin. These other waterways will not be impacted upon by MOD 10.

3.2.3 Habitat connectivity

Habitat connectivity facilitates the movement of flora or fauna across the landscape, which is important for the health and persistence of their populations, and for ecosystem health in general. Connectivity can be subdivided into structural connectivity, or the quantification of the characteristics and spatial arrangements of elements of the landscape, and functional connectivity, or how an ecological process is influenced by the arrangement of elements of the landscape (Crooks K.R. and Sanjayan, 2006).

The Leard State Forest occurs as a large remnant patch of native vegetation surrounded by agriculture tenures, which effectively isolated it from other large patches of native vegetation in the locality. Three open cut coal mines currently operate within and immediately adjacent to the Leard State Forest, progressively reducing its footprint.

The subject land is positioned towards the centre of the Leard State Forest and immediately north of BCMs existing approval boundary (Figure 15.3) and south of the 500 m wide Vegetation Corridor between the BCM and MCCM as stipulated within conditions of SSD 09_0182 and EPBC 2009/5257. The 500 m wide Vegetation Corridor is approximately 3.5 km long, connecting larger retained areas of the Leard State Forest to the south-west and north-east (Figure 15.1).

MOD 10 will reduce vegetation connectivity between areas of the Leard State Forest to the east and south-west. However, it is considered that the 500 m wide Vegetation Corridor will allow for suitable persistence of both structural and functional connectivity across the Leard State Forest and adjacent biodiversity offset properties.

3.2.4 Karst, caves, crevices, cliffs, rocks, or other geological features of significance

No geological significant features have been identified within or immediately adjacent the subject land that relate to biodiversity. Extensive field surveys, involving full site walkovers, between 2019 and 2024 have confirmed there are no karst, caves, crevices, cliffs or other areas of geological significance within the subject land. Analysis of satellite imagery and a review of existing information of the locality (refer to Section 1.5) have not identified any known geological significant features as being likely to occur within the assessment area.

The subject land is comprised predominantly of soils derived from Permian geology (Maules Creek Formation) conglomerate and sandstone consisting predominantly of conglomerate, sandstone, siltstone, claystones, and intercalated coal seams (Australian Groundwater & Environmental Consultants Pty Ltd, 2010).

The subject land does contain areas of rocky habitats such as small boulder piles and small rock outcropping.

3.2.5 Areas of outstanding biodiversity value

No areas of outstanding biodiversity value, identified under the BC Act, occurred in the subject land or assessment area.

3.2.6 NSW (Mitchell) landscape

The subject land occurs within the Bugaldie Uplands NSW Mitchell Landscape region. For BAM-C purposes, the Bugaldie Uplands has been selected based on it covering 100 % of the subject land.

3.2.7 Additional landscape features identified in SEARs

No additional landscape features were identified in the SEARs.

3.3 Native vegetation cover

Native vegetation cover in the assessment area was determined via the use of published vegetation mapping (NSW State Vegetation Type Map (Current Release C2.0M2.0 (November 2023)) (Department of Climate Change Energy the Environment and Water, 2023b) combined with the field verified vegetation mapping within the subject land.

The assessment area contains areas that are not comprised of native vegetation. These areas are considered to not be consistent with the definition of native vegetation and therefore excluded included:

- access tracks
- borehole exploration pads.

The native vegetation cover assessment concluded that 69.29% of the assessment area is comprised of a native vegetation cover. Therefore, the total native vegetation cover of the assessment area falls within the 30–70% category within the BAM-C. Native vegetation cover within the assessment area is summarised in Table 3.2 and depicted in the Location Map (Figure 15.2).

Table 3.2 Native vegetation cover in the assessment area

Assessment area (ha)	1,666.99
Total area of native vegetation cover (ha)	1,154.99
Percentage of native vegetation cover (%)	69.29
Class (0–10, >10–30, >30–70 or >70%)	30–70%

4 Native vegetation, threatened ecological communities, and vegetation integrity

4.1 Native vegetation extent

Mapping of native vegetation extent within the subject land is required under section 4.1 of the BAM with detailed requirements outlined in section 3.2 of the BAM 2020 Operational Manual.

Native vegetation covers approximately 69.29 % of the subject land based on field validation surveys completed. Native vegetation extent within the subject land is illustrated in Figure 15.12 (Section 15).

4.1.1 Changes to the mapped native vegetation extent

The extent of native vegetation in the subject land was determined through field verification surveys and digitisation of native vegetation and PCT boundaries using the satellite images provided on ArcGIS online.

The entirety of the subject land is mapped as a single PCT by the SVTM (Department of Climate Change Energy the Environment and Water, 2023b); being PCT 592 Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion. Whilst surveys confirmed that PCT 592 was the dominant PCT within the subject land, an additional four PCTs were also identified as being present. Field surveys confirmed the presence of these additional PCTs via the confirmation of variations in attributes such as floristic composition, geological substrate, soils and landscape positions. These variations were compared and analysed against each PCTs profile in the BioNet Vegetation Classification Database (Department of Climate Change Energy the Environment and Water, 2024a). The discrepancies identified are not unexpected given the SVTM is a broadscale mapping tool largely based on GIS modelling. Further, all these PCTs (or equivalent vegetation communities described in other broadscale vegetation mapping projects) have been previously recorded within the Leard State Forest and wider locality as part of other studies conducted over the past 20 years.

The additional PCTs identified include:

- PCT 462 Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion.
- PCT 531 Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion.
- PCT 594 Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion.
- PCT 588 White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion.

Native vegetation extent within the subject land is illustrated in Figure 15.12 (Section 15).

4.1.2 *Areas that are not native vegetation*

The subject land contains areas that are not comprised of native vegetation (approximately 1.84 ha). These areas are illustrated in Figure 15.12 and Figure 15.13 and classified as a miscellaneous ecosystem, being 'highly disturbed areas with no or limited native vegetation'. Areas that were considered to form part of this non-native miscellaneous ecosystem included:

- access tracks
- borehole exploration pads.

Areas of the subject land that are not classified as containing native vegetation are illustrated in Figure 15.12 (Section 15) and examples are depicted below in Photo 4.1 and Photo 4.2.



Photo 4.1 An example of access tracks mapped as not being native vegetation



Photo 4.2 An example of a borehole exploration pad mapped as being native vegetation

The subject land occurs entirely within the Leard State Forest, which is excluded from the LLS Act and its supporting native vegetation regulatory map. As such, these areas are not considered further.

4.2 Plant community types

4.2.1 *Overview*

The native vegetation within the subject land has been aligned to the most likely PCT as outlined in the BioNet Vegetation Classification database. The extent of each PCT is illustrated in Figure 15.13 (Section 15) and summarised below in Table 4.1.

Native vegetation has been recorded by vegetation formation, class and associated PCT. The native vegetation within the subject land has been assigned to five PCTs representing two vegetation formations and two vegetation classes, all of which occur within the Brigalow Belt South IBRA bioregion and Liverpool Plains IBRA subregion. The recorded vegetation formations and vegetation classes in the subject land include:

- KF_CH5A Dry Sclerophyll Forests (Shrub/grass sub-formation)
  - North-west Slopes Dry Sclerophyll Woodlands
- KF_CH5B Dry Sclerophyll Forests (Shrubby sub-formation)
  - Western Slopes Dry Sclerophyll Forests.

Detailed descriptions of each PCT within each vegetation formation and vegetation class are provided in the following subsections.

Table 4.1 PCTs identified within the subject land

PCT ID	PCT name	Subject land area (ha)
PCT 462	Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion	16.35
PCT 531	Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion	7.32
PCT 588	White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion	3.59
PCT 592	Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion	51.51
PCT 594	Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion	5.71
	Total area	**84.48**

4.2.2 PCT 462 Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion

4.2.2.1 PCT overview

PCT 462 Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion is described in the BioNet Vegetation Classification Database as a mid-high woodland or open forest dominated by *Eucalyptus dweryi* (Dwyer's Red Gum) and *Callitris glaucophylla* (White Cypress Pine). A small tree layer of *Acacia cheelii* (Motherumbah) may also be present. PCT 462 is known to occur within the Brigalow Belt South IBRA bioregion and Liverpool Plains IBRA subregion.

Vegetation within the subject land assigned to PCT 462 occurred as a mid-high shrubby dry sclerophyll forest which occurred in small patches throughout the subject land on hillslopes and hillcrests. The community occurred on shallow skeletal sandy loam soils derived from sandstones and conglomerates which form part of the underlying geology. The underlying geology is derived from the Maules Creek Formation and Leard Formation which are characterised by early Permian lithic conglomerates, quartz sandstones, siltstones and claystones (Brownlow, 1997, Hansen Bailey, 2010).

The floristic composition of PCT 462 within the subject land was dominated by a canopy of *Eucalyptus dweryi* (Dwyer's Red Gum), *Acacia cheelii* (Motherumbah) and *Callitris glaucophylla* (White Cypress Pine). Other canopy species do occur intermittingly throughout the community; however, these are typically not dominate. The shrub layer was generally mid-dense to dense. The groundlayer was dominated by a variety of native tussock grasses, herbs, forbs and climbers.

Table 4.2 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.3 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 462 during the field survey.

Table 4.2 PCT 462 Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion

PCT ID	PCT 462
PCT name	Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
Vegetation formation	KF_CH5B Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	Western Slopes Dry Sclerophyll Forests
Per cent cleared value (%)	40%
Extent within subject land (ha)	16.35 ha

Table 4.3 PCT 462 Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion floristic composition and structure

Growth form	Height range	Percentage foliage cover range	Dominant species recorded
Tree	T1: 8–10 m T2: 4–8 m	T1: 5–20% T2: 15–45%	*Eucalyptus dwyeri, Acacia cheellii, Callitris glaucophylla,* with occurrences of *Alphitonia excelsa, Notelaea microcarpa* var. *microcarpa, Eucalyptus crebra, Brachychiton populneus* subsp. *populneus* and occasionally *Alstonia constricta*
Shrub	0.4–2.5 m	10–40%	*Psydrax odorata* subsp. *australiana, Dodonaea viscosa* subsp. *angustifolia, Geijera parviflora, Melichrus urceolatus, Pimelea neo-anglica, Solanum parvifolium* subsp. *parvifolium, Olearia elliptica* subsp. *elliptica, Beyeria viscosa, Euphorbia tannensis* subsp. *eremophila, Breynia oblongifolia, Hibbertia obtusifolia* and *Denhamia cunninghamii*
Fern	0.1–0.2 m	<1	*Cheilanthes sieberi* subsp. *sieberi* and *Cheilanthes distans*
Grass and grasslike	0.1–0.5 m	3–30%	*Austrostipa scabra* subsp. *scabra, Aristida caput-medusae, Cymbopogon refractus, Aristida ramosa,* various *Rytidosperma* species, *Sporobolus caroli, Chloris truncata, Digitaria diffusa, Cyperus gracilis, Eragrostis brownii, Aristida personata, Enteropogon acicularis, Lomandra multiflora* subsp. *multiflora, Digitaria divaricatissima, Paspalidium gracile* and *Paspalidium constrictum*
Forb	0.1–0.5 m	2–10%	*Einadia hastata, Arthropodium milleflorum, Sigesbeckia australiensis, Gonocarpus elatus, Daucus glochidiatus, Phyllanthus virgatus, Oxytes brachypoda, Hibiscus sturtii, Ranunculus pumilio* var. *politus, Chrysocephalum semipapposum, Stackhousia viminea, Vittadinia cervicularis* var. *subcervicularis, Ajuga australis, Dianella revoluta* var. *revoluta, Dichondra* sp. Inglewood, *Teucrium betchei, Pterostylis longicurva, Oxalis perennans* and *Scutellaria humilis*
Other	0.1–10 m	<1	*Cymbidium canaliculatum, Parsonsia eucalyptophylla, Glycine clandestina, Marsdenia viridiflora* subsp. *viridiflora, Clematis microphylla, Pandorea pandorana* subsp. *pandorana* and *Grona varians*



Photo 4.3 PCT 462 at survey plot Bog_NE_6



Photo 4.4 PCT 462 at survey plot Bog_NE_11

4.2.2.2 Condition states

Within the subject land, PCT 462 occurred in a single broad condition state (equivalent to vegetation zones), being 'Moderate'. Three BAM vegetation integrity plots were completed within PCT 462 moderate condition including Bog_NE_6, Bog_NE_11, and Bog_NE_12.

4.2.2.3 Justification of PCT selection

The PCT filter tool was used to determine a candidate PCT list for this vegetation community. Attributes entered into the tool included the IBRA bioregion, IBRA subregion and flora species recorded from each BAM vegetation integrity plot completed. Over 1,600 PCTs were identified by the PCT filter tool as containing one or more of the attributes entered. This list was reduced to 32 candidate PCTs via the exclusion of PCTs that did not contain *Eucalyptus dwyeri* which was prevalent canopy species throughout the community or did not occur within the Brigalow Belt South – Liverpool Plains IBRA subregion. This candidate list was further reduced to 29 candidate PCTs via the exclusion of PCTs that align to rainforest and heathland vegetation formation types. The most suitable PCT was determined by analysing the BioNet Vegetation Classification Database profile of each shortlisted candidate PCT against the characteristics of the vegetation recorded within the subject land.

Of the shortlisted PCTs known from the Brigalow Belt South – Liverpool Plains IBRA subregion, the following PCT options were considered the most similar for this vegetation type:

- PCT 462 Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion.
- PCT 531 Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion.
- PCT 576 Motherumbah – hill red gum – Black Cypress Pine shrubby low woodland mainly in the southern Nandewar Bioregion.
- PCT 581 Tumbledown Red Gum – Dwyer's Red Gum – Wallaby Bush shrubby woodland of the Nandewar Bioregion.
- PCT 430 Motherumbah – Dwyer's Red Gum – White Cypress Pine tall shrubland of the Narrabri to Warialda region, Brigalow Belt South Bioregion.
- PCT 439 Mock Olive – Tumbledown Red Gum – Red Ash – Wilga siliceous rocky hill low woodland / shrubland in the Gunnedah – Tambar Springs region, Brigalow Belt South Bioregion.

PCT 531 and PCT 576 can both contain *Eucalyptus dweryi* and *Acacia cheelii* within the canopy stratum however they are typically dominated by either *Eucalyptus crebra, Corymbia trachyphloia* subsp. *amphistomatica* and/or *Callitris endlicheri.* All these other species were either absent or occurred only occasionally within areas mapped as PCT 462 except where the community transitioned with other PCTs such as PCT 531 and PCT 592 where these species are more prevalent. PCT 462 was also considered a more suitable PCT than PCT 576 based on the shrub and groundcover floristics recorded within the subject land. The shrub and ground layer of PCT 576 is usually comprised of species that prefer rockier environments such as *Homoranthus flavescens, Ozothamnus obcordatus* subsp. *major, Leionema viriflorum, Isotoma axillaris* and *Dampiera purpurea* which were not recorded within the subject land. As such, both these PCTs were discounted.

PCT 430 may also contain *Eucalyptus dwyeri, Acaica cheelii* and *Callitris gluacophylla* within its canopy. PCT 430 however typically occurs north of Narrabri on flats and low rises whereas the vegetation recorded within the subject land occurs south of Narrabri on hillcrests and hillslopes. Further, vegetation mapped as PCT 462 within the subject land did not contain other canopy species such as *Eucalyptus chloroclada* or *Acacia leiocalyx* subsp. *leiocalyx* which typically occur within PCT 430.

Although the floristics of PCT 439 are similar to that of vegetation mapped as PCT 462 the vegetation within the subject land is more representative of the 'Western Slopes Dry Sclerophyll' (PCT 462) rather than the 'Inland Rocky Hills Woodland' (PCT 439) vegetation class. Further, although the community contained species within the rainforest derived genera, it was not dominated by them, rather they occurred intermittingly.

PCT 581 is another PCT which shares similar canopy floristics and aligns with the 'Western Slopes Dry Sclerophyll vegetation class. This PCT was however discounted as a candidate PCT as it typically contains a more variable canopy dominated by a range of Eucalyptus species rather than just Red Gum species and *Acacia cheelii* for example may contain a combination of *Eucalyptus albens, Eucalyptus crebra* and *Eucalyptus melanophloia*. PCT 581 is also typically dominated by *Eucalyptus dealbata* rather than *Eucalyptus dweryi.* Finally, the shrub and groundcover floristics of vegetation with the subject land were generally more consistent with PCT 462 rather than PCT 581.

4.2.2.4 Alignment with TECs

As outlined in the BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 462.

4.2.2.5 Alignment with EPBC Act listed ECs

As outlined in the BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 462.

4.2.3 PCT 531 Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion

4.2.3.1 PCT overview

PCT 531 Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion is described in the BioNet Vegetation Classification Database as a mid-high woodland or open forest dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Callitris endlicheri* (Black Cypress Pine). Other trees commonly recorded within PCT 531 include *Eucalyptus dweryi* (Dwyeri's Red Gum), *Eucalyptus dealbata* (Tumbledown), *Calliltris gluacophylla* (White Cypress Pine), *Alphitonia excelsa* (Red Ash) and *Corymbia trachyphloia* subsp. *amphistomatica* (White Bloodwood). A small tree layer of *Acacia cheelii* (Motherumbah) may also be present. PCT 531 is known to occur within the Brigalow Belt South IBRA bioregion and Liverpool Plains IBRA subregion and described as occurring in the Nandewar Range near Kaputar however has also been mapped by the STVM as occurring to the north-east of the subject land.

Vegetation within the subject land assigned to PCT 531 occurred as a mid to tall shrubby/open dry sclerophyll forest which was largely restricted to the western portion of the subject land on hillslopes. The community occurred on light brown loamy sand soils derived from sandstones and conglomerates which form part of the underlying geology. The underlying geology is derived from the Maules Creek Formation and Leard Formation which are characterised by early Permian lithic conglomerates, quartz sandstones, siltstones, and claystones (Brownlow, 1997, Hansen Bailey, 2010).

The floristic composition of PCT 531 within the subject land was dominated by a canopy of *Eucalyptus crebra* (Narrow-leaved Ironbark), *Callitris glaucophylla* (White Cypress Pine) with frequent occurrences of *Corymbia trachyphloia* subsp. *amphistomatica* (White Bloodwood), *Eucalyptus dwyeri* (Dwyer's Red Gum), *Alphitonia excelsa* (Red Ash) and *Acacia cheelii* (Motherumbah). In some locations, these other species dominated or co-dominated the canopy. The shrub layer was variable in structure and composition but typically occurred as open to mid-dense in cover. The groundlayer was dominated by a variety of native tussock grasses, herbs, forbs and climbers.

Table 4.4 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.5 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 531 during the field survey.

Table 4.4 PCT 531 Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion

PCT ID	PCT 531
PCT name	Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Vegetation formation	KF_CH5B Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	Western Slopes Dry Sclerophyll Forests
Per cent cleared value (%)	20%
Extent within subject land (ha)	7.32 ha

Table 4.5 PCT 531 Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion floristic composition and structure

Growth form	Height range	Percentage foliage cover range	Species recorded
Tree	T1: 12–18 m T2: 3.5–10 m	T1: 20–70% T2: 5–10%	*Eucalyptus crebra, Callitris glaucophylla, Corymbia trachyphloia* subsp. *amphistomatica, Alphitonia excelsa, Acacia cheelii, Eucalyptus dwyeri* and *Notelaea microcarpa* var. *microcarpa*
Shrub	0.4–3.5 m	10–40%	*Dodonaea viscosa* subsp. *angustifolia, Olearia elliptica* subsp. *elliptica, Beyeria viscosa, Prostanthera granitica, Psydrax odorata* subsp. *australiana, Exocarpos cupressiformis, Denhamia cunninghamii, Cassinia laevis, Pultenaea setulosa, Persoonia sericea, Melichrus urceolatus, Hibbertia obtusifolia, Solanum parvifolium* subsp. *parvifolium, Breynia oblongifolia, Hovea apiculata, Hovea lanceolata, Geijera parviflora, Acacia deanei* subsp. *deanei, Indigofera adesmiifolia, Acacia decora* and *Dodonaea heteromorpha*
Fern	0.1–0.2 m	<1%	*Cheilanthes sieberi* subsp. *sieberi* and *Cheilanthes distans*

Growth form	Height range	Percentage foliage cover range	Species recorded
Grass and grasslike	0.1–0.5 m	5–15%	*Lomandra multiflora* subsp. *multiflora, Sporobolus caroli, Austrostipa scabra, Aristida vagans, Aristida caput-medusae, Carex inversa, Cyperus gracilis, Poa sieberiana* var. *sieberiana, Lomandra filiformis* subsp. *filiformis, Chloris truncata, Lepidosperma laterale, Rytidosperma racemosum* var. *obtusatum* and *Dichelachne micrantha*
Forb	0.1–0.5 m	5–10%	*Einadia hastata, Pomax umbellata, Goodenia hederacea* subsp. *hederacea, Haloragis heterophylla, Phyllanthus virgatus, Goodenia rotundifolia, Arthropodium milleflorum, Chrysocephalum semipapposum, Dianella revoluta, Calotis lappulacea, Brunoniella australis, Oxytes brachypoda, Rostellularia adscendens* subsp. *adscendens* and *Einadia nutans* subsp. *nutans*
Other	0.1–0.5	<1%	*Marsdenia viridiflora* subsp. *viridiflora*



Photo 4.5 PCT 531 at survey plot Bog_NE_1



Photo 4.6 PCT 531 at survey plot Bog_NE_2

4.2.3.2 Condition states

Within the subject land, PCT 531 occurred in a single broad condition state (equivalent to vegetation zones), being 'Moderate'. Three BAM vegetation integrity plots were completed within PCT 531 moderate condition including Bog_NE_1, Bog_NE_2 and Bog_NE_3.

4.2.3.3 Justification of PCT selection

The PCT filter tool was used to determine a candidate PCT list for this vegetation community. Attributes entered into the tool included the IBRA bioregion, IBRA subregion and flora species recorded from each BAM vegetation integrity plot completed. Over 800 PCTs were identified by the PCT filter tool as containing one or more of the attributes entered. This list was reduced to 35 candidate PCTs via the exclusion of PCTs that did not contain both *Eucalyptus crebra* and *Corymbia trachyphloia* subsp. *amphistomatica* which were prevalent throughout the community within the subject land. The most suitable PCT was determined by analysing the BioNet Vegetation Classification Database profile of each shortlisted candidate PCT against the characteristics of the vegetation recorded within the subject land.

Of the shortlisted PCTs known from the Brigalow Belt South – Liverpool Plains IBRA subregion, the following PCT options were considered the most similar for this vegetation type:

- PCT 531 Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion.
- PCT 1380 Narrow-leaved Ironbark – pine – Brown Bloodwood shrub/grass open forest in the north west of the Nandewar Bioregion.
- PCT 610 Black Cypress Pine – Dwyer's Gum low woodland / open forest on rocky ridges mainly of the Nandewar Range.
- PCT 576 Motherumbah – hill red gum – Black Cypress Pine shrubby low woodland mainly in the southern Nandewar Bioregion.

PCT 576 can contain a canopy of *Corymbia trachyphloia* subsp. *amphistomatica* however it is typically dominated by *Acacia cheelii, Eucalyptus dwyeri* and/or *Eucalyptus dealbata* on skeletal soils and thus occurs as a low woodland rather than a mid-tall woodland/forest. Further, PCT 576 is typically restricted to the Kaputar Mitchell Landscape types. In comparison the vegetation within the subject land typically occurs as a mid-tall forest dominated by *Eucalyptus crebra* and/or *Corymbia trachyphloia* subsp. *amphistomatica* on deeper loamy sand soils.

PCT 610 may also contain a canopy comprised of *Eucalyptus crebra* and/or *Corymbia trachyphloia* subsp. *amphistomatica* however it is typically dominated by *Callitris endlicheri* and contains a sparse groundcover (i.e., has a high cover of rock and bare soil making up a large proportion of the groundcover). Whilst the vegetation type within the subject land does contain occasional occurrences of *Callitris endlicheri*, it is not the dominant canopy species. Further, the community occurs on deeper loamy sand soils that would not typically be referred to as skeletal.

PCT 531 and PCT 1380 were considered the PCTs most similar and representative of this vegetation type recorded within the subject land. PCT 531 was selected as the most representative for the following key reasons:

- PCT 531 contained a larger number of flora species recorded within this vegetation type within the subject land, noting that the PCT profile for PCT 1380 within the BioNet Vegetation Classification Database is limited.
- PCT 531 has a high classification confidence level compared to PCT 1380 (high versus low).
- PCT 531 has been recorded within the broader locality by the SVTM whereas PCT 1380 has not.
- Vegetation within the subject land is more representative of the 'Western Slopes Dry Sclerophyll' (PCT 531) rather than the 'Yetman Dry Sclerophyll Forests' (PCT 1380) vegetation class.

4.2.3.4 Alignment with TECs

As outlined in the BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 531.

4.2.3.5 Alignment with EPBC Act listed ECs

As outlined in the BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 531.

4.2.4 PCT 588 White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion

4.2.4.1 PCT overview

PCT 588 White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion is described in the BioNet Vegetation Classification Database as an open woodland to forest dominated by *Eucalyptus albens* (White Box) and *Callitris galucophylla* (White Cypress Pine) with a shrubby understorey. Other trees that commonly occur within the community include *Eucalyptus melliodora* (Yellow Box), *Angophora floribunda* (Rough-barked Apple), *Eucalyptus dealbata* (Tumbledown) and *Eucalyptus melanophloia* (Silver-leaved Ironbark). PCT 588 is known to occur within the Brigalow Belt South IBRA bioregion and Liverpool Plains IBRA subregion and has been mapped by the STVM as occurring within areas of the Leard State Forest and the Leard State Conservation Area.

Vegetation within the subject land assigned to PCT 588 occurred as a mid to tall open woodland to forest with a shrubby understorey on hill landforms within the north-west portion of the subject land. The community occurred on light brown loamy soils derived from sandstones and conglomerates which form part of the underlying geology. The underlying geology is derived from the Maules Creek Formation and Leard Formation which are characterised by early Permian lithic conglomerates, quartz sandstones, siltstones and claystones (Brownlow, 1997, Hansen Bailey, 2010).

The floristic composition of PCT 588 within the subject land was dominated by a canopy of *Eucalyptus albens* (White Box) and *Callitris glaucophylla* (White Cypress Pine) with occasional occurrences of *Eucalyptus crebra* (Narrow-leaved Ironbark) where it transitions into areas mapped as PCT 592. The shrub layer was typically dominated by tall woody shrubs that were dense in cover (i.e., >30% cover). During the previous drought (between 2017 and 2019), the shrub layer in some areas of this community succumb to desiccation and dieback due to the severe dry conditions. More recent surveys have confirmed the recovery of the shrub layer, and as such, White Box grassy woodland PCTs do not represent this vegetation type. The groundlayer was dominated by a variety of native tussock grasses, herbs, forbs and climbers.

Table 4.6 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.7 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 588 during the field survey.

Table 4.6 PCT 588 White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion

PCT ID	PCT 588
PCT name	White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
Vegetation formation	KF_CH5A Dry Sclerophyll Forests (Shrub/grass sub-formation)
Vegetation class	North-west Slopes Dry Sclerophyll Woodlands
Per cent cleared value (%)	67%
Extent within subject land (ha)	3.59 ha

Table 4.7 PCT 588 White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion floristic composition and structure

Growth form	Height range	Percentage foliage cover range	Dominant species recorded
Tree	T1: 12–16 m T2: 4–8 m	T: 20–25% T2: 10–15%	*Eucalyptus albens, Callitris glaucophylla, Notelaea microcarpa* var. *microcarpa, Brachychiton populneus* subsp. *populneus* and occasional *Eucalyptus crebra* and *Alphitonia excelsa* where it transitions into PCT 592
Shrub	0.5–2.5 m	25–45%	*Dodonaea viscosa* subsp. *angustifolia, Geijera parviflora, Olearia elliptica* subsp. *elliptica, Rhagodia parabolica, Pimelea neo-anglica, Solanum parvifolium* subsp. *parvifolium, Denhamia cunninghamii, Breynia oblongifolia, Pittosporum angustifolium, Acacia decora* and various *Cassinia* species
Fern	0.1–0.2 m	<1	*Cheilanthes sieberi* subsp. *sieberi* and *Cheilanthes distans*

Growth form	Height range	Percentage foliage cover range	Dominant species recorded
Grass and grasslike	0.1–0.5 m	10–25%	*Austrostipa scabra* subsp *scabra, Aristida ramosa, Digitaria diffusa, Enteropogon acicularis, Panicum decompositum, Aristida personata, Cyperus gracilis, Aristida personata, Paspalidium constrictum, Enteropogon acicularis, Aristida leptopoda, Paspalidium gracile* and *Rytidosperma racemosum* var. *obtusatum*
Forb	0.1–0.5 m	5–10%	*Swainsona galegifolia, Dichondra* sp. Inglewood, *Einadia nutans* subsp. *nutans, Glossocardia bidens,* various *Wahlenbergia* species, *Boerhavia domini, Ajuga australis, Stackhousia viminea, Teucrium betchei, Ranunculus pumilio* var. *politus, Daucus glochidiatus, Arthropodium milleflorum, Geranium solanderi, Pterostylis longicurva, Phyllanthus virgatus, Oxalis perennans, Sida cunninghamii, Rostellularia adscendens* subsp. *adscendens, Brunonioella australis, Hypericum gramineuum* and *Einadia hastata*
Other	0.1–16 m	<1%	*Clematis microphylla, Oxytes brachypoda, Parsonsia eucalyptophylla, Amyema miquelii, Glycine clandestina, Marsdenia viridiflora* subsp. *viridiflora* and *Glycine tabacina*



Photo 4.7 PCT 588 at survey plot Bog_NE_4



Photo 4.8 PCT 588 at survey plot Bog_NE_5

4.2.4.2 Condition states

Within the subject land, PCT 588 occurred in a single broad condition state (equivalent to vegetation zones), being 'Moderate'. Two BAM vegetation integrity plots were completed within PCT 588 moderate condition including Bog_NE_4 and Bog_NE_5.

4.2.4.3 Justification of PCT selection

The PCT filter tool was used to determine a candidate PCT list for this vegetation community. Attributes entered into the tool included the IBRA bioregion, IBRA subregion and flora species recorded from each BAM vegetation integrity plot completed. Over 1,500 PCTs were identified by the PCT filter tool as containing one or more of the attributes entered. This list was reduced to 80 candidate PCTs via the exclusion of PCTs that did not contain *Eucalyptus albens*, which was the prevalent canopy species throughout the community within the subject land.

This candidate list was further reduced to 66 candidate PCTs via the exclusion of PCTs that align to dry rainforest, eastern riverine forest, inland riverine forests, western vine thicket, grassy woodland, and floodplain transition woodland vegetation formation types. The most suitable PCT was determined by analysing the BioNet Vegetation Classification Database profile of each shortlisted candidate PCT against the characteristics of the vegetation recorded within the subject land.

Of the shortlisted PCTs known from the Brigalow Belt South – Liverpool Plains IBRA subregion, the following PCT options were considered the most similar for this vegetation type:

- PCT 588 White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion.
- PCT 592 Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion.
- PCT 591 White Box shrubby open forest on hills mainly in the Nandewar Bioregion.
- PCT 1308 White Box – White Cypress Pine shrubby open forest of the Nandewar Bioregion and Brigalow Belt South Bioregion.

There were also several other PCTs which typically contain a canopy dominated by *Eucalyptus albens* identified by the PCT filter tool (including PCT 433, PCT 434, PCT 435, PCT 590 and PCT 1383). These PCTs however were all discounted as they occur as grassy woodlands whereas the vegetation within the subject land occurred as an open/shrubby dry sclerophyll woodland or forest with a shrub layer that had a cover consistently greater than 30 %.

Although PCT 592 has been confirmed as the dominant PCT with the subject land and may have *Eucalyptus albens* within the canopy it is described in the BioNet Vegetation Classification Database as being largely dominated by *Eucalyptus crebra* and usually a sparse shrubby understorey. Vegetation mapped within the subject land as PCT 588 however was dominated by *Eucalyptus albens* and typically contained an understorey that was dense in cover across its range forming distinct patches when compared with areas of PCT 592. Further, the groundcover floristics differed to that recorded in PCT 592 and more closely aligned with PCT 588.

PCT 588, PCT 591 and PCT 1308 were considered the PCTs most similar and representative of this vegetation type recorded within the subject land. PCT 588 was selected as the most representative for the following key reasons:

- PCT 588 contained a larger number of flora species recorded within this vegetation type within the subject land, noting that the PCT profile for PCT 1308 within the BioNet Vegetation Classification Database is limited.
- PCT 588 has a canopy dominated by *Eucalyptus albens* and *Callitris glaucophylla* whereas the canopy of PCT 591 and PCT 1308 are typically more diverse containing a range of other myrtaceous species such as *Angophora floribunda, Eucalyptus melliodora* and *Eucalyptus nortonii,* as well as *Callistris endlicheri* which were not recorded.
- PCT 588 and PCT 591 had a high classification confidence level compared to PCT 1308 (high versus very low).
- PCT 588 is identified as being known to grade into less shrubby *Eucalyptus albens* dominated PCTs (namely PCT 435) on less steep soils within the Brigalow Belt South IBRA bioregion, within the locality of the subject land this transition has been observed particularly within the southern and eastern areas of the Leard State Forest.
- PCT 588 has been recorded within the immediate locality of the subject land by the SVTM (i.e., within Leard State Forest and Leard State Conservation) whereas PCT 591 and PCT 1308 have not.

4.2.4.4 Alignment with TECs

As outlined in the BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 588.

4.2.4.5 Alignment with EPBC Act listed ECs

As outlined in the BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 588.

4.2.5 PCT 592 Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion

4.2.5.1 PCT overview

PCT 592 Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion is described in the BioNet Vegetation Classification Database as a tall or mid-high forest to woodland dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Callitris glaucophylla* (White Cypress Pine) and/or *Eucalyptus albens* (White Box). Other trees commonly recorded within PCT 592 include *Eucalyptus dealbata* (Tumbledown) and *Eucalyptus melanophloia* (Silver-leaved Ironbark). PCT 592 is known to occur within the Brigalow Belt South IBRA bioregion and Liverpool Plains IBRA subregion and described as occurring in the Mount Kaputar to Lake Keepit regions. PCT 592 is mapped as the dominant PCT by the SVTM throughout subject land and immediate surrounds, including large areas of the Leard State Forest and Leard State Conservation Area.

Vegetation within the subject land assigned to PCT 592 occurred as a tall to mid-high shrubby/open dry sclerophyll forest. PCT 592 was the dominant PCT recorded throughout the subject land occurring on hillslopes and hillscrests on grey to light brown loamy soils derived from sandstones and conglomerates, which form part of the underlying geology. The underlying geology is derived from the Maules Creek Formation and Leard Formation which are characterised by early Permian lithic conglomerates, quartz sandstones, siltstones and claystones (Brownlow, 1997, Hansen Bailey, 2010).

The floristic composition of PCT 592 within the subject land was dominated by a canopy of *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Callitris glaucophylla* (White Cypress Pine) with infrequent occurrences of *Eucalyptus albens* (White Box), *Brachychiton populneus* subsp. *populneus* (Kurrajong) and *Eucalyptus melanophloia* (Silver-leaved Ironbark) more commonly occurring where it adjoined with other PCTs where these species were more prevalent, such as PCT 588 and PCT 594. The shrub layer was variable in structure and composition but typically occurred as open to mid-dense in cover. The groundlayer was dominated by a variety of native tussock grasses, herbs, forbs and climbers.

Table 4.8 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.9 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 592 during the field survey.

Table 4.8 PCT 592 Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion

PCT ID	PCT 592
PCT name	Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion
Vegetation formation	KF_CH5B Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation class	Western Slopes Dry Sclerophyll Forests
Per cent cleared value (%)	52%
Extent within subject land (ha)	51.51 ha

Table 4.9 PCT 592 Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion floristic composition and structure

Growth form	Height range	Percentage foliage cover range	Dominant species recorded
Tree	T1: 12–22 m T2: 3.5–10 m	T1: 15–40% T2: 15–35%	*Eucalyptus crebra, Callitris glaucophylla, Eucalyptus albens, Brachychiton populneus* subsp. *populneus, Alphitonia excelsa*, *Notelaea microcarpa* var. *microcarpa* and other species such as *Acacia cheelii* and *Callitris endlicheri* along ecotones
Shrub	0.3–4 m	20–65%	*Dodonaea viscosa* subsp. *angustifolia, Olearia elliptica* subsp. *elliptica, Beyeria viscosa, Rhagodia parabolica, Teucrium junceum, Denhamia cunninghamii, Exocarpos cupressiformis, Solanum parvifolium* subsp. *parvifolium, Breynia oblongifolia, Geijera parviflora, Pimelea neo-anglica, Acacia decora, Hibbertia obtusifolia, Dodonaea sinuolata* subsp. *sinuolata, Cassinia laevis, Melichrus urceolatus* and *Senna aciphylla*
Fern	0.1–0.2 m	<1%	*Cheilanthes sieberi* subsp. *sieberi* and *Cheilanthes distans*
Grass and grasslike	0.1–0.6 m	5–35%	*Austrostipa scabra* subap. *scabra, Aristida ramosa, Aristida personata, Carex inversa, Cymbopogon refractus, Cyperus gracilis, Lomandra multiflora* subsp. *multiflora, Digitaria diffusa, Aristida caput-medusae, Lomandra filiformis* subsp. *coriacea, Eragrostis brownii, Rytidosperma* species, *Lomandra filiformis* subsp. *filiformis, Enteropogon acicularis*, *Austrostipa ramosissima, Enneapogon gracilis* and *Microlaena stipoides* var. *stipoides*
Forb	0.1–0.6 m	2–10%	*Sida corrugata, Arthropodium milleflorum, Chrysocephalum semipapposum, Dianella longifolia, Dichondra* sp. Inglewood, *Wahlenbergia* species, *Brunoniella australis, Einadia hastata, Teucrium betchei, Oxytes brachypoda, Phyllanthus virgatus, Oxalis perennans, Pomax umbellata, Stackhousia viminea, Haloragis heterophylla, Geranium solanderi, Cardamine paucijuga, Goodenia hederacea* subsp. *hederacea, Calotis lappulacea, Oxytes brachypoda, Rostellularia adscendens* var. *adscendens, Dianella revoluta* var. *revoluta, Einadia nutans* subsp. *nutans, Sigesbeckia australiensis, Ajuga australis, Gonocarpus elatus, Oxalis perennans* and *Daucus glochidiatus*
Other	0.1–22 m	<1–5	*Parsonsia eucalyptophylla, Glycine tabacina, Clematis microphylla, Amyema quandang* var. *quandang, Amyema mirquelii, Marsdenia viridiflora* subsp. *viridiflora, Lysiana subfalcata* and *Grona varians*



Photo 4.9 PCT 592 at survey plot Bog_NE_7



Photo 4.10 PCT 592 at survey plot Bog_NE_13

4.2.5.2 Condition states

Within the subject land, PCT 592 occurred in a single broad condition state (equivalent to vegetation zones), being 'High'. Five BAM vegetation integrity plots were completed within PCT 592 high condition including Bog_NE_7, Bog_NE_13, Bog_NE_14, Bog_NE_15, Bog_NE_16.

4.2.5.3 Justification of PCT selection

The PCT filter tool was used to determine a candidate PCT list for this vegetation community. Attributes entered into the tool included the IBRA bioregion, IBRA subregion and flora species recorded from each BAM vegetation integrity plot completed. Over 1,600 PCTs were identified by the PCT filter tool as containing one or more of the attributes entered. This list was reduced to 72 candidate PCTs via the exclusion of PCTs that did not contain *Eucalyptus crebra* which was prevalent canopy species throughout the community within the subject land. This candidate list was further reduced to 61 candidate PCTs via the exclusion of PCTs that align to rainforest, grassy woodland and forested wetland vegetation formation types. The most suitable PCT was determined by analysing the BioNet Vegetation Classification Database profile of each shortlisted candidate PCT against the characteristics of the vegetation recorded within the subject land.

Of the shortlisted PCTs known from the Brigalow Belt South – Liverpool Plains IBRA subregion, the following PCT options were considered the most similar for this vegetation type:

- PCT 592 Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion.
- PCT 531 Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion.
- PCT 459 Narrow-leaved Ironbark – Black Cypress Pine – White Box shrubby woodland in sedimentary hills of the Gunnedah region, Brigalow Belt South Bioregion.
- PCT 532 Narrow-leaved Ironbark – Tumbledown Red Gum shrubby open forest in the Melville Range area of southern Nandewar Bioregion.
- PCT 1313 White Cypress Pine – Narrow-leaved Ironbark shrub/grass open forest of the western Nandewar Bioregion.

Whilst PCT 459 and PCT 532 are both described as having a canopy dominated by *Eucalyptus crebra* and both align to the dry sclerophyll forest vegetation formation PCT 459 is described as occurring within the Gunnedah region and PCT 532 is restricted to the Melville Range. Neither of these PCTs have been recorded within the locality of the subject land where as PCT 592 is mapped as the dominant PCT within the Leard State Forest and the immediate surrounds. Further, the understorey floristics of PCT 592 is a better fit for this vegetation type based on the species inventories collected for areas mapped as PCT 592 within the subject land.

PCT 531 can also contain a canopy dominated by *Eucalyptus crebra*, however it usually also contains other canopy species such as *Callitris endlicheri* and *Corymbia trachyphloia* subsp. *Amphistomatica*, both of which were largely absent from areas mapped as PCT 592. PCT 531 was mapped elsewhere in the subject land where these species were prevalent. Boundaries between PCT 592 and PCT 531 within the subject land relied upon the prevalence of differing canopy and understorey species.

PCT 592 and PCT 1313 were considered the PCTs most similar and representative of this vegetation type recorded within the subject land. PCT 592 was selected as the most representative for the following key reasons:

- PCT 592 contained a larger number of flora species recorded within this vegetation type within the subject land, noting that the PCT profile for PCT 1313 within the BioNet Vegetation Classification Database is limited.
- PCT 592 has a higher classification confidence level compared to PCT 1313 (medium versus very low).
- PCT 592 has been recorded throughout the subject land and locality as the dominant PCT by the SVTM whereas PCT 1313 has not.

4.2.5.4 Alignment with TECs

As outlined in the BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 592.

4.2.5.5 Alignment with EPBC Act listed ECs

As outlined in the BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 592.

4.2.6 PCT 594 Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion

4.2.6.1 PCT overview

PCT 594 Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion is described in the BioNet Vegetation Classification Database as a mid-high to tall open woodland or forest dominated by *Eucalyptus melanophloia* (Silver-leaved Ironbark) and *Callitris glaucophylla* (White Cypress Pine). Other trees commonly recorded within PCT 594 include *Eucalyptus dealbata* (Tumbledown), *Eucalyptus albens* (White Box), *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Angophora floribunda* (Rough-barked Apple). PCT 594 is known to occur within the Brigalow Belt South IBRA bioregion and Liverpool Plains IBRA subregion. The community is currently mapped by the STVM as occurring within the north-east portion of the subject land.

Vegetation within the subject land assigned to PCT 594 occurred as a mid to tall shrubby/open dry sclerophyll forest, which was largely restricted to the north-west portions of the subject land on hillslopes and hillcrests. The community occurred on light brown loamy sand soils derived from sandstones and conglomerates, which form part of the underlying geology. The underlying geology is derived from the Maules Creek Formation and Leard Formation which are characterised by early Permian lithic conglomerates, quartz sandstones, siltstones and claystones (Brownlow, 1997, Hansen Bailey, 2010).

The floristic composition of PCT 594 within the subject land was dominated by a canopy of *Eucalyptus melanophloia* (Silver-leaved Ironbark) and *Callitris glaucophylla* (White Cypress Pine). The shrub layer was variable in structure and composition, however typically occurred as either open to mid-dense in cover. The ground layer was dominated by a variety of native tussock grasses, herbs, forbs and climbers.

Table 4.10 provides an overview of the PCT as outlined in the BioNet Vegetation Classification database. Table 4.11 provides a detailed description of each species per growth form recorded from BAM plots undertaken in PCT 594 during the field survey.

Table 4.10 PCT 594 Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion

PCT ID	PCT 594
PCT name	Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
Vegetation formation	KF_CH5A Dry Sclerophyll Forests (Shrub/grass sub-formation)
Vegetation class	North-west Slopes Dry Sclerophyll Woodlands
Per cent cleared value (%)	53%
Extent within subject land (ha)	5.71 ha

Table 4.11 PCT 594 Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion floristic composition and structure

Growth form	Height range	Percentage foliage cover range	Dominant species recorded
Tree	T1: 10–16 m T2: 4–10 m	T1: 10–30% T2: 15–45%	*Eucalyptus melanophloia, Notelaea microcarpa* var. *microcarpa, Callitris glaucophylla* with *Alphitonia excelsa* and *Acacia cheelii*
Shrub	1–3.5 m	5–55%	*Dodonaea viscosa* subsp. *angustifolia, Solanum parvifolium* subsp. *parvifolium, Melichrus urceolatus, Pimelea neo-anglica, Senna aciphylla, Olearia elliptica* subsp. *elliptica*, *Solanum cinereum, Geijera parviflora, Psydrax odorata* subsp. *australiana, Beyeria viscosa*, *Acacia deanei* subsp. *deanei, Senna artemisioides* subsp. *zygophylla* and *Breynia oblongifolia*
Fern	0.1–0.2 m	<2%	*Cheilanthes distans* and *Cheilanthes sieberi* subsp. *sieberi*
Grass and grasslike	0.1–0.9 m	15–20%	*Aristida personata, Enteropogon acicularis, Lomandra multiflora* subsp. *multiflora, Aristida ramosa, Digitaria diffusa, Aristida caput-medusae, Cyperus gracilis, Sporobolus caroli, Cymbopogon refractus, Austrostipa scabra* subsp. *scabra*, *Eragrostis megalosperma* and *Scleria mackaviensis*
Forb	0.1–0.5 m	<1–10%	*Einadia hastata, Daucus glochidiatus, Geranium solanderi, Phyllanthus virgatus, Laxmannia gracilis, Sigesbeckia australiensis, Teucrium betchei, Teucrium betchei, Einadia nutans* subsp. *nutans, Chrysocephalum semipapposum, Oxytes brachypoda, Gonocarpus elatus, Dichondra* sp. Inglewood, *Ajuga australis* and *Calotis lappulacea*
Other	0.1–16 m	<1–2%	*Parsonsia eucalyptophylla, Marsdenia viridiflora* subsp. *viridiflora, Cymbidium canaliculatum* and *Amyema miquelii*



Photo 4.11 PCT 594 at survey plot Bog_NE_8



Photo 4.12 PCT 594 at survey plot Bog_NE_9

4.2.6.2 Condition states

In the subject land, PCT 594 occurred in a single broad condition state (equivalent to vegetation zones), being 'Moderate'. Three BAM vegetation integrity plots were completed within PCT 594 moderate condition, including Bog_NE_8, Bog_NE_9 and Bog_NE_10.

4.2.6.3 Justification of PCT selection

The PCT filter tool was used to determine a candidate PCT list for this vegetation community. Attributes entered into the tool included the IBRA bioregion, IBRA subregion and flora species recorded from each BAM vegetation integrity plot completed. Over 1,600 PCTs were identified by the PCT filter tool as containing one or more of the attributes entered. This list was reduced to 41 candidate PCTs via the exclusion of PCTs that did not contain *Eucalyptus melanophloia* which was the dominant tree species within the community. This candidate list was further reduced to 33 candidate PCTs via the exclusion of PCTs that align to rainforest, grassland and forested wetland vegetation formation types. The most suitable PCT was determined by analysing the BioNet Vegetation Classification Database profile of each shortlisted candidate PCT against the characteristics of the vegetation recorded within the subject land.

Of the shortlisted PCTs known from the Brigalow Belt South – Liverpool Plains IBRA subregion, the following PCT options were considered the most similar for this vegetation type:

- PCT 594 Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion.
- PCT 597 White Box – cypress pine – Silver-leaved Ironbark shrub grass open forest / woodland of the northern Brigalow Belt South Bioregion and Nandewar Bioregion.
- PCT 1316 White Cypress Pine – Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion.
- PCT 1317 White Cypress Pine – White Box – Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion.

PCT 597 and PCT 1316 can contain a canopy of *Eucalyptus melanophloia* however are also typically dominated by other tree species including *Eucalyptus albens, Callitris glaucophylla, Ficus rubignosa, Eucalyptus dealbata* and *Eucalyptus caleyi* subsp. *caleyi*. These communities also contain a small tree layer which is dominated by rainforest derived genera more typical of semi-evergreen vine thicket. Comparatively, vegetation within the subject land contains a canopy dominated by *Eucalyptus melanophloia, Callitris glaucophylla* and *Acacia cheelii.* Whilst species within rainforest genre do occur within this vegetation type in the subject land, they are not dominant. Further, PCT 597 occurs on clay-based soils whilst the vegetation present in the subject land occur on loamy soils. PCT 597 and PCT 1316 are more typically found in regions to the north and west of the subject land.

PCT 594 and PCT 1317 were considered the PCTs most similar and representative of this vegetation type recorded within the subject land. PCT 594 was selected as the most representative for the following key reasons:

- PCT 594 contained a larger number of flora species recorded within this vegetation type within the subject land, noting that the PCT profile for PCT 1317 within the BioNet Vegetation Classification Database is limited.
- PCT 594 has a higher classification confidence level compared to PCT 1317 (medium versus very low).
- PCT 594 has been mapped within the subject land by the SVTM whereas PCT 1317 has not.
- PCT 1317 typically occurs on substrates associated with the Melville Range to the Warialda area (outside the region where the subject land occurs) whilst PCT 594 occurs on sedimentary and volcanic substrates throughout the central and northern areas of the Liverpool Plains IBRA subregion.

4.2.6.4 Alignment with TECs

As outlined in the BioNet Vegetation Classification database, there is no BC Act listed TEC associated with PCT 594.

4.2.6.5 Alignment with EPBC Act listed ECs

As outlined in the BioNet Vegetation Classification database, there is no EPBC Act listed TEC associated with PCT 594.

4.3 Threatened ecological communities

4.3.1 BC Act listed threatened ecological communities

Based on the results of the regional BioNet Atlas database search, there are nine BC Act listed TECs that are known or are considered likely to occur within the Brigalow Belt South – Liverpool Plains IBRA subregion. These include:

- Artesian Springs Ecological Community in the Great Artesian Basin.
- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions.
- *Cadellia pentastylis* (Ooline) community in the Nandewar and Brigalow Belt South Bioregions.
- Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions.
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions.
- Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions.
- Native Vegetation on Cracking Clay Soils of the Liverpool Plains.
- Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions.
- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions.

None of the PCTs recorded within the subject land are associated with the above BC Act listed TECs in their respective BioNet Vegetation Classification profile.

In considering the above, only a single BC Act listed TEC was considered to have potential to occur within the subject land based on the vegetation mapped (areas of PCT 588) and characteristics of the subject land, being White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner, and Riverina Bioregions (Box Gum Woodland).

Whilst vegetation mapped as PCT 588 within the subject land shares some affiliations with the Box Gum Woodland TEC, it does not meet the NSW Scientific Determination as the understorey of all patches was dominated by tall woody shrubs that exceed 30 % cover. Given this, areas of PCT 588 failed to meet the definition of a grassy woodland and are not consistent with the Box Gum Woodland TEC, which is characterised by an absent to sparse understorey of shrubs (NSW Threatened Species Scientific Committee, 2020).

4.3.2 EPBC Act listed threatened ecological communities

Based on the results of the PMST, there are eight EPBC Act listed TECs that are known or are considered likely to occur within the assessment area. These include:

- Coolibah – Black Box Woodlands of the Darling River Plains and Brigalow Belt South Bioregions.
- Grey Box (*Eucalyptus macrocarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia.
- Mount Kaputar land snail and slug community.
- Natural grasslands on basalt fine-textured alluvial plains of northern NSW and southern Queensland.
- New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands.
- Poplar Box Grassy Woodland on Alluvial Plains.
- Weeping Myall Woodlands.
- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

None of these EPBC Act listed TECs were identified as occurring within the subject land.

In considering the above, only a single EPBC Act listed threatened ecological community was considered to have potential to occur within the subject land based on the vegetation mapped (areas of PCT 588) and characteristics of the subject land, being White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

A comparative analysis of PCT 588 against the key diagnostic characteristics of the TEC detailed in the EPBC Act Conservation Advice (Department of Climate Change Energy the Environment and Water, 2023a) is provided in Table 4.12. This analysis confirms that PCT 588 is not consistent with the TEC, as it forms a shrubby woodland rather than a grassy woodland as all patches within the study area contained a shrub layer with greater than 30 % cover.

Table 4.12 Comparison of PCT 588 within the subject land against the key diagnostic characteristics of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland detailed within the Commonwealth Conservation Advice for the threatened ecological community

Key diagnostic characteristic	PCT 588 within the subject land
The ecological community occurs in the following bioregions: Brigalow Belt South, Murray Darling Depression, Nandewar, New England Tableland, NSW North Coast, NSW South Western Slopes, Riverina, South Eastern Queensland, South East Corner, South East Coastal Plain, South Eastern Highlands, Southern Volcanic Plain, Sydney Basin and Victorian Midlands.	Yes, subject land occurs within the Brigalow Belt South Bioregion.
It has, or previously had, an overstorey dominated or co-dominated by *Eucalyptus albens* (White Box), *Eucalyptus melliodora* (Yellow Box) or *Eucalyptus blakelyi* (Blakey's Red Gum).	Yes, canopy of PCT 588 is dominated by *Eucalyptus albens* (White Box) within the subject land.
It predominantly has a native ground layer.	Yes, the ground layer is dominated by native species and cover.
Tussock grasses are conspicuous in the ground layer (except in some situations, such as under dense groves of shrubs or regenerating trees), usually with several native species from the following genre: *Austrostipa, Bothriochloa, Chloris, Cymbopogon, Dichanthium, Microlaena, Poa, Themeda, Rytidosperma* or *Sorghum.*	Yes, tussock grasses are present from most of the genre listed.

Key diagnostic characteristic	PCT 588 within the subject land
Amongst the grass tussocks and sometimes in swathes, a range of broad-leaved forbs and petaloid monocots may be a major component of the plant diversity.	Yes, native ground layer of PCT 588 within the subject land is comprised of a diversity of native forbs and monocots.
While shrubs may be dominant locally within areas of the ecological community, areas of native vegetation with a more continuous shrub layer, in which the average shrub cover of the whole patch is greater than 30%, is considered to be a shrubby woodland and so is not part of the listed ecological community. In assessing this, the effects of disturbance need to be considered, for example where heavy grazing may result in high densities of shrubs during a recovery phase.	No, the average shrub cover of all patches within the subject land are greater than 30 % and therefore considered to be a shrubby woodland.
Meets all key diagnostic characteristics?	**No – fails to meet all characteristics.**

4.4 Vegetation zones

The vegetation within the subject land was firstly assessed to a PCT, which was then divided into vegetation zones based on condition using features such as disturbance to growth form groups for tree, shrub, and ground cover, and/or extent of exotic species. A vegetation zone is defined in the BAM as '*an area of native vegetation on the proposal site that is the same PCT and has the same broad condition state'*. A broad condition state infers that the vegetation has a similar tree cover, shrub cover, ground cover, weediness or combinations of these attributes which determine vegetation condition.

The broad condition state was used for stratifying areas of the same PCT into a vegetation zone for determining vegetation integrity score in accordance with BAM subsection 4.3.1. The broad condition states used for this assessment are outlined in Table 4.13.

Patch size was determined in accordance with BAM subsection 4.3.2. A patch was determined as an area of native vegetation that occurred on the subject land and included any native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤ 30 m for non-woody ecosystems) whether it be within or extending into adjoining land. The vegetation zones in the subject land are connected to large areas of high condition remnant native vegetation that are more than 100 ha in size. As such, each vegetation zone has been assigned to the ≥ 100 ha class.

The vegetation zones identified within the subject land are illustrated in Figure 15.14. Table 4.14 provides an overview of the vegetation zones and patch size for each vegetation zone mapped within the subject land.

Table 4.13 Native vegetation broad condition states

Category and rationale	Thresholds
High	Native vegetation is relatively intact with all structural layers present. Exotic weed cover is generally low.
Moderate	Native vegetation that has been subject to canopy removal or 'thinning' of a structural layer but otherwise retains native species.
Low (Derived)	Derived native vegetation that forms either a natural grassland or shrubland that contains native species occurs in a derived or secondary form resulting from clearing of a PCT. These areas generally lack a native over-storey and mid stratum but can contain small areas of shrubs or scattered trees. It generally includes PCTs that have changed to an alternative state because of land management practices since European settlement. Over-storey structural components of derived communities have either entirely been removed or are severely reduced (i.e., derived native grasslands with or without scatted paddock trees).

Table 4.14 Vegetation zones and patch sizes

Vegetation zone ID	PCT ID number and name	Condition	Area (ha)	Patch size class	No. VI plots required	No. VI plots completed	No. VI plots used in assessment[1]	Plot IDs of VI plots used in assessment[1]
1	PCT 462 Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion	Moderate	16.35	>100 ha	3	3	3	Bog_NE_6, Bog_NE_11 and Bog_NE_12
2	PCT 531 Narrow-leaved Ironbark – pine – Brown Bloodwood shrub/grass open forest in the north west of the Nandewar Bioregion	Moderate	7.32	>100 ha	3	3	3	Bog_NE_1, Bog_NE_2 and Bog_NE_3
3	PCT 588 White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion	Moderate	3.59	>100 ha	2	2	2	Bog_NE_4 and Bog_NE_5
4	PCT 592 Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion	High	51.51	>100 ha	5	5	5	Bog_NE_7, Bog_NE_13, Bog_NE_14, Bog_NE_15 and Bog_NE_16
5	PCT 594 Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion	Moderate	5.71	>100 ha	3	3	3	Bog_NE_8, Bog_NE_9 and Bog_NE_10

(1) VI plot = BAM vegetation integrity plot.

4.5 Vegetation integrity (vegetation condition)

4.5.1 Vegetation integrity survey plots

Sixteen vegetation integrity plots were completed in the subject land in 2024 during average rainfall in the preceding 12 months. This assessment utilises data collected in 2024 only. The location of the 16 vegetation integrity plots undertaken in 2024 is illustrated in Figure 15.7.

Table 4.14 outlines the number of vegetation integrity plots required for each vegetation zone and whether the minimum number of plots has been sampled in accordance with Table 3 of the BAM.

4.5.2 Vegetation integrity scores

The vegetation integrity scores for each vegetation zone recorded within the subject land is summarised below in Table 4.15.

Table 4.15 Vegetation integrity scores

Vegetation zone ID	Condition class	Composition condition score	Structure condition score	Function condition score	Vegetation integrity score	Hollow bearing trees present?
VZ1: PCT 462 Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion	Moderate	75	48	73.6	64.3	Yes
VZ2: PCT 531 Narrow-leaved Ironbark – pine – Brown Bloodwood shrub/grass open forest in the north west of the Nandewar Bioregion	Moderate	81.6	31.3	96.2	62.7	Yes
VZ3: PCT 588 White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion	Moderate	93.5	42.4	63.5	63.1	Yes
VZ4: PCT 592 Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion	High	93.9	51.4	98.8	78.1	Yes
VZ5: PCT 594 Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion	Moderate	84.8	39.2	62.7	59.3	Yes

4.5.3 Use of benchmark data

Version 1.2 benchmarks, available within the BioNet Vegetation Classification Database for each PCT as of 29 January 2024, were used to assess vegetation integrity attributes of each vegetation zone. Scattered tree assessment.

According to Gunnedah Airport weather station (055202) provided by the Bureau of Meteorology (Bureau of Meteorology, 2024a), the previous 12 months prior to the August 2024 survey, Boggabri received 548.6 mm.

Benchmark variations for PCT 462, 531 and 592 defines an average rainfall year as 467 mm to 765 mm. Benchmark variations for PCT 588 and 594 define an average rainfall year as 522 mm to 831 mm. 548.6 mm is within the range of an average rainfall year for all PCTs and as such all PCT / vegetation zones conditions have been measured against their default benchmarks for an average rainfall year.

No scattered tree assessment is required as all vegetation contained within the subject land is in moderate to high condition and no scattered trees were present.

4.6 Groundwater dependent ecosystems

Impacts to groundwater (including groundwater dependent ecosystems (GDEs)) were assessed as part of the Groundwater Impact Assessment Report (Australasian Groundwater & Environmental Consultants Pty Ltd, 2025). This BDAR undertook a review of GDEs by reviewing the relevant water sharing plan documents and accessing the Bureau of Meteorology's Groundwater Dependent Ecosystems Atlas (GDE Atlas) (Bureau of Meteorology, 2024b). The GDE Atlas was developed as a national dataset of Australian GDEs to inform groundwater planning and management.

Vegetation mapped in the subject land, consistent with PCT 592 (Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion) and PCT 594 (Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion) was assessed as having a low potential to be a terrestrial GDE (regional assessment). No high potential terrestrial GDEs were identified in the subject land. PCTs identified in the subject land are likely to be classified as 'vadophytic vegetation'. Vadophytic vegetation is considered to primarily use water in the unsaturated zone above the water table and be associated with moisture holding soils. Therefore, PCTs in the subject land are unlikely to be groundwater dependant.

Notwithstanding this, the cumulative impact of groundwater drawdown associated with current approved BTM complex operations and the proposed BCM MOD 10 may have an impact on terrestrial GDEs in the locality. A Terrestrial Groundwater Dependent Ecosystem Assessment (WSP, 2025) is appended to the MOD 10 Modification Report.

5 Habitat suitability for threatened species

5.1 Identification of threatened species for assessment

5.1.1 Geographic and habitat constraints assessment

Field survey for ecosystem and candidate threatened flora and fauna species included a detailed assessment of geographic and habitat constraints. The following species with geographic and/or habitat constraints were assessed (Table 5.1 and Table 5.2).

Table 5.1 Geographic limitations and habitat constraints assessed for threatened flora species

Common Name	Scientific Name	Geographic limitation / habitat constraint	Presence in the subject land
Cyperus conicus	*Cyperus conicus*	There are no geographic limitations or habitat constraints for this species.	None present. Potential habitat present on subject land within PCT 531 and PCT 592.
Bluegrass	*Dichanthium setosum*	There are no geographic limitations or habitat constraints for this species.	None present. Potential habitat present on subject land within PCT 531, PCT 592 and PCT 594.
Pine Donkey Orchid	*Diuris tricolor*	There are no geographic limitations or habitat constraints for this species.	None present. Potential habitat present on subject land within PCT 592.
Spiny Peppercress	*Lepidium aschersonii*	There are no geographic limitations or habitat constraints for this species.	None present. No associated PCTs occur within the subject land.
Native Milkwort	*Polygala linariifolia*	There are no geographic limitations or habitat constraints for this species.	None present. Potential habitat present on subject land within PCT 531 and PCT 592.
Scant Pomaderris	*Pomaderris queenslandica*	There are no geographic limitations or habitat constraints for this species.	Species recorded within subject land. A small clump of this species, covering an area of 0.0314 ha, was recorded in PCT592 within the subject land (Figure 15.16). Potential habitat present on subject land within PCT 462, 531, 588, 592, and 594.
Slender Darling Pea	*Swainsona murrayana*	There are no geographic limitations or habitat constraints for this species.	None present. No associated PCTs occur within the subject land.

Common Name	Scientific Name	Geographic limitation / habitat constraint	Presence in the subject land
Austral Toadflax	*Thesium australe*	There are no geographic limitations or habitat constraints for this species.	None present. Potential habitat present on subject land within PCT 594.
Tylophora linearis	*Tylophora linearis*	There are no geographic limitations or habitat constraints for this species.	Species recorded within subject land. Potential habitat present on subject land within PCT 531, PCT 592, PCT 594 and PCT 462.

Table 5.2 Geographic limitations and habitat constraints assessed for threatened fauna species

Common name	Scientific name	Geographic limitation / habitat constraint	Presence in the subject land
Ecosystem Credit Species (Predicted)			
South-eastern Glossy Black Cockatoo (foraging)	*Calyptorhynchus lathami lathami*	Habitat constraint: Presence of Allocasuarina and Casuarina species.	Habitat constraint not met. Allocasuarina and Casuarina species were not recorded in the subject land. *Allocasuarina leuhmannii* is present within the broader Leard State Forest, however no specimens were observed within the subject land. Survey methodologies and effort for habitat constraints are detailed in Section 2.4.3.
Painted Honeyeater	*Grantiella picta*	Habitat constraint: Mistletoes present at a density of greater than five mistletoes per hectare.	Habitat constraint met. Mistletoe species occurred in densities greater than five per hectare throughout the subject land. Survey methodologies and effort for habitat constraints are detailed in Section 2.4.3.
White-bellied Sea-Eagle (foraging)	*Haliaeetus leucogaster*	Habitat constraint: Waterbodies. Within 1km of rivers, lakes, large dams or creeks, wetlands and coastlines.	Habitat constraint met. The subject land is within 1 km of waterbodies. No lakes, large dams, wetlands, coastal areas, or large dams or creeks (3rd order or above) occur within 1 km of subject land, with the exception of temporary dams associated with mining operations. The subject land does contain both 1st and 2nd order streams, which are unlikely to provide suitable habitat for this species. Survey methodologies and effort for habitat constraints are detailed in Section 2.4.3.
Black-striped Wallaby	*Macropus dorsalis*	Geographic Limitation: North of Gunnedah.	The subject land is north of Gunnedah within the known distribution of this species.

Common name	Scientific name	Geographic limitation / habitat constraint	Presence in the subject land
Species Credit Species (Candidate)			
Regent Honeyeater (breeding)	*Anthochaera phrygia*	Habitat constraint: As per Important Habitat Map.	Habitat constraint not met. The subject land is not mapped on the Important Habitat Map for Regent Honeyeater. This species was therefore removed from further consideration as a candidate species based on no Important Habitat being present.
Pink-tailed Legless Lizard	*Aprasia parapulchella*	Habitat constraint: Rocky areas or within 50m of rocky areas.	Habitat constraint met. The subject land contained rocky areas. This species was therefore retained as a candidate species based on habitat constraints being met.
South-eastern Glossy Black Cockatoo (breeding)	*Calyptorhynchus lathami lathami*	Habitat constraint: Hollow bearing trees. Living or dead trees with hollows greater than 15 cm diameter and higher than 8 m above ground.	Habitat constraint met. A total of 46 hollow-bearing trees containing one or more hollow greater than 15 cm diameter were recorded in the subject land. This species was therefore retained as a candidate species based on habitat constraints being met.
Large-eared Pied Bat	*Chalinolobus dwyeri*	Habitat constraint being cliffs or within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within 2 km of old mines or tunnels.	Habitat constraints not met. The Leard State Forest contains lower gentle slopes without any cliff lines or escarpments. No caves, overhangs, escarpments, outcrops, crevices or old mines and tunnels are known to occur within 2 km of the subject land. This species is known to occur in association with the Nandewar Range in BCMs Eastern Offset Area. This species was therefore removed from further consideration as a candidate species based on the absence of breeding habitat.
White-bellied Sea-Eagle (breeding)	*Haliaeetus leucogaster*	Habitat constraint: Living or dead mature trees within suitable vegetation within 1 km of rivers, lakes, large dams or creeks, wetlands and coastlines.	Habitat constraints met. The subject land contained living or dead mature trees in suitable vegetation within 1 km of a large temporary mine dam. This species was therefore retained as a candidate species based on habitat constraints being met.
Little Eagle (Breeding)	*Hieraaetus morphnoides*	Habitat constraint: Nest trees Live (occasionally dead) large old trees within vegetation.	Habitat constraints met. Live (occasionally dead) large old trees within vegetation were present in the subject land. This species was therefore retained as a candidate species based on habitat constraints being met.

Common name	Scientific name	Geographic limitation / habitat constraint	Presence in the subject land
Swift Parrot (breeding)	*Lathamnus discolor*	Habitat constraint: As per Important Habitat Map.	Habitat constraint not met. The subject land is not mapped on the Important Habitat Map for Swift Parrot. This species was therefore removed from further consideration as a candidate species based on no Important Habitat being present.
Square-tailed Kite (breeding)	*Lophoictinia isura*	Habitat constraint: Nest trees.	Habitat constraints met. One stick nest was observed immediately adjacent to the subject land. However, this was confirmed to be used by a Wedge-tailed Eagle. This species was retained, despite the absence of any known Square-tailed Kite nest trees within the subject land.
Barking Owl (breeding)	*Ninox connivens*	Habitat constraint: Hollow bearing trees. A living or dead tree with a hollow >20 cm diameter that occurs >4 m above the ground.	Habitat constraint met. A total of 46 hollow-bearing trees with one or more large hollows were recorded in the subject land. This species was therefore retained as a candidate species based on habitat constraints being met.
Brush-tailed Rock-wallaby	*Petrogale penicillata*	Habitat constraint: Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliff lines.	Habitat constraint not met. Leard State Forest contains lower gentle slopes without any cliff lines or rocky escarpments. This species was therefore removed from further consideration as a candidate species based on the subject land (and 1 km buffer) does not contain any rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliff lines.
Koala	*Phascolarctos cinereus*	Habitat constraint: Presence of koala use trees – refer to Survey Comments field in TBDC.	Habitat constraint met. The subject land contained four Koala use tree species listed for the North West Slopes Koala modelling region (Environment, 2022), and this species in known from a low population density in the Leard State Forest. This species was therefore retained as a candidate species based on habitat constraints being met.
Grey-headed Flying-fox (Breeding)	*Pteropus poliocephalus*	Habitat constraint: Breeding camps.	Habitat constraints not met. There are no known Grey-headed Flying-fox breeding camps in the subject land. This species was therefore removed from further consideration as a candidate species based on the absence of breeding camps.

Common name	Scientific name	Geographic limitation / habitat constraint	Presence in the subject land
Masked Owl (Breeding)	*Tyto novaehollandiae*	Habitat constraint: Hollow bearing trees A living or dead tree with a hollow >20 cm diameter that occurs >4 meters above the ground.	Habitat constraint met. A total of 46 hollow-bearing trees with one or more large hollows were recorded in the subject land. This species was therefore retained as a candidate species based on habitat constraints being met.
Eastern Cave Bat	*Vespadelus troughtoni*	Habitat constraint: Caves, or within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within 2 km of old mines, tunnels, old buildings or sheds.	Habitat constraints not met. The Leard State Forest contains lower gentle slopes without any cliff lines or escarpments. No caves, overhangs, escarpments, outcrops, crevices or old mines and tunnels are known to occur within 2 km of the subject land. A known maternity breeding cave for Eastern Cave Bat is located approximately 11 km to the west of the subject land in the Namoi Biodiversity Offset Area. This species was therefore removed from further consideration as a candidate species based on the absence of breeding habitat.

5.1.2 Ecosystem credit species

Table 5.3 outlines the ecosystem credit species considered likely to occur on or use habitat available within the subject land.

Table 5.3 Predicted ecosystem credit species

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Regent Honeyeater (foraging)	*Anthochaera phrygia*	CE	CE	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 588, 592, 594	High
Southern Whiteface	*Aphelocephala leucopsis*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 588, 592	Moderate
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	–	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	Moderate
South-eastern Glossy Black-Cockatoo (foraging)	*Calyptorhynchus lathami lathami*	V	V	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded. Habitat constraint, Allocasuarina and Casuarina species were not recorded in the subject land.	Not applicable	High

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Little Pied Bat	*Chalinolobus picatus*	V	–	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	High
Speckled Warbler	*Chthonicola sagittata*	V	–	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	High
Spotted Harrier	*Circus assimilis*	V	–	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 531, 588, 592, 594	Moderate
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	High
Varied Sittella	*Daphoenositta chrysoptera*	V	–	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	High

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	Moderate
Black Falcon	*Falco subniger*	V	–	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 592	High
Little Lorikeet	*Glossopsitta pusilla*	V	–	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	Moderate
Painted Honeyeater	*Grantiella picta*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	Moderate
White-bellied Sea-Eagle (foraging)	*Haliaeetus leucogaster*	V	–	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 531, 588, 592, 594	High

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Little Eagle (foraging)	*Hieraaetus morphnoides*	V	–	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	Moderate
White-throated Needletail	*Hirundapus caudacutus*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	High
Swift Parrot (foraging)	*Lathamus discolor*	E	CE	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	Moderate
Square-tailed Kite (foraging)	*Lophoictinia isura*	V	–	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	Moderate
Black-striped Wallaby	*Macropus dorsalis*	V	–	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
South-eastern Hooded Robin	*Melanodryas cucullata cucullata*	E	E	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	Moderate
Black-chinned Honeyeater (Eastern Subspecies)	*Melithreptus gularis gularis*	V	–	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 531, 592	Moderate
Turquoise Parrot	*Neophema pulchella*	V	–	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	High
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	High

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Yellow-bellied Glider	*Petaurus australis*	V	V	No	☒ BAM-C ☐ TBDC ☒ Previous survey ☒ Current survey	No	This species has been excluded as it does not occur in the Leard State Forest. A review of the NSW BioNet Atlas indicates that the closest records occur greater than 100 km from the subject land to the north-east (Copeton, NSW) and south-east (Wallabahdah, NSW). In 17 years of two-staged land clearing activities supervised by experienced ecologists in the Leard State Forest, this species has never been accounted for.	PCTs 462, 588, 592, 594	High
Scarlet Robin	*Petroica boodang*	V	–	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	Moderate
Flame Robin	*Petroica phoenicea*	V	–	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 531, 592	High

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Pilliga Mouse	*Pseudomys pilligaensis*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 592, 594	High
Grey-headed Flying-fox (foraging)	*Pteropus poliocephalus*	V	V	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	High
Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*	V	–	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	High
Diamond Firetail	*Stagonopleura guttata*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	Moderate

5.1.3 Species credit species

Table 5.4 and Table 5.5 outline the list of species credit species likely to occur or use the subject land and whether they were retained for assessment.

Table 5.4 Flora species credit species

Common name	Scientific name	Listing status		Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Cyperus conicus	*Cyperus conicus*	E	–	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 531, 592
Bluegrass	*Dichanthium setosum*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 531, 588, 592, 594
Pine Donkey Orchid	*Diuris tricolor*	V	–	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 592
Large-leafed Monotaxis	*Monotaxis macrophylla*	E	–	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 462, 531, 588, 592, 594

Common name	Scientific name	Listing status		Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Native Milkwort	*Polygala linariifolia*	E	–	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 531, 592
Scant Pomaderris	*Pomaderris queenslandica*	E	–	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 462, 531, 588, 592, 594
Austral Toadflax	*Thesium australe*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 588, 594
Tylophora linearis	*Tylophora linearis*	V	E	☒ BAM-C ☐ TBDC ☒ Previous survey ☒ Current survey	Yes	Species retained.	PCT 462, 531, 588, 592, 594

Table 5.5 Fauna species credit species

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Rufous Bettong	*Aepyprymnus rufescens*	V	–	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 462, 531, 588, 592, 594
Regent Honeyeater (breeding)	*Anthochaera phrygia*	CE	CE	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded. Habitat constraints – no Important Habitat Mapping present within the subject land. Survey methodologies and effort for habitat constraints are detailed in Section 2.4.3.	Species polygons not created. Suitable habitat deemed not present.
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 462, 531, 588, 592, 594
South-eastern Glossy Black-Cockatoo (breeding)	*Calyptorhynchus lathami lathami*	V	V	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 462, 531, 588, 592, 594

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Eastern Pygmy-possum	*Cercartetus nanus*	V	–	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 462, 531, 588, 592, 594
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	E	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☒ Current survey	No	Species excluded. Habitat constraint – Leard State Forest contains lower gentle slopes without any cliff lines or escarpments. No caves, overhangs, escarpments, outcrops, crevices or old mines and tunnels are known to occur within 2 km of the subject land. Survey methodologies and effort for habitat constraints are detailed in Section 2.4.3.	Species polygons not created. Suitable habitat deemed not present.
White-bellied Sea-Eagle (breeding)	*Haliaeetus leucogaster*	V	–	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 462, 531, 588, 592, 594

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Little Eagle (breeding)	*Hieraaetus morphnoides*	V	–	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained.	PCT 462, 531, 592, 594
Pale-headed Snake	*Hoplocephalus bitorquatus*	V	–	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 462, 531, 588, 592, 594
Swift Parrot (breeding)	*Lathamus discolor*	E	CE	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded. Habitat constraints – no Important Habitat Mapping present within the subject land. Survey methodologies and effort for habitat constraints are detailed in Section 2.4.3.	Species polygons not created. Suitable habitat deemed not present.
Square-tailed Kite (breeding)	*Lophoictinia isura*	V	–	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 462, 531, 588, 592, 594

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Barking Owl (breeding)	*Ninox connivens*	V	–	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 462, 531, 588, 592, 594
Squirrel Glider	*Petaurus norfolcensis*	V	–	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 462, 531, 588, 592, 594
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded. Habitat constraints – no rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliff lines occur within 1 km of the subject land. Leard State Forest contains lower gentle slopes without any cliffs or escarpments. Survey methodologies and effort for habitat constraints are detailed in Section 2.4.3.	Species polygons not created. Suitable habitat deemed not present.

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Koala	*Phascolarctos cinereus*	E	E	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 462, 531, 588, 592, 594
Grey-headed Flying-fox (breeding)	*Pteropus poliocephalus*	V	V	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Species excluded. Habitat constraint. No breeding camps or evidence of breeding camps have been recorded within the subject land.	PCT 462, 531, 588, 592, 594
Masked Owl (breeding)	*Tyto novaehollandiae*	V	–	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 462, 531, 588, 592, 594
Border Thick-tailed Gecko	*Uvidicolus sphyrurus*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 462, 531, 588, 592, 594

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Eastern Cave Bat	*Vespadelus troughtoni*	V	–	No	☒ BAM-C ☐ TBDC ☒ Previous survey ☒ Current survey	Yes	Species excluded. Habitat constraint – Leard State Forest contains lower gentle slopes without any cliff lines or escarpments. No rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles are known to occur within 2 km of the subject land. No old mines, tunnels, old buildings or sheds occur within 2 km of the subject land. A known maternity breeding cave for Eastern Cave Bat is located approximately 11 km to the west within the Namoi Biodiversity Offset Area. Survey methodologies and effort for habitat constraints are detailed in Section 2.4.3.	Species polygons not created. Suitable habitat deemed not present.

5.2 Presence of candidate species credit species

Table 5.6 identifies the candidate threatened flora species and Table 5.7 identifies the candidate fauna species determined to be present within the subject land in accordance with section 5.2.4 of the BAM based on:

- assumed presence within the subject land
- an important habitat map (for dual credit species)
- targeted threatened species surveys, or
- an expert report.

The sections below provide a description of the candidate species credit species found during the field surveys undertaken to inform this BDAR or assumed present within the subject land based on previous surveys and observations made within the Leard State Forest.

Table 5.6 Determining the presence of candidate flora species credit species on the subject land

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Austral Toadflax	*Thesium australe*	V	V	Threatened species targeted survey	No	No
Cyperus conicus	*Cyperus conicus*	E	–	Threatened species targeted survey	No	No
Bluegrass	*Dichanthium setosum*	V	V	Threatened species targeted survey	No	No
Native Milkwort	*Polygala linariifolia*	E	–	Threatened species targeted survey	No	No
Pine Donkey Orchid	*Diuris tricolor*	V	–	Threatened species targeted survey	No	No
Large-leafed Monotaxis	*Monotaxis macrophylla*	E	–	Threatened species targeted survey	No	No
Scant Pomaderris	*Pomaderris queenslandica*	E	–	Threatened species targeted survey	Yes. Recorded in the subject land during surveys. Refer to Section 5.2.2 for further details.	Yes
Tylophora linearis	*Tylophora linearis*	V	E	Threatened species targeted survey	Yes. Recorded in the subject land during surveys. Refer to Section 5.2.1 for further details.	Yes

Table 5.7 Determining the presence of candidate fauna species credit species on the subject land

Common name	Scientific name	Listing status		Method used to determine presence	Present?	Further assessment required? (BAM subsections 5.2.5 and 5.2.6)
		BC Act	EPBC Act			
Birds						
Barking Owl (breeding)	*Ninox connivens*	V	–	Threatened species targeted survey	No	No
South-eastern Glossy-Black Cockatoo (breeding)	*Calyptorhynchus lathami lathami*	V	V	Threatened species targeted survey	No	No
Little Eagle (breeding)	*Hieraaetus morphnoides*	V	–	Threatened species targeted survey	No	No
Masked Owl (breeding)	*Tyto novaehollandiae*	V	–	Threatened species targeted survey	No	No
Square-tailed Kite (breeding)	*Lophoictinia isura*	V	–	Threatened species targeted survey	No	No
White-bellied Sea-Eagle (breeding)	*Haliaeetus leucogaster*	V	–	Threatened species targeted survey	No	No
Mammals						
Eastern Pygmy-possum	*Cercartetus nanus*	V	–	Threatened species targeted survey	No	No
Grey-headed Flying-fox (breeding)	*Pteropus poliocephalus*	V	V	Threatened species targeted survey	No	No
Koala	*Phascolarctos cinereus*	E	E	Assumed present	Assumed present	Yes
Rufous Bettong	*Aepyprymnus rufescens*	V	–	Threatened species targeted survey	No	No
Squirrel Glider	*Petaurus norfolcensis*	V	–	Assumed present	Assumed present	Yes
Reptiles						
Border Thick-tailed Gecko	*Uvidicolus sphyrurus*	V	V	Threatened species targeted survey	No	No
Pale-headed Snake	*Hoplocephalus bitorquatus*	V	–	Assumed present	Assumed present	Yes
Pink-tailed Worm Lizard	*Aprasia parapulchella*	V	V	Threatened species targeted survey	No	No

5.2.1 *Tylophora linearis*

Three patches of sparsely occurring *Tylophora linearis* individuals were recorded within the subject land during the survey program.

Investigations into the species ecology within Leard State Forest indicate that some individuals contain rhizomes which join aerial stems thereby making it difficult to visually identify and count the exact number of individual plants present. As such, the number of individuals recorded within the subject land were determined as the total number of 'aerial stems'. A total of 30 aerial stems were recorded within the subject land.

The location of the *Tylophora linearis* recorded during the field surveys and mapped species polygons is illustrated in Figure 15.15. As an 'Area' species, the species polygon for *Tylophora linearis* was mapped in accordance with section 5.2.5 of the BAM whereby a 30 m buffer was applied around all recorded aerial stems to ensure the extent of vegetation zones that contain the species and similar adjacent habitats that are likely to be suitable for the species was captured. The *Tylophora linearis* species polygon within the subject land covers an area of approximately 1.29 ha comprised of the following vegetation types:

- 0.68 ha of PCT 531 Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion.
- 0.61 ha of PCT 592 Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion.

These individuals form part of a larger population which extends throughout the Leard State Forest and out into the Leard State Conservation Area and neighbouring properties. Previous studies done by Niche Environment and Heritage within the Leard State Forest, the Leard State Conservation Area and other adjoining offset properties have modelled that the population is likely to contain 1.04 million plants within the region (Hunter Eco, 2016).

The individuals recorded within the subject land were recorded occurring within two PCTs; being PCT 531 and PCT 592. At these locations *Tylophora linearis* was commonly associated with a canopy of *Eucalyptus crebra, Callitris glaucophylla* and *Corymbia trachyphloia* subsp. *amphistomatica* as well as a small tree layer of *Alphitonia excelsa, Acacia cheelii* and *Notelaea microcarpa* var. *macrocarpa*. The shrub layer at these locations were typically dominated by *Dodonaea viscosa* subsp. *angustifolia, Olearia elliptica* subsp. *elliptica, Beyeria viscosa* and *Solanum parvifolium* subsp. *parvifolium* whilst the ground stratum commonly included *Austrostipa scabra* subsp. *scabra, Rytidosperma racemosum* var. *obtusatum, Aristida ramosa, Dichondra* sp. Inglewood, *Brunoniella australis, Teucrium betchei, Oxytes brachypoda, Phyllanthus virgatus, Stackhousia viminea, Geranium solanderi, Rostellularia adscendens* var. *adscendens, Einadia nutans* subsp. *nutans, Marsdenia viridiflora* subsp. *viridiflora* and *Grona varians.*

As the species is often difficult to detect due to its growth form and ability to dieback during drier periods, it can be easily confused with other climbers. To improve species recognition, reference locations within the Leard State Forest were inspected prior to the completion of targeted surveys. During the inspection, individuals were observed in good physical health (i.e., showed no sign of die back) and one individual was observed producing reproductive structures (i.e., buds). Rain received within the region during the summer of 2023/2024 had provided optimal conditions to survey for the species.

Samples of *Tylophora linearis* recorded within the subject land were sent to the Royal Botanic Gardens Herbarium to confirm the identification of the species. The samples sent to the Royal Botanic Gardens were confirmed as *Tylophora linearis* (refer to Appendix G). *Tylophora linearis* individuals and typical examples of habitat within the subject land are depicted in Photo 5.1 to Photo 5.4.



Photo 5.1 *Tylophora linearis* in bud at Leard State Forest reference location inspected prior to the summer 2023/24 targeted survey



Photo 5.2 *Tylophora linearis* individuals recorded within the subject land



Photo 5.3 Typical habitat of *Tylophora linearis* within the subject land (PCT 592)



Photo 5.4 Typical habitat of *Tylophora linearis* within the subject land (PCT 531)

5.2.2 *Pomaderris queenslandica*

One small clump of densely occurring *Pomaderris queenslandica* individuals were recorded within the subject land during the survey program.

A sample of *Pomaderris queenslandica* recorded within the subject land was sent to the Royal Botanic Gardens Herbarium to confirm the identification of the species. The samples sent to the Royal Botanic Gardens were confirmed as *Pomaderris queenslandica* (refer to Appendix G). Examples of *Pomaderris queenslandica* individuals recorded within the subject land and the typical habitat within the locality are displayed in Photo 5.5 to Photo 5.8 below.

As an 'Area' species, the species polygon for *Pomaderris queenslandica* was mapped in accordance with section 5.2.3 of the BAM threatened flora survey guide (Department for Planning Industry and Environment, 2020). As such, the following information was considered in defining the species polygon:

- ***the land-use history and disturbance on the subject land, including fire history***

Prior to the development of coal mines in the area, the subject land was surrounded by Leard State Forest including disturbances from vehicle access, recreation and logging activities, with the broader surrounds containing mostly agricultural landuses such as sheep and wheat activities.

The three adjacent mines, referred to as the Boggabri, Tarrawonga, Maules Creek Complex (BTM Complex), began with the commencement of Boggabri and Tarrawonga mines to the south in 2006 and more recently Maules Creek to the north in 2015.

According to NPWS Fire History available in SEED map viewer (NPWS, 2025), Leard State Conservation Area, located approximately 3 km to the north-west, was subject to a prescribed burn in 2014-2015. However, within the Leard State Forest, including the subject land, no fires or prescribed burns have been recorded.

- ***recent rainfall events, and how it compares to long-term averages***

Pomaderris queenslandica was recorded in August 2024. Monthly rainfall in the 6 months preceding August 2024 from Gunnedah Airport weather station (055202) (Bureau of Meteorology, 2024a), with a comparison to long-term monthly averages (using data from 2001 to present), is as follows:

- January 2024 rainfall was 49 mm, compared to a long-term average of 46.1 mm
- February 2024 rainfall was 29.4 mm, compared to a long-term average of 62.9 mm
- March 2024 rainfall was 9.6 mm, compared to a long-term average of 57.4 mm
- April 2024 rainfall was 63.4 mm, compared to a long-term average of 23.1 mm
- May 2024 rainfall was 25.8 mm, compared to a long-term average of 27.1 mm
- June 2024 rainfall was 93.8 mm, compared to a long-term average of 43.3 mm
- July 2024 rainfall was 69 mm, compared to a long-term average of 31.5 mm
- August 2024 rainfall was 58.8 mm, compared to a long-term average of 33.4 mm.

This indicates that the subject land is likely to have received well below average rainfall for February and March, and well above average rainfall in April, June, and July prior to the survey in August.

- ***previous surveys for the species at or near the subject land***

The WSP ecology team (previously Parsons Brinckerhoff) have been undertaking ecology work associated with BCM and the surrounding Leard State Forest since 2006, including annual monitoring of the Leard State Forest as well as biodiversity assessments for previous modifications. As a result of this history of ecology work in the locality, the WSP ecology team have an intimate knowledge of the natural environment in this locality and the specific biodiversity values present. A list of ecological investigations undertaken by WSP and Parsons Brinckerhoff is provided in Table 1.2.

Pomaderris queenslandica was previously recorded by Parsons Brinckerhoff in 2010 in two locations within the Vegetation Corridor to the north-west of the subject land as well as a further six locations to the north within what is now part of the Maules Creek mining area (Parsons Brinckerhoff, 2010a).

A search in the BioNet Atlas found 48 records of *Pomaderris queenslandica* within the Narrabri LGA (Search date: 11/02/2025). The closest records to the subject land include three records from 2017 located on the western side of Leard State Forest and two records on the northern side of Leard State Forest from 2018 and 2020.

- ***reference populations in the local area***

No reference populations were used as part of targeted surveys.

- ***life history characteristics of the species, and***

There is limited knowledge of life history characteristics of this species.

- ***habitat constraints, growth form, any other relevant ecological information (e.g., hydrology, aspect, soil type, underlying lithology, and vegetation community).***

Pomaderris queenslandica is found in moist eucalypt forest or sheltered woodlands with a shrubby understorey, and occasionally along creeks (OEH, 2025).

The individuals recorded within the subject land were on a lower slope within PCT 592 Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion, approximately 30 m west of an ephemeral first order drainage line. The location of the individuals was also adjacent to BAM plot Bog_NE_16.

Vegetation within the subject land assigned to PCT 592 occurred as a tall to mid-high shrubby/open dry sclerophyll forest dominated by a canopy of *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Callitris glaucophylla* (White Cypress Pine) with infrequent occurrences of *Eucalyptus albens* (White Box), *Brachychiton populneus* subsp. *populneus* (Kurrajong) and *Eucalyptus melanophloia* (Silver-leaved Ironbark). The shrub layer was variable in structure and composition, however typically occurred as either open to mid-dense in cover. The groundlayer was dominated by a variety of native tussock grasses, herbs, forbs and climbers.

Vegetation recorded in BAM plot Bog_NE_16 was consistent with PCT592 within the subject land. However, the *Pomaderris queenslandica* clump was located in an area with a lower canopy cover, as a result of a large fallen tree observed adjacent to the clump.

Summary

Despite extensive surveys, *Pomaderris queenslandica* was only recorded in the one location within the subject land. This clump of individuals covers a small circular area of 0.0314 ha, equivalent to a 10 m radius circle. Due to the absence of the species from the remainder of the subject land, it is considered that suitable habitat is restricted to this locality. A 30 m buffer has been applied to the clump to create the species polygon to ensure the extent of vegetation zone containing the species and similar adjacent habitats that are likely to be suitable for the species were captured.

With the 30 m buffer applied, the *Pomaderris queenslandica* species polygon within the subject land therefore covers an area of 0.5 ha. This area is comprised entirely of PCT 592 Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion. The location of the *Pomaderris queenslandica* recorded during the field surveys and the resulting species polygon is illustrated in Figure 15.16.



Photo 5.5 *Pomaderris queenslandica* individual, showing the density of the clump in the background



Photo 5.6 *Pomaderris queenslandica* individuals



Photo 5.7 Typical habitat of *Pomaderris queenslandica* within the subject land (Photos of Plot Bog_NE_16 located in PCT 592 adjacent to clump)



Photo 5.8 Typical habitat of *Pomaderris queenslandica* within the subject land (Photos of Plot Bog_NE_16 located in PCT 592 adjacent to clump)

5.2.3 Koala (*Phascolarctos cinereus*)

Koala is listed as Endangered under the BC Act and the EPBC Act. Koalas naturally inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by Eucalyptus species. They are a leaf-eating specialist that feed primarily during dawn, dusk or night. Koalas feed primarily on the foliage of Eucalyptus species; though may sometimes consume Corymbia, Angophora, Lophostemon, and occasionally Leptospermum and Melaleuca species.

In NSW, Koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with smaller populations on the plains west of the Great Dividing Range. The most notable population west of the Great Dividing Range is the Gunnedah population and those occupying the Pilliga forests. Within the Leard State Forest, previous studies undertaken for Koala occurrence proximate to the BCM indicated a low population density and low habitat utilisation in the south of the Leard State Forest (Hansen Bailey, 2010). One hundred and sixty-six survey sites were sampled in the Project Boundary and mine lease area with evidence of Koala habitat use recorded in 3% of the sampled sites (Parsons Brinckerhoff, 2010a). Koala activity within these sites was typically low, ranging from <5 to 20%, with a mean activity score (active sites only) of 11%. *Eucalyptus blakelyi* (Blakely's Red Gum) was inferred as the dominant tree species utilised, followed by *E. pilligaensis* (Pilliga Box), *E. albens* and *E. crebra*. One Koala was observed at a survey location in the BCM lease area during systematic searches for this species in 2009. Another Koala was recorded opportunistically in 2009.

In addition to the above surveys, the following survey was undertaken in the subject land during investigations informing this report:

- 25 Koala SATs (August 2023 to October 2023, and August 2024)
- 57.6 person hours spotlighting (August 2023, November 2023, January 2024, August 2024)
- 18 call playback stations (August 2023, November 2023, January 2024)
- three call playback stations completed on each of six separate nights (August 2024)
- 1,074 remote camera trap nights (October 2023 to December 2023)
- eight nights stag watching 31 hollow-bearing trees (August 2023)
- five habitat assessments.

Although no Koala activity was recorded in the subject land during abovementioned surveys, the species is considered to occupy the Leard State Forest in a low population density. Based on previous ecological studies, local records and the presence of suitable foraging habitat, it is possible that the subject land may be used on an intermittent basis during local movements. As such, Koala is assumed present in all PCTs and vegetation zones in the subject land.

The surveys undertaken for threatened fauna species are outlined in detail in Section 2.4. Table 5.9 outlines the survey effort undertaken for threatened animal species in the subject land.

5.2.4 Squirrel Glider (Petaurus norfolcensis)

The Squirrel Glider is listed as Vulnerable under the NSW BC Act. The Squirrel Glider has a wide, albeit sparse, distribution throughout eastern Australia, from northern Queensland to western Victoria. The species inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range. It prefers mixed species stands with a shrub or *Acacia* midstorey. The species relies on large old trees with hollows for breeding and nesting. The following surveys were undertaken in the subject land:

- 57.6 person hours spotlighting (August 2023, November 2023, January 2024, August 2024)
- 18 call playback station (August 2023, November 2023, January 2024)
- three call playback stations completed on six separate nights (August 2024)
- 1,074 remote camera trap nights (October 2023 to December 202, and August 2020)
- eight nights stag watching 31 hollow-bearing trees (August 2023)
- five habitat assessments.

The targeted surveys did not record the species within the subject land; however, based on records in the locality, including the Leard State Forest; the presence of foraging habitat and hollow-bearing trees for nesting and breeding, and the general cryptic nature of the species, it is considered that the subject land would form part of the species home range and thus likely be used by the species. Accordingly, Squirrel Glider is assumed present in all PCTs and vegetation zones in the subject land. The surveys undertaken for threatened fauna species are outlined in detail in Section 2.4. Table 5.9 outlines the survey effort undertaken for threatened animal species in the subject land.

5.2.5 Pale-headed Snake (Hoplocephalus bitorquatus)

The Pale-headed Snake is listed as Vulnerable under the NSW BC Act. The Pale-headed Snake is patchily distributed from north-east Queensland to the north-eastern portion of NSW and appears to have contracted to a fragmented distribution. In NSW it has historically been recorded from as far west as Mungindi and Quambone on the Darling Riverine Plains, across the north-west slopes, and from the north-east Queensland to Sydney. The species is highly cryptic and difficult to survey for as they can spend weeks at a time hidden in tree hollows.

Survey requirements for Pale-headed Snake specify a combination of spotlighting and funnel trapping survey, ideally following rainfall and on humid nights (Department of Planning and Environment, 2022b). The following surveys were undertaken in the subject land:

- 31 person hours of spotlighting (November 2023 and January 2024)
- habitat assessments to determine habitat features
- nine nights of opportunistic survey (November 2023 and January 2024).

Targeted surveys did not record this species in the subject land; however, the species is very cryptic and it has previous been regularly recorded in the Leard State Forest during annual tree clearing operations (Photo 5.9 and Photo 5.10). Based on previous records, the presence of hollow-bearing trees and foraging habitat, and the general cryptic nature of the species, it is considered that the species would occupy the subject land. Therefore, Pale-headed Snake is assumed present in all PCTs and vegetation zones in the subject land. The surveys undertaken for threatened fauna species are outlined in detail in Section 2.4. Table 5.9 outlines the survey effort undertaken for threatened animal species in the subject land.



Photo 5.9 Pale-headed Snake sheltering in a tree hollow, Leard State Forest, Boggabri NSW



Photo 5.10 Pale-headed Snake, Leard State Forest, Boggabri NSW

5.3 Threatened species surveys

Threatened species surveys were undertaken with regard to the various published guidelines as outlined in Section 2.3 for threatened plant species and Section 2.4 for threatened animal species.

Reference sites for threatened plant species were used to determine likely detectability at the time of survey. Reference sites for most species were not available near to the subject land, or publicly accessible, but the following reference sites were used:

- *Tylophora linearis*: two reference populations for this species in the Leard State Forest were inspected prior to the targeted flora surveys undertaken in January 2024. All individuals were in good health (i.e., did not show any signs of dieback) and one individual was observed producing reproductive material (i.e., bud). Rain received within the region during the summer of 2023/2024 had provided optimal conditions to survey for the species.

The surveys undertaken for threatened flora species are outlined in detail in Section 2.3. Table 5.8 outlines the survey effort undertaken for threatened flora species in the subject land.

The surveys undertaken for threatened fauna species are outlined in detail in Section 2.4. Table 5.9 outlines the survey effort undertaken for threatened fauna species in the subject land.

Table 5.8 Threatened species surveys for candidate flora species credit species on the subject land

Common name	Scientific name	Threatened flora species surveys					Present	Further assessment required (BAM subsections 5.2.5 and 5.2.6)
		Survey method (transects or grids)	Specified survey timing in TBDC	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. Ecologists)		
Cyperus conicus	*Cyperus conicus*	Two-phased grid surveys	January to May	☒ Yes 15–19/01/2024	☐ No	100 hrs Two Ecologists	No	No
Bluegrass	*Dichanthium setosum*	Two-phased grid surveys and parallel transects	November to May	☒ Yes 15–19/01/2024 22/01/2024 24/01/2024	☐ No	100 hrs Two Ecologists	No	No
Pine Donkey Orchid	*Diuris tricolor*	Two-phased grid surveys	September to October	☒ Yes 4-8/09/2023	☐ No	80 hrs Two Ecologists	No	No
Large-leafed Monotaxis	*Monotaxis macrophylla*	Two-phased grid surveys	August to February	☒ Yes 4-8/09/2023 15-19/01/2024 22/01/2024 24/01/2024	☐ No	180 hrs Two Ecologists	No	No
Native Milkwort	*Polygala linariifolia*	Two-phased grid surveys	October to February	☒ Yes 15-19/01/2024	☐ No	100 hrs Two Ecologists	No	No

Common name	Scientific name	Threatened flora species surveys					Present	Further assessment required (BAM subsections 5.2.5 and 5.2.6)
		Survey method (transects or grids)	Specified survey timing in TBDC	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. Ecologists)		
Scant Pomaderris	*Pomaderris queenslandica*	Two-phased grid surveys and parallel transects	All year	☒ Yes 4-8/09/2023 15-19/01/2024 22/01/2024 24/01/2024	☐ No	180 hrs Two Ecologists	Yes	Yes
Austral Toadflax	*Thesium australe*	Parallel transects	November to February	☒ Yes 15-19/01/2024 22/01/2024 24/01/2024	☐ No	100 hrs Two Ecologists	No	No
Tylophora linearis	*Tylophora linearis*	Two-phased grid surveys and parallel transects	October to May	☒ Yes 15-19/01/2024 22/01/2024 24/01/2024	☐ No	100 hrs Two Ecologists	Yes	Yes

Table 5.9 Threatened species surveys for candidate fauna species credit species on the subject land

Common name	Scientific name	Threatened fauna species surveys					Present	Further assessment required (BAM subsections 5.2.5 and 5.2.6)
		Survey method (e.g., harp trap, Elliott trap, bioacoustics, etc.)	Specified survey timing in TBDC	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. Ecologists)		
Reptiles								
Pink-tailed Legless Lizard	*Aprasia parapulchella*	— Active searches	September – November	☒ Yes October	☐ No	**Active searches** — 9-10 October 2023: — 10.3 person hours (2 ecologists) — 1,291 rocks searched — 116 timber palings searched — 23-27 Oct 2023: — 6 person hours (2 ecologists) — 651 rocks searched — 30 palings searched	No	No
Pale-headed Snake	*Hoplocephalus bitorquatus*	— Spotlighting — Opportunistic surveys — Habitat assessment	November – March	☒ Yes November, January	☐ No	**Spotlighting** — 21 November 2023: 2 person hours (2 ecologists) — 8-11 January 2024: 12 person hours (2 ecologists) — 21-24 January 2024: 17 person hours (2 ecologists) **Opportunistic survey** — 9 nights opportunistic survey (November 2023 & January 2024) **Habitat assessment** — 27-28 August 2024: 5 x habitat assessments	Assumed present	Yes
Border Thick-tailed Gecko	*Uvidicolus sphyrurus*	— Spotlighting (recommended method) — Active searches — Habitat assessment	November – March	☒ Yes November, January	☐ No	**Spotlighting** — 21 November 2023: 2 person hours (2 ecologists) — 8-11 January 2024: 12 person hours (2 ecologists) — 21-24 January 2024: 4 person hours (2 ecologists) **Active searches** — 9-10 October 2023: — 10.3 person hours (2 ecologists) — 1,291 rocks searched — 116 timber palings searched — 23-27 October 2023: — 6 person hours (2 ecologists) — 651 rocks searched — 30 palings searched **Habitat assessment** — 27-28 August 2024: 5 x habitat assessments	No	No

Common name	Scientific name	Threatened fauna species surveys					Present	Further assessment required (BAM subsections 5.2.5 and 5.2.6)
		Survey method (e.g., harp trap, Elliott trap, bioacoustics, etc.)	Specified survey timing in TBDC	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. Ecologists)		
Birds								
Regent Honeyeater	*Anthochaera phrygia*	— Winter surveys	N/A	N/A	N/A	**Parallel winter bird transects** — 14-18 August 2023: 17 person hours (2 ecologists) — 28-31 August 2023: 28 person hours (2 ecologists) **Winter bird surveys** — 14-18 August 2023: 15 x diurnal bird surveys — 28-31 August 2023: 4 x diurnal bird surveys — 27-28 August 2024: 7 x diurnal bird surveys	No Note: Excluded by habitat constraint (refer to Table 5.5).	No
Glossy Black-Cockatoo (breeding)	*Calyptorhynchus lathami*	— Opportunistic bird survey — Bird survey — Targeted nest transects — Habitat assessments	January – September	☒ Yes August, January	☐ No	**Targeted nest/ parallel bird transects** — 14-18 August 2023: 17 person hours (2 ecologists) — 28-31 August 2023: 28 person hours (2 ecologists) **Diurnal bird survey** — 14-18 August 2023: 15 x diurnal bird surveys — 28-31 August 2023: 4 x diurnal bird surveys — 4-8 September 2023: 5 x diurnal bird surveys — 8-11 January 2024: 4 x diurnal bird surveys — 21-24 January 2024: 4 x diurnal bird surveys — 27-28 August 2024: 7 x diurnal bird surveys **Opportunistic bird survey** — 4-6 September 2023: 38 person hours (2 ecologists) — 7 September 2023: 18 person hours (2 ecologists) **Habitat assessment** — 27-28 August 2024: 5 x habitat assessments	No	No
White-bellied Sea-Eagle (breeding)	*Haliaeetus leucogaster*	— Opportunistic bird survey — Bird survey — Targeted nest transects — Habitat assessments	July – December	☒ Yes August, September, October	☐ No	**Targeted nest/ parallel bird transects** — 14-18 August 2023: 17 person hours (2 ecologists) — 28-31 August 2023: 28 person hours (2 ecologists) — 9-13 October 2023: 32 person hours (2 ecologists) — 24-27 October 2023: 24 person hrs (2 ecologists) **Diurnal bird survey** — 14-18 August 2023: 15 x diurnal bird surveys — 28-31 August 2023: 4 x diurnal bird surveys — 4-8 September 2023: 5 x diurnal bird surveys — 9-13 October 2023: 4 x diurnal bird surveys — 23-27 October 2023: 4 x diurnal bird surveys — 27-28 August 2024: 7 x diurnal bird surveys **Opportunistic bird survey** — 4-6 September 2023: 38 person hours (2 ecologists) — 7 September 2023: 18 person hours (2 ecologists) **Habitat assessment** — 27-28 August 2024: 5 x habitat assessments	No	No

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM subsections 5.2.5 and 5.2.6)
		Survey method (e.g., harp trap, Elliott trap, bioacoustics, etc.)	Specified survey timing in TBDC	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. Ecologists)	
Little Eagle (breeding)	*Hieraaetus morphnoides*	— Opportunistic bird survey — Bird survey — Targeted nest transects — Habitat assessments	August – October	☒ Yes August, September, October	☐ No	**Targeted nest/ parallel bird transects** — 14-18 August 2023: 17 person hours (2 ecologists) — 28-31 August 2023: 28 person hours (2 ecologists) — 9-13 October 2023: 32 person hours (2 ecologists) — 24-27 October 2023: 24 person hrs (2 ecologists) **Diurnal bird survey** — 14-18 August 2023: 15 x diurnal bird surveys — 28-31 August 2023: 4 x diurnal bird surveys — 4-8 September 2023: 5 x diurnal bird surveys — 9-13 October 2023: 4 x diurnal bird surveys — 23-27 October 2023: 4 x diurnal bird surveys — 27-28 August 2024: 7 x diurnal bird surveys **Opportunistic bird survey** — 4-6 September 2023: 38 person hours (2 ecologists) — 7 September 2023: 18 person hours (2 ecologists) **Habitat assessment** — 27-28 August 2024: 5 x habitat assessments	No	No
Swift Parrot	*Lathamus discolor*	— Winter surveys	N/A	N/A	N/A	**Parallel winter bird transects** — 14-18 August 2023: 17 person hours (2 ecologists) — 28-31 August 2023: 28 person hours (2 ecologists) **Winter bird surveys** — 14-18 August 2023: 15 x diurnal bird surveys — 28-31 August 2023: 4 x diurnal bird surveys — 27-28 August 2024: 7 x diurnal bird surveys	No Note: Excluded by habitat constraint (refer to Table 5.5).	No
Square-tailed Kite (breeding)	*Lophoictinia isura*	— Opportunistic bird survey — Bird survey — Targeted nest transects — Habitat assessments	September – January	☒ Yes January, October, September	☐ No	**Targeted nest/ parallel bird transects** — 9-13 October 2023: 32 person hours (2 ecologists) — 24-27 October 2023: 24 person hrs (2 ecologists) **Diurnal bird survey** — 4-8 September 2023: 5 x diurnal bird surveys — 9-13 October 2023: 4 x diurnal bird surveys — 23-27 October 2023: 4 x diurnal bird surveys — 8-11 January 2024: 4 x diurnal bird surveys — 21-24 January 2024: 4 x diurnal bird surveys **Opportunistic bird survey** — 4-6 September 2023: 38 person hours (2 ecologists) — 7 September 2023: 18 person hours (2 ecologists) **Habitat assessment** — 27-28 August 2024: 5 x habitat assessments	No	No

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM subsections 5.2.5 and 5.2.6)
		Survey method (e.g., harp trap, Elliott trap, bioacoustics, etc.)	Specified survey timing in TBDC	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. Ecologists)	
Barking Owl (breeding)	*Ninox connivens*	— Call playback (recommended method) — Stag watching — Spotlighting — Habitat assessments	All year	☒ Yes	☐ No	**Targeted parallel nest transects** — 14-18 August 2023: 17 person hours (2 ecologists) — 28-31 August 2023: 28 person hours (2 ecologists) **Call-playback** — 14-17 and 28-31 August 2023: 7 x call playback stations — 21 November 2023: 1 x call playback station — 11 January 2024: 1 x call playback station — 19-22 August 2024: 3 x call playback stations sampled over 4 consecutive nights — 27-28 August 2024: 3 x call playback stations sampled over 2 consecutive nights **Stag-watching** — 14-17 and 28-31 August 2023: 21 hollow-bearing trees (2 ecologists) — 28-31 August 2023: 10 hollow-bearing trees (2 ecologists) **Spotlighting** — 14-17 and 28-31 August 2023: 11.6 person hours (2 ecologists) — 21 November 2023: 2 person hours (2 ecologists) — 8-11 January 2024: 12 person hours (2 ecologists) — 21-24 January 2024: 17 person hours (2 ecologists) — 19-22 August 2024: 10 person hours (2 ecologists) — 27-28 August 2024: 5 person hours (2 ecologists) **Habitat assessments** — 27-28 August 2024: 5 x habitat assessments	No	No
Masked Owl (Breeding)	*Tyto novaehollandiae*	— Call playback — Stagwatching — Spotlighting — Habitat assessments	All year	☒ Yes	☐ No	**Targeted parallel nest transects** — 14-18 August 2023: 17 person hours (2 ecologists) — 28-31 August 2023: 28 person hours (2 ecologists) **Call-playback** — 14-17 and 28-31 August 2023: 7 x call playback stations — 21 November 2023: 1 x call playback station — 11 January 2024: 1 x call playback station — 19-22 August 2024: 3 x call playback stations sampled over 4 consecutive nights — 27-28 August 2024: 3 x call playback stations sampled over 2 consecutive nights **Stag-watching** — 14-17 and 28-31 August 2023: 21 hollow-bearing trees (2 ecologists) — 28-31 August 2023: 10 hollow-bearing trees (2 ecologists) **Spotlighting** — 14-17 and 28-31 August 2023: 11.6 person hours (2 ecologists) — 21 November 2023: 2 person hours (2 ecologists) — 8-11 January 2024: 12 person hours (2 ecologists) — 21-24 January 2024: 17 person hours (2 ecologists) — 19-22 August 2024: 10 person hours (2 ecologists) — 27-28 August 2024: 5 person hours (2 ecologists) **Habitat assessments** — 27-28 August 2024: 5 x habitat assessments	No	No

Common name	Scientific name	Threatened fauna species surveys					Present	Further assessment required (BAM subsections 5.2.5 and 5.2.6)
		Survey method (e.g., harp trap, Elliott trap, bioacoustics, etc.)	Specified survey timing in TBDC	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. Ecologists)		
Mammals								
Rufous Bettong	*Aepyprymnus rufescens*	— Spotlighting — Habitat assessment — Camera trapping	All year	☒ Yes August, November, January, September, October	☐ No	**Spotlighting** — 14-17 and 28-31 August 2023: 11.6 person hours (2 ecologists) — 21 November 2023: 2 person hours (2 ecologists) — 8-11 January 2024: 12 person hours (2 ecologists) — 21-24 January 2024: 17 person hours (2 ecologists) — 19-22 August 2024: 10 person hours (2 ecologists) — 27- 28 August 2024: 5 person hours (2 ecologists) **Opportunistic survey transects** — 14-18 August 2023: 17 person hours (2 ecologists) — 28-31 August 2023: 28 person hours (2 ecologists) — 4-6 September 2023: 38 person hours (2 ecologists) — 9-13 October 2023: 32 person hours (2 ecologists) — 24-27 October 2023: 24 person hrs (2 ecologists) **Habitat assessments** — 27-28 August 2024: 5 x habitat assessments	No	No
Eastern Pygmy-possum	*Carcartetus nanus*	— Spotlighting — Camera trapping — Habitat assessment	October – March	☒ Yes October, November, January	☐ No	**Camera trapping** — 9-24 October 2023: 288 remote camera nights — 24 October to 6 December 2023: 786 remote camera nights **Spotlighting** — 21 November 2023: 2 person hours (2 ecologists) — 8-11 January 2024: 12 person hours (2 ecologists) — 21-24 January 2024: 17 person hours (2 ecologists) **Habitat Assessments** — 27-28 August 2024: 5 x habitat assessments	No	No
Large-eared Pied Bat	*Chalinolobus dwyeri*	— Anabat recorders (recommended method) — Harp trapping (recommended method) — Habitat assessment	November – January	☒ Yes January	☐ No	**Ultrasonic recording device** — 21-24 January 2024: 6 Anabats x 4 nights (24 recorder nights) — 25-28 January 2024: 2 Anabats x 4 nights (8 recorder nights) **Harp trap** — 21-22 November 2023: 1 harp trap x 2 nights (2 trap nights) — 8-11 January 2024: 2 harp traps x 4 nights (8 trap nights) — 21-24 January 2024: 2 harp traps x 4 nights (8 trap nights) — 19-20 November 2024: 1 harp trap x 2 nights (2 trap nights) **Habitat Assessments** — 27-28 August 2024: 5 x habitat assessments	No Note: Excluded by habitat constraint (refer to Table 5.5).	No

Common name	Scientific name	Threatened fauna species surveys					Present	Further assessment required (BAM subsections 5.2.5 and 5.2.6)
		Survey method (e.g., harp trap, Elliott trap, bioacoustics, etc.)	Specified survey timing in TBDC	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. Ecologists)		
Squirrel Glider	*Petaurus norfolcensis*	– Spotlighting – Call-playback – Camera trapping	All year	☒ Yes August, November, January	☐ No	**Camera trapping** — 9-24 October 2023: 288 remote camera nights — 24 October to 6 December 2023: 786 remote camera nights **Parallel hollow transects** — 14-18 August 2023: 17 person hours (2 ecologists) — 28-31 August 2023: 28 person hours (2 ecologists) **Stag-watching** — 14-17 and 28-31 August 2023: 21 hollow-bearing trees (2 ecologists) — 28-31 August 2023: 10 hollow-bearing trees (2 ecologists) **Call-playback** — 14-17 and 28-31 August 2023: 7 call playback stations — 21 November 2023: x 1: 1 call playback station — 21-23 January 2024: 16 call playback stations — 19-22 August 2024: 3 call playback stations (4 consecutive nights) — 27-28 August 2024: 3 call playback stations (2 consecutive nights) **Spotlighting** — 14-17 and 28-31 August 2023: 11.6 person hours (2 ecologists) — 21 November 2023: 2 person hours (2 ecologists) — 8-11 January 2024: 12 person hours (2 ecologists) — 21-24 January 2024: 17 person hours (2 ecologists) — 19-22 August 2024: 10 person hours (2 ecologists) — 27- 28 August 2024: 5 person hours (2 ecologists) **Habitat Assessments** — 27-28 August 2024: 5 x habitat assessments	Assumed present	Yes
Brush-tailed Rock-wallaby	*Petrogale penicillata*	– Spotlighting – Habitat assessment	All year	☒ Yes August, November, January	☐ No	**Spotlighting** — 14-17 and 28-31 August 2023: 11.6 person hours (2 ecologists) — 21 November 2023: 2 person hours (2 ecologists) — 8-11 January 2024: 12 person hours (2 ecologists) — 21-24 January 2024: 17 person hours (2 ecologists) — 19-22 August 2024: 10 person hours (2 ecologists) — 27-28 August 2024: 5 person hours (2 ecologists) **Opportunistic survey transects** — 14-18 August 2023: 17 person hours (2 ecologists) — 28-31 August 2023: 28 person hours (2 ecologists) — 4-6 September 2023: 38 person hours (2 ecologists) — 9-13 October 2023: 32 person hours (2 ecologists) — 24-27 October 2023: 24 person hrs (2 ecologists) **Habitat Assessments** — 27-28 August 2024: 5 x habitat assessments	No Note: Excluded by habitat constraint (refer to Table 5.5).	No

Common name	Scientific name	Threatened fauna species surveys				Present	Further assessment required (BAM subsections 5.2.5 and 5.2.6)
		Survey method (e.g., harp trap, Elliott trap, bioacoustics, etc.)	Specified survey timing in TBDC	Timing of survey – within recommended period? (BAM-C / TBDC)		Effort (hours & no. Ecologists)	
Koala	*Phascolarctos cinereus*	– Spotlighting – Call-playback – Koala SAT's – Habitat assessment	All year	☒ Yes August, November, January, October	☐ No	**Spotlighting** — 14-17 and 28-31 August 2023: 11.6 person hours (2 ecologists) — 21 November 2023: 2 person hours (2 ecologists) — 8-11 January 2024: 12 person hours (2 ecologists) — 21-24 January 2024: 17 person hours (2 ecologists) — 19-22 August 2024: 10 person hours (2 ecologists) — 27- 28 August 2024: 5 person hours (2 ecologists) **Call-playback** — 14-17 and 28-31 August 2023: 7 call playback stations — 21 November 2023: x 1: 1 call playback station — 21-23 January 2024: 16 call playback stations — 19-22 August 2024: 3 call playback stations (4 consecutive nights) — 27-28 August 2024: 3 call playback stations (2 consecutive nights) **Koala SAT** — 31 August 2023: 1 x Koala SAT (2 ecologists) — 7 September 2023: 9 x Koala SAT's (2 ecologists) — 12 October 2023: 2 x Koala SAT's (2 ecologists) — 19-22 August 2024: 12 x Koala SAT's (2 ecologists) — 28 August 2024: 1 x Koala SAT (2 ecologists) **Habitat Assessments** — 27-28 August 2024: 5 x habitat assessments	No	Yes
Grey-headed Flying-fox	*Pteropus poliocephalus*	– Spotlighting — Diurnal roost searches — Habitat assessment	October – December	☒ Yes October, November	☐ No	**Spotlighting** — 21 November 2023: 2 person hours (2 ecologists) **Diurnal camp searches** — 9-13 October 2023: 32 person hours (2 ecologists) — 24-27 October 2023: 24 person hrs (2 ecologists) **Habitat Assessments** — 27-28 August 2024: 5 x habitat assessments	No	No
Eastern Cave Bat	*Vespadelus troughtoni*	— Anabat recorders — Harp trapping — Habitat assessment	November – January	☒ Yes January	☐ No	**Ultrasonic recording device** — 21-24 January 2024: 6 Anabats x 4 nights (24 recorder nights) — 25-28 January 2024: 2 Anabats x 4 nights (8 recorder nights) **Harp trap** — 21-22 November 2023: 1 harp trap x 2 nights (2 trap nights) — 8-11 January 2024: 2 harp traps x 4 nights (8 trap nights) — 21-24 January 2024: 2 harp traps x 4 nights (8 trap nights) — 19-20 November 2024: 1 harp trap x 2 nights (2 trap nights) **Habitat Assessments** — 27-28 August 2024: 5 x habitat assessments	No Note: Excluded by habitat constraint (refer to Table 5.5).	No

5.4 Expert reports

Not applicable. Targeted surveys have been completed for all candidate species credit species or where surveys do not meet adequacy, or the species credit species is known to occur they have been assumed present. As such, no expert reports are required.

5.5 More appropriate local data (where relevant)

As outlined in BAM section 1.4.2(1), in some instances, the assessor may use more appropriate local data, rather than the information and datasets specified in subsection 1.4.1, to prepare a BDAR. The assessor must give the decision maker the reasons these data better reflect local environmental conditions.

All PCT / vegetation zones conditions have been measured against their default benchmarks (refer to Section 4.5.3). No local data has been used in this assessment.

5.6 Area or count, and location of suitable habitat for a species credit species (a species polygon)

For species credit species either assumed to be present, or determined to be present, or likely to use suitable habitat on the subject land, species polygons were determined with reference to the various species survey guidelines published by the department (and the TBDC), including:

- Threatened reptiles: Biodiversity Assessment Method survey guide (Department of Planning and Environment, 2022b)
- Koala (Phascolarctos cinereus): Biodiversity Assessment Method Survey Guide (Department of Planning and Environment, 2022a)
- Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method (Department of Planning Industry and Environment, 2020c).

The species polygons for each species credit species are provided in Figure 15.15, Figure 15.16, Figure 15.17, Figure 15.18, and Figure 15.19. These figures detail the extent (area) of suitable habitat for the target species within the subject land. The species polygons were based on the following:

- For flora species assessed by a count of individuals, the estimated number of individuals present and their location (or the location of a group of individuals) on the subject land is provided. A 30 m buffer was applied to each point. These species polygons were derived through field survey.
- For flora species assessed by area of suitable habitat (such as *Pomaderris queenslandica*), the area was determined in accordance with the Surveying threatened plants BAM guidelines (as referred to above). The clump of individuals of *Pomaderris queenslandica* covers an area of 0.0314 ha, equivalent to a 10 m radius circle. A 30 m buffer was applied to the clump to capture the extent of suitable habitat and the resulting species polygon. A detailed explanation of the species polygon, including considerations of the landuse history, recent rainfall events and previous surveys is provided as part of the candidate species profile provided in Section 5.2.2.
- For species assumed to be present, a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC are provided in Section 5.1. Species were assumed to be present in areas that were unable to be surveyed and where associated PCTs (as outlined in the TBDC) were present. The entirety of a vegetation zone was used for the species polygon for assumed presence species.

Table 5.10 provides a summary of the species polygons for each recorded or assumed present species credit species.

Table 5.10 Results for present species (recorded within the subject land)

Common name	Scientific name	Biodiversity risk weighting (BAM-C & TBDC)	SAII entity (BAM-C & TBDC)	Habitat constraints / microhabitats present on the subject land / vegetation zone	Abundance – No. individual plants present on subject land (flora with unit of measure of count)	Extent (ha) of habitat present on site (flora or fauna with unit of measure of area)	TBDC species specific recommendations e.g., buffers, general comments (where relevant)	Habitat condition (vegetation integrity score for each vegetation zone in the polygon – area species only)
Tylophora linearis	*Tylophora linearis*	High (2)	No	None listed in the BAM-C.	30 aerial stems	1.29 ha	No relevant species-specific recommendations for species polygons are provided in the TBDC.	VZ2 (PCT 531) current VI = 62.7 VZ4 (PCT 592) current VI = 78.1
Scant Pomaderris	*Pomaderris queenslandica*	High (2)	No	None listed in the BAM-C.	Not applicable. The clump of individuals covers an area of 0.0314 ha, equivalent to a 10 m radius circle.	0.5 ha		VZ4 (PCT 592) current VI = 78.1
Koala	*Phascolarctos cinereus*	High (2)	No	Presence of Koala use trees as detailed in the Koala (Phascolarctos cinereus): Biodiversity Assessment Method Survey Guide. Koala use trees recorded in the subject land include *Eucalyptus crebra, E. dwyeri, E. albens* and *E. melanophloia.*	Not applicable	84.48 ha		VZ1 (PCT 462) current VI = 64.3 VZ2 (PCT 531) current VI = 62.7 VZ3 (PCT 588) current VI = 63.1 VZ4 (PCT 592) current VI = 78.1 VZ5 (PCT 594) current VIS = 59.3
Squirrel Glider	*Petaurus norfolcensis*	High (2)	No	None listed in BAM-C.	Not applicable	84.48 ha		
Pale-headed Snake	*Hoplocephalus bitorquatus*	High (2)	No	None listed in BAM-C.	Not applicable	84.48 ha		

Table 5.11 Results for EPBC Act listed species present (recorded within the subject land)

Common name	Scientific name	Abundance – No. individual plants present on subject land (flora with unit of measure as count)	Extent (ha) of habitat present on site (flora or fauna with unit of measure as area)
Tylophora linearis	*Tylophora linearis*	30 aerial stems	1.29 ha
Koala	*Phascolarctos cinereus*	Not applicable	84.48 ha

5.7 Listed aquatic threatened species, populations or ecological communities

The subject land does not contain any mapped habitat for any aquatic threatened species and endangered populations scheduled under the *Fisheries Management Act 1994* (FM Act). Further, there are no FM Act listed ecological communities present in the subject land.

6 Identifying prescribed impacts

Prescribed impacts are those that may affect biodiversity values in addition to, or instead of, impacts from clearing vegetation. These impacts may be difficult to quantify or offset as they often affect biodiversity values that are irreplaceable. Prescribed additional biodiversity impacts (prescribed impacts) comprise impacts:

- on the habitat of threatened entities including:
  - karst, caves, crevices, cliffs, rocks and other geological features of significance, or
  - human-made structures, or
  - non-native vegetation
- on areas connecting threatened species habitat, such as movement corridors
- that affect water quality, water bodies and hydrological processes that sustain threatened entities
- on threatened and protected animals from turbine strikes from a wind farm
- on threatened species or fauna that are part of a TEC from vehicle strikes.

Table 6.1 identifies the prescribed impacts associated with MOD 10 and the threatened species which have the potential to use these features within the subject land. Refer to Section 10.1.3 for the assessment of the impacts on prescribed biodiversity.

Table 6.1 Prescribed impacts identified

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature. Where relevant, threatened species or fauna that are part of a TEC or EC, that are at risk of vehicle strike
Karst, caves, crevices, cliffs, rocks or other geological features of significance	☒Yes / ☐No	Rocky areas potentially used by Pink-tailed Legless Lizard and Border Thick-tailed Gecko. These features are a key part of the breeding habitat for these species. No other geological significant features have been identified within or immediately adjacent the subject land that relate to biodiversity. Extensive field surveys, involving full site walkovers, between 2019 and 2024 have confirmed that there are no karst, caves, crevices, cliffs or other areas of geological significance within the subject land. Survey methodologies and effort for habitat constraints are detailed in Section 2.4.3. Previous survey undertaken throughout Leard State Forest are outlined in Section 1.5.3.	Pink-tailed Legless Lizard (*Aprasia parapulchella*) and Border Thick-tailed Gecko (*Uvidicolus sphyrurus*) – known to have a strong association with landscapes that are characterised by outcroppings of lightly-embedded surface rocks (Office of Environment & Heritage, 2024, Threatened Species Scientific Committee, 2015b, Commonwealth Department of Climate Change Energy the Environment and Water, 2024a).
Human-made structures	☐Yes / ☒No	The subject land contains 84.48 ha of native vegetation and 1.84 ha of disturbed areas, including access tracks and borehole exploration pads. No human-made structures occur within the subject land.	Not applicable

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature. Where relevant, threatened species or fauna that are part of a TEC or EC, that are at risk of vehicle strike
Non-native vegetation	☒Yes / ☐No	The subject land contains 84.48 ha of native vegetation and 1.84 ha of disturbed areas, including access tracks and borehole exploration pads. Non-native vegetation did not occur within the subject land.	Not applicable
Habitat connectivity	☒Yes / ☐No	The subject land is located in the centre of the Leard State Forest and immediately north of the existing Mine Disturbance Boundary. A 500 m wide Vegetation Corridor is located adjacent to the subject land to the north between the BCM and MCCM (refer to Section 1.1.3). The existing project approval boundary allows for a Vegetation Corridor ranging from 500 m to approximately 1,000 m running southwest to east between BCM and MCCM. The proposed MOD 10 will reduce this connection to a set width of 500 m along the 3.5 km corridor. MOD 10 will reduce vegetation connectivity between areas of Leard State Forest to the east and south-west. However, it is considered that the 500 m wide Vegetation Corridor will allow for the persistence of both the structural and functional connectivity across the Leard State Forest and adjacent biodiversity offset properties. The locations of vegetation corridors are displayed in Figure 15.1.	All flora and fauna species are likely to benefit from structural and functional connectivity maintained across the landscape. In regard to the assessed threatened species, maintaining vegetation connectivity will benefit specific species or groups of species as follows: — The terrestrial movement of species such as Spotted-tailed Quoll, Koala and Pale-headed Snake. — Maintaining the connection of foraging habitats for airborne species, such as birds and insectivorous bats, facilitating the movement of these species across the landscape. — Maintaining of arboreal connectivity to allow for the movement of Squirrel Glider. — The terrestrial movement of less mobile species such as Pink-tailed Legless Lizard and Border Thick-tailed Gecko for the maintenance of ecological processes and functional connectivity.

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature. Where relevant, threatened species or fauna that are part of a TEC or EC, that are at risk of vehicle strike
Waterbodies, water quality and hydrological processes	☒Yes / ☐No	A series of ephemeral unnamed first and second order streams that form tributaries of Nagero Creek occur in the subject land. Most of these streams are dry drainage lines at the head of the Nagero Creek catchment and may flow during heavy rainfall events only. All these streams flow directly through the subject land (Section 3.2.2).	Amphibians and terrestrial animals identified in Section 5.1. However, impacts associated with MOD 10 will result in the removal of these streams and such, similar to direct impacts on a threatened entities habitat as a result of land clearing. Vegetation in the subject site was assessed as having a low potential to be a terrestrial GDE and therefore unlikely to be groundwater dependent (Section 4.6). The cumulative impact of groundwater drawdown associated with current approved BTM complex operations and the proposed MOD 10 may have an impact on terrestrial GDEs in the locality. A Terrestrial Groundwater Dependent Ecosystem Assessment (WSP, 2025) is appended to the MOD 10 Modification Report.
Wind turbine strikes (wind farm development only)	☐Yes / ☒No	Not applicable	Not applicable
Vehicle strikes	☒Yes / ☐No	The subject land is positioned towards the centre of the Leard State Forest and immediately north of the existing project's Mine Disturbance Boundary (Figure 15.3) and south of a 500 m wide Vegetation Corridor between the BCM and MCCM. The impacts of vehicle strikes may increase when access roads and haul roads are positioned closer to the areas of retained native vegetation, such as the Vegetation Corridor. The development layout is displayed in Figure 15.3. Vehicle strikes may increase during construction works due to an increase in vehicle movements on new roads formed adjacent to extant forest.	All threatened fauna species have the potential to be impacted by vehicle strike. Species at risk of vehicle strike include (but not limited to): Squirrel Glider, Barking Owl, Masked Owl, Little Eagle, Spotted-tailed Quoll and Koala. Based on observations of roadkill made in the locality and database records: — Mammals including Eastern Grey Kangaroo, Red-necked Wallaby, Swamp Wallaby, Short-beaked Echidna, Common Brushtail Possum, Sugar Glider, Squirrel Glider. — Reptiles including Common Bearded Dragon, Jacky Lizard, Nobbi Dragon, Blue-bellied Black Snake, Eastern Brown Snake, Eastern Bluetongue, Lace Monitor, Snake-necked Turtle.

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature. Where relevant, threatened species or fauna that are part of a TEC or EC, that are at risk of vehicle strike
		Post construction, an unformed track will traverse the northern section of the subject land for maintenance and monitoring works for the Vegetation Corridor. The road will be used intermittently by light vehicles with minimal impacts on vehicle strikes to fauna. MOD 10 is likely to generate additional vehicular movements along access roads during construction. The extent of vehicular movement may also increase as a result of the operational phases of the proposal.	

Stage 2: Impact assessment (biodiversity values and prescribed impacts)

7 Avoid and minimise impacts

7.1 Avoid and minimise direct and indirect impacts

The following provides information on avoiding and minimising impacts on biodiversity values through the planning and design phase of MOD 10. This information is provided to directly address section 7 of the BAM.

7.1.1 Project location

In accordance with section 7.1.1. of the BAM, efforts to avoid and minimise direct impact on native vegetation and habitat through location of MOD 10 are addressed in Table 7.1.

Table 7.1 Location of MOD 10 to avoid and minimise impacts on native vegetation and habitat

Principles	MOD 10 consistency
Locating the proposal to avoid or minimise direct and indirect impacts on native vegetation, threatened species, threatened ecological communities and their habitat (section 7.1.1 of the BAM)	
a *Locating the Project in areas where there are no biodiversity value*	Areas of biodiversity value could not be entirely avoided; however, the subject land has been located to avoid impact to threatened biodiversity as far as practicable. MOD 10 will have no impact to TECs or Serious and Irreversible Impact (SAII) species.
b *Locating the Project in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e., areas that have a lower vegetation integrity score)*	The subject land has been located to impact the minimal amount of native vegetation and threatened species. Whilst impacts on the threatened species *Tylophora linearis* and *Pomaderris queenslandica* will occur, the location of MOD 10 will avoid the main population of *T. linearis* and some previous records of *P. queenslandica* (refer to Figure 15.15 and Figure 15.16 respectively). Previous records of *P. queenslandica* by Parsons Brinckerhoff in 2010, including two locations within the Vegetation Corridor to the north-west of the subject land will not be directly impacted by MOD 10 (Parsons Brinckerhoff, 2010a). No TECs were recorded in the subject land. Extensive field surveys, involving full site walkovers, targeted transects and nocturnal surveys were completed between 2019 and 2024 (Table 5.9). A total of 46 hollow-bearing trees with hollows greater than 17cm diameter were recorded in the subject land. No evidence of nesting or roosting by threatened fauna species was recorded despite 57 person hours of spotlighting survey and stag watch surveys of 31 hollow-bearing trees. Ninety-seven person hours of nest transects resulted in the recording of one stick nest, confirmed to be used by a Wedge-tailed Eagle.

Principles		MOD 10 consistency
c	*Locating the proposal in areas that avoid habitat for species with a high biodiversity risk weighting or land mapped on the important habitat map, or native vegetation that is a TEC or a highly cleared PCT*	The subject land has been located to minimise impact to threatened species with a high biodiversity risk rating. As a result, no TEC or SAII species will be impacted as part of the proposed MOD 10. The subject land does not occur on land that is mapped as important habitat.
d	*Locating the proposal outside of the buffer area around breeding habitat features such as nest trees or caves.*	MOD 10 is likely to result in loss of hollow-bearing trees, large trees (e.g., diameter >50cm) and fallen timber, which provide breeding habitat for terrestrial mammals, arboreal mammals, reptiles, hollow-nesting and canopy nesting birds. The subject land has been located to avoid impact to breeding habitat features as far as practicable. No nests or hollows utilised by threatened species were identified in the subject land. Habitat features such as fallen timber and bush rock will be relocated to the Vegetation Corridor adjoining the subject land and areas subject to rehabilitation and restoration in accordance with RMP (James Bailey & Associates, 2024) and BMP (WSP, 2018b). No karst, caves, crevices, or cliffs, which may provide potential breeding habitat for threatened insectivorous bats were recorded in the subject land. Survey methodologies for the assessment of habitat constraints is provided in Section 2.4.3.

7.1.2 Project design

In accordance with section 7.1.2 of the BAM, efforts to avoid and minimise direct impact on native vegetation and habitat during the design process of MOD 10 are addressed in Table 7.2.

Table 7.2 Efforts to avoid and minimise impacts on native vegetation during MOD 10 design

Principles		Modification consistency
Designing a proposal to avoid and minimise impact on native vegetation, threatened species, threatened ecological communities and their habitat (section 7.1.2.1 of the BAM)		
a	*Reducing the proposal's clearing footprint by minimising the number and type of facilities*	The nature of an open-cut coal mining operation limits the scope for minimising the number and type of facilities. However, the clearing footprint and layout of temporary construction sites and permanent sites will be determined during routine mine operation planning, with all direct impacts contained within the subject land (Figure 15.1, Figure 15.2, and Figure 15.3). The subject land was selected to avoid direct impact to the Vegetation Corridor. MOD 10 has been designed to avoid direct impacts to vegetation commensurate with TECs, SAII species and the Vegetation Corridor. No TECs or SAII entities occurred within the subject land.
b	*Locating ancillary facilities in areas where there are no biodiversity values*	
c	*Locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e., areas that have a lower vegetation integrity score)*	

Principles	Modification consistency
d *Locating ancillary facilities in areas that avoid habitat for species and vegetation in high threat status categories (e.g., an EEC or CEEC or is an entity at risk of a serious and irreversible impact (SAII)*	
e *Actions and activities that provide for rehabilitation, ecological restoration and/or ongoing maintenance of retained areas of native vegetation, threatened species, threatened ecological communities and their habitat on the development footprint.*	Mitigation measures developed to address the direct, indirect and prescribed impacts of MOD 10 are outlined in Section 8. Ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation/ habitat on or adjacent to the subject land will continue to be conducted in accordance with BCMs RMP (James Bailey & Associates, 2024), BMP (WSP, 2018b) and Biodiversity Corridor Plan (WSP, 2022). Further to the above, it is considered that mitigation measures implemented during vegetation clearing work in accordance with *Appendix B – Clearing and fauna management procedure* as detailed in BCMs approved BMP (2018), are important for the ongoing maintenance of retained areas, such as the Vegetation Corridor. These include: — tree clearing and habitat removal will be undertaken using a two-staged process — timing works to avoid critical life cycle events such as breeding or nursing — relocation of habitat features (fallen timber, hollow logs) from the subject land into areas identified for retention.

7.2 Avoid and minimise prescribed impacts

This section addresses prescribed biodiversity impacts that may be difficult to quantify, replace or offset, making avoiding and minimising impacts critical in accordance with section 7.2 of the BAM.

7.2.1 Project location

In accordance with section 7.2.1 of the BAM, efforts to avoid and minimise direct impact on prescribed biodiversity through location of MOD 10 are addressed in Table 7.3 below.

Table 7.3 Efforts to avoid and minimise impacts on prescribed biodiversity during MOD 10 planning

Prescribed biodiversity impacts	Proposed modification planning
Locate the proposal to avoid or minimise prescribed biodiversity impacts (section 7.2.1.1 of the BAM)	
a *Locating surface works to avoid direct impacts on the habitat features identified in Chapter 6*	The nature of an existing open-cut coal mining operation restricts the scope for minimising direct impact on all habitat features. Whilst significant geological features are not associated with the subject land, rocky habitats of lightly to deeply imbedded surface rock do occur in discrete areas in the subject land, generally in association with the upper reaches of the Willowtree Range. Notwithstanding this, the Modification Disturbance Footprint for MOD 10 will mostly avoid direct impacts to the ridgeline of the Willowtree Range in association with the protected Vegetation Corridor between MCCM and BCM. Whilst other prescribed impacts were identified in Section 6, the only other prescribed impact is associated with vehicle strikes during construction and operation of mining areas within the subject land. Post construction, an unformed track will traverse the northern section of the subject land for maintenance and monitoring works for the Vegetation Corridor. The road will be used intermittently by light vehicles with minimal impacts expected as a result of vehicle strikes to fauna. Extensive field surveys, involving full site walkovers, targeted transects and nocturnal surveys were completed between 2019 and 2024 (Table 5.9). No karst, caves, crevices, cliffs or other areas of geological significance were observed within the subject land.
b *Locate sub-surface works, in both the horizontal and vertical planes, to avoid and minimise operations beneath the habitat features identified in Section 6. For example, locating longwall panels away from geological features of significance or water dependent plant communities and their supporting aquifers.*	No significant geological features or groundwater dependent ecosystems occur within the subject land.

Prescribed biodiversity impacts		Proposed modification planning
c	*Locate the proposal to avoid severing or interfering with corridors connecting different areas of habitat, migratory flight paths, to important habitat or local movement pathways*	A 500 m wide Vegetation Corridor has been established between BCM and MCCM (Figure 15.1). The Vegetation Corridor was established as part of the conditions of consent for the state approval under the EP&A Act (PA 09_0182) and the Commonwealth approval under the EPBC Act (EPBC 2009/5256). As the conditions of consent require the Vegetation Corridor to be retained and protected, connectivity will be maintained between broader sections of the Leard State Forest from the south-west to east through the Vegetation Corridor. The location of the Vegetation Corridor and potential movement corridors maintained as part of MOD 10 are displayed in Figure 15.1. It is considered that the 500 m wide Vegetation Corridor will allow for the persistence of both the structural and functional connectivity across the Leard State Forest.
d	*Optimising proposal layout to minimise interactions with threatened entities*	The subject land has been located to minimise impact to threatened species with a high biodiversity risk rating. As a result, no TEC or SAII species will be impacted as part of MOD 10.
e	*locate the proposal to avoid impacts on water bodies or hydrological processes.*	A series of ephemeral unnamed first and second order streams which form tributaries of Nagero Creek occur within the subject land. Most of these streams are dry drainage lines at the head of the Nagero Creek catchment and may flow during heavy rainfall events only. Numerous other streams and waterways (of varying order) occur within the broader assessment area. These form part of the Namoi River catchment. The proposal will avoid direct impacts to larger (third or above) streams. Indirect impacts to larger streams located outside of the subject land will be managed through mitigation measures (Section 8.4). Whilst MOD 10 is unlikely to impact upon any hydrological processes and vegetation in the subject site was assessed as having a low potential to be a terrestrial GDE, the cumulative impact of groundwater drawdown associated with current approved BTM complex operations, and MOD 10 may have an impact on terrestrial GDEs in the locality. A Terrestrial Groundwater Dependent Ecosystem Assessment (WSP, 2025) is appended to the MOD 10 Modification Report.
Analysis of alternative technologies, locations and sites (section 7.2.1.2 of BAM)		
a	*an analysis of alternative modes or technologies that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed mode or technology*	Given the existing open-cut coal operations associated with BCM, no alternative modes or technologies have been used to minimise the impacts on prescribed biodiversity. MOD 10 has been sited to avoid direct impacts to vegetation commensurate with TECs or SAII species and to avoid dissection of broader areas of the Leard State Forest to the east and west through the Vegetation Corridor (Sections 1.1.3 and 3.2.3).
b	*an analysis of alternative routes that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed route*	Although bush rock occurs in discrete location in the subject land, such habitat features will be relocated to areas subject to rehabilitation and restoration in accordance with the RMP (James Bailey & Associates, 2024), BMP (WSP, 2018b) and Biodiversity Corridor Plan (WSP, 2022).

Prescribed biodiversity impacts	Proposed modification planning
c *an analysis of alternative locations that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed location*	Whilst MOD 10 will introduce a new unformed road and small increase in risk to fauna by vehicle strikes, mitigation measures outlined in Section 8.4 will be implemented to minimise the risk of vehicle strikes.
d *an analysis of alternative sites within a property on which the proposal is proposed that would avoid or minimise prescribed biodiversity impacts and justification for selecting the proposed site.*	
Identify any other site constraints that have been considered in determining the location and design of the proposal (section 7.2.1.3 of the BAM)	
Bushfire protection requirements, including clearing for asset protection zones	No clearing for bushfire protection is required.
Flood planning levels	No flood planning levels have been discussed in this BDAR.
Servicing constraints	No servicing constraints are likely to be impacted upon by MOD 10.

7.2.2 Project design

In accordance with section 7.2.2 of the BAM, efforts to avoid or minimise impacts on prescribed biodiversity through the design process of the proposed MOD 10 are addressed in Table 7.4. There are no alternatives to MOD 10 which has been designed in a sympathetic manner to avoid direct on the vegetation corridor between the BCM and MCCM. There are no alternative modes or technologies, alternative routes, alternative locations, or alternative sites that would reduce prescribed biodiversity impacts.

Table 7.4 Efforts to avoid and minimise impacts on prescribed biodiversity during MOD 10 planning

Prescribed biodiversity impacts	MOD 10 planning
Design the proposal to avoid or minimise prescribed impacts	
a Engineering solutions, such as proven techniques to: **i** minimise fracturing of bedrock underlying features of geological significance, or groundwater dependent ecosystems	Open cut mine operations require blasting to fracture overburden to expose the mineral for extraction. Although blasting will fracture upper layers of rock, the subject land did not contain features of geological significance or groundwater dependent ecosystems. The only prescribed impact is vehicle strike through the construction of maintenance roads and MOD 10 is unlikely to impact on habitat connectivity.

Prescribed biodiversity impacts	MOD 10 planning
ii Restore connectivity and movement corridors	The Leard State Forest Vegetation Corridor is a 500 m strip of remnant native vegetation that is to be retained and protected that links the eastern section of the Leard State Forest to the western sections of the forest and the Conservation Area beyond. The MOD 10 will not compromise the link between eastern and western sections of the Leard State Forest.
b Design elements that minimise interactions with threatened entities, such as: **i** designing turbines to dissuade perching and minimise the diameter of the rotor sweep area	N/A
ii Designing fencing to prevent animal entry to transport corridors	Haul roads are typically constructed in areas not surrounded by vegetation. Existing fencing occurs around disturbance areas to minimise the risk of animal entry into the active mining areas and thus resulting in minimising the risk of vehicle strike.
iii Providing vegetated buffers rehabilitated with native species	No vegetated buffer is proposed. Ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation/ habitat on or adjacent to the subject land will continue to be conducted in accordance with BCMs RMP (James Bailey & Associates, 2024), BMP (WSP, 2018b) and Biodiversity Corridor Plan (WSP, 2022)
c maintaining environmental processes that are critical to the formation and persistence of habitat features not associated with native vegetation	No karst, caves, crevices, cliffs or other areas of geological significance were observed within the subject land.
d Maintaining hydrological processes that sustain threatened entities	MOD 10 is unlikely to impact upon any hydrological processes as it will remove upstream sections of a series of ephemeral unnamed first and second order streams that are already impacted or approved for disturbance based on existing mine approval and operations.
e Controlling the water quality of water released from the site, to avoid or minimise downstream impacts to threatened entities	No threatened aquatic habitat occurs in the subject land. However, several drainage lines (Strahler first/second Order streams, Figure 15.1) occur within the subject land, which flow intermittently following sustained and substantial local rainfall. MOD 10 is likely to directly impact upon these ephemeral creeklines. MOD 10 is unlikely to impact water quality. Appropriate sediment and erosion controls will be installed to ensure any potential water quality impacts are mitigated (Section 8.4).

7.3 Summary of measures to avoid and minimise impacts

Table 7.5 documents the measures to avoid and minimise direct, indirect, and prescribed impacts.

Table 7.5 Avoidance and minimisation measures for direct, indirect and prescribed impacts

Action	Outcome	Timing	Responsibility
Locating MOD 10 to avoid areas of high biodiversity	Avoidance of the established 500 m wide Vegetation Corridor between BCM and MCCM (Figure 15.1 and Sections 1.1.3 and 3.2.3). Minimising impacts to a population of *Tylophora linearis* through avoidance of the main population of the threatened species located in the Vegetation Corridor (Section 5.2.1 and Figure 15.15). MOD 10 will impact approximately 30 stems of *Tylophora linearis*. The main population of *Tylophora linearis* to be retained in the Vegetation Corridor with an estimated population of > 135 aerial stems. *Tylophora linearis* occurring in the subject land will be managed in accordance with *Appendix J – Tylophora linearis translocation and propagation management plan* as detailed in BCMs approved BMP (WSP, 2018b). Previous records of *Pomaderris queenslandica* by Parsons Brinckerhoff in 2010, including two locations within the Vegetation Corridor to the north-west of the subject land will not be impacted by MOD 10 (Parsons Brinckerhoff, 2010a) (refer to Section 5.2.2 and Figure 15.16).	Design phase	BCOPL
Avoidance of impacts to TECs or SAII species	No TECs or SAII species were recorded in the subject land.	Design phase	BCOPL
Avoidance of breeding habitat features for threatened fauna species.	Extensive field surveys, involving full site walkovers, targeted transects and nocturnal surveys were completed between 2019 and 2024 (Table 5.9). A total of 46 hollow-bearing trees with hollows greater than 17 cm diameter were recorded in the subject land. No evidence of nesting or roosting by threatened fauna species (such as Barking Owl and Squirrel Glider) was recorded despite 57 person hours of spotlighting survey and stag watch surveys of 31 hollow-bearing trees. Ninety-seven person hours of nest transects resulted in the recording of one stick nest, confirmed to be used by a Wedge-tailed Eagle.	Design phase	BCOPL

Action	Outcome	Timing	Responsibility
Avoiding and minimising prescribed impacts.	Avoidance of the established 500 m wide Vegetation Corridor between BCM and MCCM (Figure 15.1, Sections 1.1.3 and 3.2.3). The existing project's conditions of consent require the Vegetation Corridor to be retained and protected, and therefore, connectivity will be maintained between broader sections of Leard State Forest from the south-west to east through the Vegetation Corridor. The location of the Vegetation Corridor and potential movement corridors maintained as part of MOD 10 are displayed in Figure 15.1. Avoidance of karst, caves, crevices, cliffs or areas of geological significance. Extensive field surveys, involving full site walkovers and targeted transects were completed between 2019 and 2024 (refer to Table 5.9). No karst, caves, crevices, cliffs or other areas of geological significance were observed within the subject land. Avoidance of water bodies or impacts to hydrological processes. The proposal will have no impact on any third order or above streams. Sediment and erosion controls will be implemented to minimise impacts to water quality offsite.	Design phase	BCOPL
Locating ancillary facilities to avoid high biodiversity values.	All the proposed impacts are limited to the subject land.	Design phase	BCOPL
Removal of vegetation and habitat minimised through implementation of approved clearing procedures.	Mitigation measures have been developed to address the direct, indirect and prescribed impacts of the proposal, outlined in Section 8. Mitigation measures implemented during vegetation clearing works will be undertaken in accordance with *Appendix B – Clearing and fauna management procedure* as detailed in BCMs approved BMP (WSP, 2018b), include: — staged clearing process — timing works to avoid critical life cycle events such as breeding or nursing — relocation of habitat features (fallen timber, hollow logs, bush rock) from the subject land into areas identified for rehabilitation and restoration	Construction phase	BCOPL
Ecological restoration and rehabilitation.	Ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation/ habitat on or adjacent to the subject land will also continue to be conducted in accordance with BCMs RMP (James Bailey & Associates, 2024) and BMP (WSP, 2018b).	Operational phase	BCOPL

8 Impact assessment

8.1 Direct impacts

8.1.1 Residual direct impacts to plant community types

The overall direct impacts to PCTs and habitat for threatened species after steps taken to avoid and minimise impacts is estimated at 84.48 ha (Table 8.1 and Figure 15.20).

Table 8.1 Summary of residual direct impacts

PCT name	BC Act status	EPBC Act status	SAII entity	Project phase / timing of impact	Extent (ha)
462 – Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion	N/A	N/A	No	Construction	16.35
531 – Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion	N/A	N/A	No	Construction	7.32
588 – White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion	N/A	N/A	No	Construction	3.59
592 – Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion	N/A	N/A	No	Construction	51.51
594 – Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion	N/A	N/A	No	Construction	5.71
				Total impact (ha)	**84.48**

8.1.2 Residual direct impacts to species credit species

A summary of residual impacts to species credit species provided in Table 8.2 and Table 8.3.

Table 8.2 Summary of residual direct impacts to threatened flora within subject land

Threatened species	BC Act status	EPBC Act status	SAII entity	Project phase / timing of impact	Extent (ha)
Tylophora linearis	V	E	No	Construction	1.29
Pomaderris queenslandica	E	-	No	Construction	0.5

Table 8.3 Summary of residual direct impacts to threatened fauna within subject land

Threatened species	BC Act status	EPBC Act status	SAII entity	Project phase / timing of impact	Extent (ha)
Squirrel Glider (*Petaurus norfolcensis*)	V	-	No	Construction	84.48
Pale-headed Snake (*Hoplocephalus bitorquatus*)	V	-	No	Construction	84.48
Koala (*Phascolarctos cinereus*)	E	E	No	Construction	84.48

8.1.3 Change in vegetation integrity score

The change in vegetation integrity for residual direct impacts on native vegetation, threatened species, and their habitats that were identified on the subject land are presented in Table 8.4.

Table 8.4 Impacts to vegetation integrity

Vegetation zone	PCT ID	Management zone	Area (ha)	Before development				After development				Change
				Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	Change in VI score
1	462	Moderate	16.35	75	48	73.6	64.3	0	0	0	0	-64.3
2	531	Moderate	7.32	81.6	31.3	96.2	62.7	0	0	0	0	-62.7
3	588	Moderate	3.59	93.5	42.4	63.5	63.1	0	0	0	0	-63.1
4	592	High	51.51	93.9	51.4	98.8	78.1	0	0	0	0	-78.1
5	594	Moderate	5.71	84.8	39.2	62.7	59.3	0	0	0	0	-59.3

8.2 Indirect impacts

8.2.1 Assessment of indirect impacts

Indirect impacts, as defined in the BAM, are impacts that occur when MOD 10 affects native vegetation and threatened species habitat beyond the development footprint or within retained areas. This includes impacts from activities related to the construction or operational phase of MOD 10.

Indirect impacts associated with MOD 10 include:

- inadvertent impacts on adjacent habitat or vegetation
- reduced viability of adjacent habitat due to edge effects
- reduced viability of adjacent habitat due to noise, dust or light spill
- transport of weeds, pests and pathogens from the site to adjacent vegetation
- trampling of threatened flora species
- increased risk of fire.

Table 8.5 documents the residual indirect impacts (likely to occur on native vegetation, threatened entities and their habitat beyond the subject land). Figure 15.20 illustrates the final impacts likely to occur on the subject land including consideration of indirect impacts.

Table 8.5 Summary of residual indirect impacts

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase	Likelihood and consequences
Inadvertent impacts on adjacent habitat or vegetation	All PCTs Threatened species	All PCTs	Frequent during the length of construction/ operational phases	Long-term	Construction and operation (ongoing progression of mining operations)	**Moderate.** Inadvertent impacts on adjacent vegetation can include a range of indirect impacts including soil disturbance, erosion, sedimentation, enriched runoff and water quality. Construction and operation (i.e. the ongoing progression of mining operations) of MOD 10 has the potential to result in sedimentation and erosion and mobilisation of contaminants within the disturbance area and into adjoining native vegetation and aquatic habitats, through soil disturbance and construction activities. Sediment laden runoff and spills affect water quality.
Reduced viability of adjacent habitat due to edge effects	Native vegetation and habitats along the southern edge of the Vegetation Corridor (Sections 1.1.3 and 3.2.3)	All PCTs	Ongoing. Impacts which are likely to be higher during construction.	Long-term	Construction/ operational (ongoing progression of mining operations)	**Moderate.** The germination and establishment of weeds is most likely to occur in areas affected by vegetation clearing, in areas of exposed soil/fill (such as topsoil stockpiles, soil cuttings, fill batters and scree slopes) and along edge-affected areas of remnant vegetation, particularly vegetation bordering the mining operations. However, the increase in disturbance will not interfere with condition 3 of the EPBC Act approval conditions, and will maintain the protection of native vegetation of a total width of 500 m where the BCM lease boundary is adjacent to the MCCM lease boundary, retaining and protecting this area as a Vegetation Corridor (*See Objective 16 —protecting a vegetated corridor between the Project and the Maules Creek Coal Project of BMP, 2018).* Impacts on adjacent habitats will be managed through mitigation measures as outlined in Table 8.8.

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase	Likelihood and consequences
Reduced viability of adjacent habitat due to noise, dust or light spill	Native vegetation Threatened species	All PCTs	Impacts from noise, dust and light will occur daily throughout both construction and operation.	Long-term	Construction/ operational (ongoing progression of mining operations)	**Moderate.** During construction, the impacts from noise and dust are likely to increase in the short-term during vegetation clearing works. A short-term increase in construction noise will be limited to daylight hours during the approved clearing window from mid-February to the end of April and is unlikely to have long-term adverse effects on the viability of adjacent habitats. Impacts from noise, dust and light spill will also occur over the long-term from standard mining operations, but these impacts will be managed by mitigation measures as outlined in Table 8.8. MOD 10 is likely to increase noise, dust or light spill into areas of the Vegetation Corridor to the north. However, this impact is unlikely to adversely reduce the viability of adjacent habitats. This is supported by the last 19 years of ecological monitoring of the existing open cut mine operation impacts on the biodiversity within Leard State Forest (WSP 2006–2024), which has not observed any substantial changes attributed to the mine operations from the sampling of invertebrates, insectivorous bats, birds and vegetation.
Transport of weeds, pests and pathogens from the site to adjacent vegetation	Native vegetation Threatened flora species	All PCTs	Ongoing. Impacts which are likely to be higher during construction.	Long-term	Construction/ operational (ongoing progression of mining operations)	**Moderate.** MOD 10 has the potential to facilitate the transport of weeds in the Vegetation Corridor to the north of the subject land. The management of weeds, pests and pathogens will be managed through the mitigation measures outlined in Table 8.8 and with protocols in place in accordance with the BCMs BMP (*See Objective 16 —protecting a vegetated corridor between the Project and the Maules Creek Coal Project & Objective 11 — controlling weeds and feral animal species of BMP, 2018*).

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase	Likelihood and consequences
Trampling of threatened flora species	Threatened flora species	All PCTs providing habitat for these species	Infrequent, but ongoing. Impacts potentially higher during construction.	Construction – Short-term Operational – Long-term	Construction / operational (ongoing progression of mining operations)	**Negligible.** Threatened flora species are known to occur in the Vegetation Corridor and may be at risk of trampling along the new transition between the Vegetation Corridor and areas cleared by MOD 10. However, these impacts are likely to be negligible as a result of mitigation and management measures outlined in BCMs BMP (*See Objective 5 – protecting vegetation and soil outside the disturbance areas (minimising disturbance), Objective 13 – controlling access, and Objective 16 – protecting a vegetated corridor between the Project and Maules Creek Coal Project*).
Increased risk of fire	Native vegetation All flora and fauna species	All PCTs	Infrequent. Impacts potentially higher during construction.	Long-term	Construction/ operational (ongoing progression of mining operations)	**Negligible.** Increased risk of fire is unlikely to be exacerbated by MOD 10. Bushfire management protocols are set in place in accordance with the BCMs BMP (*See Objective 15 — bushfire management of BMP, 2018*).

8.2.1.1 Evidence-based justification for prediction of impacts

Reduced viability of adjacent habitat due to edge effects

Edge effects are the result of interaction between two adjacent ecosystems, where an abrupt transition separates the pair and creates an 'edge'(Murcia, 1995). Vegetation clearing associated with MOD 10 will create an edge effect at the transition of the disturbance area and the southern boundary of the Vegetation Corridor. However, the increase in disturbance will not interfere with the project's conditions of consent, and will retain and protect native vegetation of a total width of 500 m where the boundary of the BCM lease is adjacent to the MCCM lease boundary, maintaining this area as a Vegetation Corridor (*See Objective 16 – protecting a vegetated corridor between the Project and the Maules Creek Coal Project* of BMP, 2018).

Reduced viability of adjacent habitat due to noise, dust, or light spill

Impacts from noise and dust are likely to increase during vegetation clearing works associated with MOD 10. These works are limited to daylight hours and as such, are unlikely to have significant impacts in terms of light spill. Long-term effects from noise, dust, and light spill may occur from ongoing progression of mining operations, but these will be managed to limit significant impact.

Many anthropogenic sounds can represent a form of noise pollution for biodiversity and can interfere with communication, habitat use, and reproductive behaviours (Sordello et al., 2020). Multiple studies have shown that some species (birds in particular), decrease in species richness and abundance as noise levels in an area increase (Newport, 2014). Increases in anthropogenic sound can interrupt territorial and mating communications, potentially affecting reproductive behaviour and success, and can also result in hypervigilance in prey species as a result of alarm calls and auditory inter-species cues being obscured (Newport, 2014).

Noise levels associated with MOD 10 are likely to increase in the short-term during vegetation clearing campaigns and may persist long-term at higher levels during standard mining operations.

Nocturnal species are the most likely to be impacted by light pollution, with light spill potentially causing issues with nocturnal vision, changes to the way objects are visually perceived, and changes to circadian rhythm (Newport *et al*., 2014). Changes in light during nocturnal periods may also affect reproductive, foraging, and dispersal behaviours in nocturnal and crepuscular species (Newport, 2014).

Elevated levels of dust may be deposited onto the foliage of vegetation adjacent to MOD 10 during the ongoing progression of mining operations. This may impact photosynthesis and transpiration and has the potential to affect growth and the overall health of the vegetation through abrasion and heat damage. Subsequent changes to the vegetation may have a compounding effect on the composition of plant communities and their use by local fauna (Newport, 2014).

The deposition of dust on foliage is likely to be long-term and ongoing in association with MOD 10 but will be managed as part of BCMs operations.

MOD 10 is likely to increase noise, dust and light spill into areas of the Vegetation Corridor to the north but this impact is unlikely to reduce the viability of adjacent habitats as several mitigation measures will be in place to reduce the impacts associated with MOD 10 (Table 8.8). The ongoing progression of mining operations and associated dust and noise, will be timed daily and seasonally to reduce impacts on biodiversity and managed in accordance with BCMs approved BMP (WSP, 2018b). Additionally, lighting is designed to be in accordance with Australian Standards outlined in the *National Light Pollution Guidelines for Wildlife* (DEE, 2020).

Transportation of weeds, pests, and pathogens from the site to adjacent vegetation

The introduction of weeds, pests and pathogens to an environment has the potential to be a key threatening process for native species, through displacement, predation, competition, and damage to vegetation (DCCEEW, 2024b). Almost all of Australia's native vegetation communities have been, or are at risk of being, invaded by exotic species that could result in changes to environmental conditions such as floristic structure, and species abundance and composition (Centre for Invasive Species Solutions, 2024). Many weed species thrive in disturbed habitats and are often the first species to recolonise in areas of cleared land (Centre for Invasive Species Solutions, 2024), a process that may not be immediately experienced, but which might present in the months after construction.

Vegetation clearing during the ongoing progression of mining operations in association with MOD 10 presents the highest risk of transporting weeds, pests, and pathogens, both to the site from other areas, and from the site to adjacent vegetation. Activities such as earth works, habitat removal in the clearing process, and the presence of machinery, plant, vehicles or people that may be transporting weed seeds, invasive species, or pathogens have the highest potential to contribute to increased levels of risk. Vigilance and strong biosecurity protocols should be exercised during standard mining operations to minimise the likelihood of the spread of pathogens and pest species.

The subject land is currently habitat for a range of pest species, including feral pigs, goats, black rat, and foxes. The proposed action has the potential to disperse these pest species out of the subject land and into adjacent vegetation and may increase the ability of pest species to utilise disturbed habitats that native species cannot. However, it is likely that many of these species are already established in adjacent vegetation and that their dispersal into these areas would not provide a novel risk.

Additionally, BCMs BMP outlines mitigation measures for pest species in *Objective 11 – controlling weeds and feral animal species*, *Objective 16 – protecting a vegetated corridor between the Project and Maules Creek Coal Project* and *Appendix C – Weed and pest management strategy* (WSP, 2018b). Adhering to these protocols would be required during the ongoing progression of mining operations in associated with MOD 10, subsequently reducing the likelihood of significant impacts on adjacent land from established pest species.

Trampling of threatened flora species

Trampling of vegetation can cause reductions in cover, biomass, reproductive performance, and the survival of individual plant species, with the potential to lead to local extinctions in susceptible species (Kelly, 2003). The ability of a plant to resist and/or recover from a trampling event, and how tolerant it is to such disturbances, dictates how vulnerable the species is to the impacts of trampling (Roovers, 2004, Dumitrascu, 2010).

The risk of trampling threatened flora species is considered negligible for species outside the subject land, due to the extensive mitigation and management measures outlined in BCMs approved BMP (*see Objective 5 – protecting vegetation and soil outside the disturbance areas (minimising disturbance), Objective 13 – controlling access, Objective 16 – protecting a vegetated corridor between the Project and Maules Creek Coal Project,* and *Appendix B – Clearing and fauna management procedure*) (WSP, 2018b). These measures provide clear directives regarding vegetation clearing protocols, access to environmentally sensitive areas, and the protections associated with the Vegetation Corridor.

Increased risk of fire

Most Australian plant species are adapted to specific fire regimes. Different components of the fire regime may have adverse impacts on plant persistence, including fire frequency, severity, seasonality, type and spatial extent and patchiness (Gallagher, 2021). High fire frequency is known to threaten the persistence of plant species reliant on specific fire intervals to facilitate regeneration (Fisher, 2009, Russell-Smith, 2002).

Most faunal groups are extremely resilient to fire (highly contrasting fire regimes often having little or no detectable impact on species abundances, at least in the medium term) (Andersen, 2021). The most important effects of fire on fauna are typically indirect through habitat modification (Andersen, 2021). Several hollow-obligate species (Pale-headed Snake, Squirrel Glider, Corben's Long-eared Bat) occur within the subject land that would potentially be indirectly impacted if habitat trees were lost. Fire intensity is not as important a factor as is widely thought; rather, fire frequency is particularly important (Andersen, 2021).

As the proposed actions are unlikely to exacerbate the incidence of fire, negligible indirect impacts are expected to occur as a result of MOD 10. Additionally, several protocols and mitigation measures are in place through BCMs BMP (WSP, 2018b) to prevent and minimise the potential outbreak of fire, including the use of fire breaks, vegetation management, and fuel load reduction.

8.3 Prescribed impacts

An assessment of prescribed biodiversity impacts has been prepared in accordance with section 8.3 of the BAM and is presented in Table 8.6.

Table 8.6 Prescribed impacts within the subject land

Nature	Extent of impact	Duration	Consequence
Karst, caves, crevices, cliffs, rock or other geological features of significance			
Relatively small discrete areas of partially to deeply imbedded surface rock occur in the subject land. No other geological significant features (karst, caves, crevices, cliffs) occurred in the subject land.	All areas of surface rock in the subject land will be removed as part of MOD 10.	Impact to surface rock would be permanent	MOD 10 will result in the removal of all surface rock and as such, is like a direct impact on a threatened entities habitat because of land clearing. Surface rock will be salvaged in accordance with BCM approved BMP and stockpiled for use in rehabilitated and restored habitats or relocated to the adjoining Vegetation Corridor.
Human-made structures			
MOD 10 is positioned in the Leard State Forest and consisted predominately of remnant native vegetation, with small areas of cleared land in association with access tracks and borehole pads. No human-made structures were recorded in the subject land.	No human-made structures will be impacted by MOD 10.	Not applicable.	Not applicable.
Habitat connectivity			
The subject land is positioned in the Leard State Forest immediately north of BCMs existing approved Mine Disturbance Boundary. MOD 10 will add cumulatively to the reduction in size of the area of woodland within the Leard State Forest. In the southern portion of the Leard State Forest, the BCM (and neighboring TCM) effectively isolates habitat in the east and west for less mobile or sedentary species. However, a 500 m wide Vegetation Corridor is located adjacent to the subject land to the north between the BCM and MCCM (Sections 1.1.3 and 3.2.3), which facilitates the free movement of animals and plant pollinating species.	Whilst MOD 10 will add cumulatively to the loss of vegetation and habitat in the Leard State Forest, a 500 m wide native Vegetation Corridor has been maintained between BCM and MCCM (Figure 15.1). The Vegetation Corridor was established as part of the conditions of consent for the State approval under the EP&A Act (PA 09_0182) and the Commonwealth approval under the EPBC Act (EPBC 2009/5256). The Vegetation Corridor runs between the BCM and MCCM open-cut pits, connecting habitats in the south-western portion of the Leard State Forest to those in the east. As the conditions of consent require the Vegetation Corridor to be retained and protected, connectivity will be maintained between broader sections of the Leard State Forest from the south-west to east through the Vegetation Corridor. The location of the Vegetation Corridor and potential movement corridors maintained as part of MOD 10 are illustrated in Figure 15.1.	Although connectivity will be maintained in the Leard State Forest, the reduction in the size of connection points will be reduced over the long-term. However, mine rehabilitation will progressively follow mining operations, which is known to provide habitat and connectivity for semi-mobile and mobile species, including threatened species.	The consequence of the impact would be minor. It is considered that the 500 m wide Vegetation Corridor will allow for the persistence of both the structural and functional connectivity across the Leard State Forest and adjacent BOAs.
Waterbodies, water quality, and hydrological processes			
A series of ephemeral unnamed first and second order streams that form tributaries of Nagero Creek occur in the subject land. Most of these streams are dry drainage lines at the head of the Nagero Creek catchment and may flow during heavy rainfall events only. All these streams flow directly through the subject land (Section 3.2.2).	MOD 10 will impact hydrological processes by removing the upper reaches of these ephemeral streams. Although vegetation in the subject land was assessed as having a low potential to be a terrestrial GDE and therefore unlikely to be groundwater dependent (Section 4.6), the cumulative impact of groundwater drawdown associated with current approved BTM complex operations and the proposed MOD 10 may impact terrestrial GDEs in the locality. A Terrestrial Groundwater Dependent Ecosystem Assessment (WSP, 2025) is appended to the MOD 10 Modification Report.	The impacts to hydrological processes would be for the life of BCM operations. However, mine closure planning will allow for a free-draining rehabilitated landscape post-mining operations.	MOD 10 will result in the removal of sections of these streams and as such, is like a direct impact on a threatened entities habitat because of land clearing. Mine closure planning has allowed for a free draining rehabilitated landscape with rehabilitation progressively following active mining areas. Cumulative groundwater drawdown associated with existing mining operations in the Leard Forest Mining precinct could impact potential terrestrial groundwater dependent ecosystems in the locality. A Terrestrial Groundwater Dependent Ecosystem Assessment (WSP, 2025) is appended to the MOD 10 Modification Report. Based on the MOD 10 Groundwater Impact Assessment (Australasian Groundwater & Environmental Consultants Pty Ltd, 2025), the cumulative drawdown predicted within the Nagero Creek alluvium is less than 1 m to 5 m for current approved mining and MOD 10. The predicted drawdown exceeded 5 m in a small portion of the alluvium directly south-west of the BCM coal handling infrastructure, where a maximum drawdown of approximately 10 m to 20 m was predicted. Drawdown directly attributable to MOD 10 is expected to be a maximum of 1 m to 2 m at the fringe of the alluvium, whilst an incremental difference of 0.5 m is expected closer to Nagero Creek.

Nature	Extent of impact	Duration	Consequence
Wind farm development			
MOD 10 is not a wind farm.	MOD 10 is not a wind farm.	Not applicable.	Not applicable.
Vehicle strikes			
Vehicle strike has the potential to occur in the subject land during ongoing progression of mining operations as a result of increased traffic on unformed roads adjacent to remnant native vegetation and the Vegetation Corridor.	Aside from existing access tracks, forestry trails and mine operations within the Leard State Forest, the potential for vehicle strikes will be introduced to a new area of the forest during ongoing progression of mining operations in association with MOD 10. An increase in vehicle traffic when unformed access roads and haul roads are positioned adjacent to areas of retained native vegetation, such as the Vegetation Corridor, means potential vehicle strike to native fauna is likely to occur. The development layout is displayed in Figure 15.3. Following annual clearing campaigns for BCM resource recovery, an unformed light vehicle access road will traverse the interface of mining operations and native vegetation. This light vehicle road, which forms a hard boundary between natural and highly modified areas, may observe a small increase in risk of animal-vehicle strikes. However, such roads are used intermittently by light vehicles for maintenance, inspections and monitoring works with minimal impacts on vehicle strike to fauna. MOD 10 will introduce a new unformed road and small increase in risk to vehicle strikes.	Impacts associated with vehicle strike are likely to occur for the extent of mine life, including post-mining rehabilitation activities.	The consequence for the predicted level of impact is expected to be minor. Vehicle strike because of the proposed MOD 10 is not likely to have a significant impact on any local fauna population or threatened species. Mitigation measures outlined in Section 8.4 will be implemented to minimise the risk of vehicle strikes. Due to the low likelihood of vehicle strike, lack of threatened species records and mitigation measures that would be undertaken (i.e., detailed design of access routes, implementation of onsite speed limits), the residual impact for these threatened species is minor.

8.3.1 Vehicle strikes

A summary of the likely impacts on threatened species as a results of vehicle strikes is provided Table 8.7.

Table 8.7 Residual prescribed impacts – vehicle strikes

Threatened fauna or protected fauna that are part of a TEC that are at risk of vehicle strike (identified in Section 6)	SAII entity	Likelihood	Estimated vehicle strike rates	Consequences
Threatened species				
Squirrel Glider (*Petaurus norfolcensis*)	No	Low	Threatened terrestrial and sedentary species, and species with broad home ranges have higher potential for vehicle strike when crossing roads and tracks, and vehicle movement may be increased during ongoing progression of mining operations in association with MOD 10. However, due to the lack of records for the vulnerable species in the subject land and minor rate of traffic increase, the overall risk of vehicle strike for these species is low.	Due to the low likelihood of vehicle strike, lack of threatened species records and mitigation measures that would be undertaken (i.e., detailed design of access routes, implementation of on-site speed limits), the residual impact for these threatened species is minor.
Pale-headed Snake (*Hoplocephalus bitorquatus*)	No			
Koala (*Phascolarctos cinereus*)	No			

8.4 Mitigating residual impacts – management measures and implementation

Mitigation and management measures have been developed and would be implemented as part of MOD 10, including undertaking vegetation and habitat removal in accordance with BCMs approved BMP (WSP, 2018b). A summary of proposed mitigation and management measures for residual impacts is provided in Table 8.8.

Table 8.8 Summary of proposed mitigation and management measures for residual impacts (direct, indirect, and prescribed)

Potential impact	Mitigation measure	Method/technique	Timing	Frequency	Responsibility	Likely efficacy (including risk of failure)	MNES (when relevant)
Direct impacts							
Direct impact to native vegetation and habitat, including: — removal of hollow-bearing trees and other habitat features — animal displacement, injury or death.	BM1 – Biodiversity inductions, toolbox talks, targeted training	All relevant project personnel, including relevant sub-contractors are to be trained on biodiversity management protocols and requirements for MOD 10, through inductions, toolbox talks and targeted training, and provided with clearing boundaries and exclusion zones and updates as required. Inductions and training must be completed prior to commencement of work for all relevant personnel.	Pre-construction Construction	Inductions and training are to be completed once prior to commencing work. Toolbox talks will be undertaken daily or as required.	BCOPL	Efficacy: high Risk of failure: low	All MNES impacted by MOD 10
	BM2 – Limit annual vegetation disturbance to the minimum necessary for planned mining operations	Tree clearing and habitat removal will be undertaken in accordance with *Appendix B – Clearing and fauna management procedure* as detailed in BCMs approved BMP (WSP, 2018b), including: — annual clearing campaigns limited to 12 months of forecast mine operations — demarcation of clearing boundaries using continuous high visibility flagging (or similar).	Pre-construction Construction	Prior to the commencement of clearing works.	BCOPL	Efficacy: high Risk of failure: low	All MNES impacted by MOD 10
	BM3 – Timing works to avoid critical life cycle events (e.g., breeding)	Habitat removal will be undertaken in accordance with *Appendix B – Clearing and fauna management procedure* as detailed in BCMs BMP (WSP, 2018b), including: — annual vegetation disturbance to be completed in late summer and autumn to avoid the spring and early summer breeding period and over-winter torpor period.	Construction	Clearing works	BCOPL	Efficacy: high Risk of failure: moderate	All MNES impacted by MOD 10
	BM4 – Pre-clearing survey	Tree clearing and habitat removal will be undertaken in accordance with *Appendix B – Clearing and fauna management procedure* as detailed in BCMs approved BMP (WSP, 2018b), including: — pre-clearing surveys completed prior to clearing at each location by a suitability qualified person. — clearing boundaries clearly delineated prior to pre-clearing surveys. Pre-clearing surveys are to be carried out prior to the commencement of clearing works. During the surveys, the ecologist will: — survey the proposed clearing extent — identify any fauna that will require relocation prior to clearing, including inspection of any built structures and wooden fence posts to be demolished — confirm that biodiversity exclusion zones are demarcated — confirm that hollow-bearing trees within the clearing extents are prominently marked/tagged — confirm that nest boxes are in place (where required) in suitable locations adjacent to areas to be cleared, or suitable locations for installation have been identified.	Pre-construction Construction	Prior to the commencement of clearing works.	BCOPL	Efficacy: high Risk of failure: low	All MNES impacted by MOD 10
	BM5 – Staged clearing process	Tree clearing and habitat removal will be undertaken in accordance with *Appendix B – Clearing and fauna management procedure* as detailed in BCMs approved BMP (WSP, 2018b), including: — Stage 1 clearing will incorporate removal of trees less than 25 cm DBH that are not identified as hollow-bearing, and shrub and ground layers — Stage 2 clearing will occur no sooner than 48 hours following stage 1 clearing and incorporate hollow-bearing trees.	Construction	Clearing works	BCOPL	Efficacy: ranges from low to high depending on target species. Risk of failure: moderate	Brown Treecreeper Spotted-tailed Quoll Corben's Long-eared Bat

Potential impact	Mitigation measure	Method/technique	Timing	Frequency	Responsibility	Likely efficacy (including risk of failure)	MNES (when relevant)
	BM6 – Presence of suitably qualified animal handlers during all clearing events to relocate any displaced fauna to appropriate habitat.	Tree clearing and habitat removal will be undertaken in accordance with *Appendix B – Clearing and fauna management procedure* as detailed in BCMs approved BMP (WSP, 2018b), including: — An ecologist will be present during all clearing operations to inspect the site immediately before clearing and capture/relocate any identified animals. Following clearing, the ecologist will complete post-felling inspections to relocate/treat any injured or remaining animals.	Construction	Clearing works	BCOPL	Efficacy: high Risk of failure: moderate	Brown Treecreeper Spotted-tailed Quoll Corben's Long-eared Bat
	BM7 – Relocation of habitat features (woody debris, hollow logs and bush rock)	Tree clearing and habitat removal will be undertaken in accordance with *Appendix B – Clearing and fauna management procedure* as detailed in BCMs approved BMP (WSP, 2018b), including: — Maximising the salvage of habitat features, such as woody debris, hollow logs and bush rock.	Construction	Clearing works	BCOPL	Efficacy: high Risk of failure: moderate	Brown Treecreeper Spotted-tailed Quoll
	BM8 – Implementation of the nest box management plan	The Nest Box Management Plan will be implemented for the creation of nest boxes or other hollow creation methods to provide alternative roosting and/or nesting habitat for threatened fauna in accordance with BCMs approved BMP (WSP, 2018b) and associated *Appendix B – Clearing and fauna management procedure*. Where necessary, nest boxes would be installed at identified fauna relocation sites where hollow density is lower than clearing areas.	Pre-construction Construction	As required	BCOPL	Efficacy: ranges from low to high depending on target species. Risk of failure: low, subject to the implementation of ongoing management.	Brown Treecreeper Corben's Long-eared Bat
	BM9 – Rehabilitation of post-mined land	Rehabilitation of the subject land will be conducted in accordance with BCMs RMP (James Bailey & Associates, 2024) and BMP (WSP, 2018b).	Post-operation	As per life of mine planning	BCOPL	Efficacy: high Risk of failure: low	All MNES impacted by the Modification
Indirect impacts							
Inadvertent impacts on adjacent habitat or vegetation	BM10 – Appropriate delineation of proposed clearing areas	Tree clearing and habitat removal will be undertaken in accordance with *Appendix B – Clearing and fauna management procedure* as detailed in BCMs approved BMP (WSP, 2018b), including: — demarcation of clearing boundaries using continuous high visibility flagging (or similar).	Pre-construction Construction	Clearing works	BCOPL	Efficacy: high. Risk of failure: low.	All MNES impacted by MOD 10
Reduced viability of adjacent habitat to due to edge effects, such as noise, dust or light spill	BM11 – Minimise indirect impacts from light spill	Where it does not impact mine safety, lighting designs should be in accordance with the National Light Pollution Guidelines for Wildlife (DEE, 2020) and minimise light spill to adjacent habitat.	Construction Operation	Daily	BCOPL	Efficacy: high Risk of failure: moderate	All MNES impacted by MOD 10
	BM12 – Minimise indirect impacts from noise	Noise or daily/seasonal timing of construction and operational activities to reduce impacts of noise will be managed in accordance with BCMs BMP (WSP, 2018b).	Operation	Daily	BCOPL	Efficacy: low Risk of failure: low	All MNES impacted by MOD 10
	BM13 – Minimise indirect impacts from dust	Dust control will be implemented as per BCMs existing mine operation procedures.	Construction Operation	Daily	BCOPL	Efficacy: moderate Risk of failure: high	All MNES impacted by MOD 10
Transport of weeds, pests and pathogens from the site to adjacent vegetation/ habitat	BM14 – Minimise the transport of weeds and pests	Weeds and pest species will be managed and comply with *Appendix C – Weed and Pest Management Strategy* as detailed in BCMs approved BMP (WSP, 2018b).	Pre-construction Construction	As required	BCOPL	Efficacy: moderate Risk of failure: high	All MNES impacted by MOD 10
	BM15 – Biodiversity monitoring	Undertake ongoing management and monitoring of weed invasion in the subject land and adjacent Vegetation Corridor in accordance with BCMs approved BMP (WSP, 2018b) and Biodiversity Corridor Plan (WSP, 2022).	Operation	As specified in approved management plans	BCOPL	Efficacy: high Risk of failure: low	All MNES impacted by MOD 10

Potential impact	Mitigation measure	Method/technique	Timing	Frequency	Responsibility	Likely efficacy (including risk of failure)	MNES (when relevant)
Prescribed impacts							
Disturbance and removal of bush rock	BM16 – Habitat salvage	Tree clearing and habitat removal will be undertaken in accordance with *Appendix B – Clearing and fauna management procedure* as detailed in BCMs approved BMP (WSP, 2018b), including: — daily pre-clearing survey — maximising the salvage of habitat features, such as woody debris, hollow logs and bush rock for use in rehabilitation and restoration areas	Pre-construction	Ongoing during pre-construction. Monitored at each stage of clearing when completed, or as often as needed.	Boggabri Coal Mine Environmental Officer / Project ecologist	Efficacy: High. Risk of failure: Low	All MNES impacted by MOD 10
Changes to hydrology	BM17 – Erosion and sediment control	Sediment and erosion control is to be implemented in accordance with BCMs approved Surface Water Management Plan (SWMP) (Boggabri Coal Operations Pty Limited, 2024).	Construction Operation	As required	BCOPL	Efficacy: moderate Risk of failure: high (if not sufficiently maintained)	All MNES impacted by MOD 10
	BM18 – Biodiversity monitoring	The existing vegetation monitoring program described in section 5 of the approved SWMP (Boggabri Coal Operations Pty Limited, 2024) will be used to identify changes to stream and riparian conditions of Nagero Creek and the Namoi River. The existing vegetation monitoring program described in section 4.1.8 of the Groundwater Management Plan (Boggabri Coal Operations Pty Ltd, 2017) will be used to monitor whether the drawdown expected from mining operations will result in adverse impacts to potential terrestrial GDEs associated with Nagero Creek (i.e., Poplar Box Woodland on Alluvial Plains ecological community).	Operation	Annual	BCOPL	Efficacy: high Risk of failure: low	All MNES impacted by MOD 10
Vehicle strike	BM19 – Traffic calming	Implement appropriate speed limits for unformed access roads located adjacent to remnant habitat in accordance with onsite management measures implemented within the mining lease.	Construction Operation	Daily	BCOPL	Efficacy: moderate Risk of failure: moderate	All MNES impacted by MOD 10

8.5 Adaptive management strategy for uncertain impacts

8.5.1 Monitoring programs

Mitigation measures are proposed for direct, indirect, and prescribed impacts associated with MOD 10, as detailed in Table 8.8. BCM currently implements four biodiversity monitoring programs to monitor the potential impacts of mining operations on the Leard State Forest and adjacent Nagero Creek and Namoi River floodplain. It is proposed that the continuation of these monitoring programs will allow for detection of potential mine precinct impacts through the biological variables sampled. The monitoring programs include:

1. Leard State Forest biodiversity monitoring program (section 7.1.1 of BCMs BMP (WSP, 2018b))
2. Vegetation Corridor monitoring (section 7.1.2 of BCMs BMP (WSP, 2018b))
3. Stream and riparian vegetation monitoring (Boggabri Coal Operations Pty Limited, 2024) (WSP, 2018b)
4. Terrestrial groundwater dependent ecosystem monitoring (Boggabri Coal Operations Pty Ltd, 2017).

8.5.1.1 Leard State Forest biodiversity monitoring program

Monitoring of the operational impacts of BCM on the Leard State Forest has been undertaken annually since 2006. This monitoring program is completed in spring and comprises survey of vegetation, diurnal birds, insectivorous bats and invertebrates, including:

- two 100 m transects of vegetation cover and abundance
- two 20-minute area bird searches within 80 m (approximately 2 ha) of fixed monitoring sites on non-consecutive days
- ultrasonic bat recordings to record insectivorous bat species and activity on two non-consecutive nights
- two 100 m transects with small pitfall traps at 10 m intervals to sample invertebrates.

This monitoring program also comprises two control locations within BCMs Central Offset Area and Namoi Offset Area.

8.5.1.2 Vegetation Corridor monitoring

Monitoring of the Vegetation Corridor has been undertaken annually since 2013 to monitor operational impacts of the BCM on the corridor. General monitoring comprising vegetation and vertebrate methodologies is undertaken in spring in conjunction with other BCM related biodiversity monitoring programs, including threatened species monitoring for Corben's Long-eared Bat, Swift Parrot and Regent Honeyeater. Survey methodologies include:

- one BioBanking plot
- two 20-minute area bird searches within 80 m (approximately 2 ha) of fixed monitoring sites on separate days
- two nights of passive ultrasonic bat recordings to record insectivorous bat species and activity
- two consecutive nights of passive infra-red/ motion sensor camera detection (targeting terrestrial mammals and pest species)
- targeted searches for Swift Parrot and Regent Honeyeater
- targeted trapping Corben's Long-eared Bat.

8.5.1.3 Groundwater dependent ecosystems and riparian vegetation

Due to the potential for impacts on surface water and groundwater systems, BCOPLs existing Conditions of Approval (PA 09_0182) incorporate the requirement for monitoring and assessment of GDEs (including stygofauna) and riparian health.

Stream and riparian health monitoring

BCOPL monitors the stream and riparian condition of Nagero Creek and the Namoi River at permanent monitoring locations to identify the potential for impacts to stream and riparian condition due to changes in catchment area and discharges associated with the BCM. The monitoring locations are aligned with existing biodiversity monitoring points, incorporating two along Nagero Creek and three along the Namoi River. Stream and riparian conditions at these locations are monitored annually by recording photographs to identify changes over time as mining operations progress (Boggabri Coal Operations Pty Limited, 2024).

Additionally, these five replicate monitoring points are also sampled in association with the terrestrial GDE monitoring program discussed below, and as such, are also sampled using those prescribed methodologies.

Terrestrial GDE monitoring

To assess the impacts of the operational bore field (assessed in BCMs Modification 5) on the native vegetation, monitoring of health and composition of the terrestrial vegetation in the locality of Modification 5 and proposed groundwater draw down impacts is undertaken to identify potential poor vegetation health associated with the groundwater extraction. If impacts are identified they will be assessed against water levels in groundwater monitoring bores and climatic conditions to identify any potential correlation between vegetation health and groundwater extraction.

Riparian and terrestrial vegetation health is monitored at eleven replicate monitoring via the completion of quantitative transect/plot surveys in accordance with the methodology contained in the BioBanking Assessment Method (Office of Environment & Heritage, 2014) and described in BCMs approved BMP (WSP, 2018b).

The terrestrial GDE monitoring program was expanded in 2024 to incorporate an additional two sampling points along Nagero Creek in association with BCMs MOD 8. These monitoring points also sample vegetation that meets the EPBC Act threshold for Poplar Box Woodland on Alluvial Plains ecological community.

9 Serious and irreversible impacts

This section identifies every potential SAII entity that are listed to assist a decision-maker to determine a serious and irreversible impact that would be impacted on by the development footprint.

Impact assessment of potential entities of SAII impacts on biodiversity values are outlined under Chapter 9 of the BAM and addressed below.

9.1 Threatened ecological communities

No threatened ecological communities listed under the BC Act occurred within the subject land. Therefore, no threatened SAII entity will be affected by MOD 10.

9.2 Threatened flora candidate SAII entities

No SAII flora species listed under the BC Act occurred within the subject land. Therefore, no threatened flora SAII entity will be affected by MOD 10.

9.3 Threatened fauna candidate SAII entities

No SAII fauna species listed under the BC Act occurred within the subject land. Therefore, no threatened fauna SAII entity will be affected by MOD 10.

10 Impact summary

10.1 Determine an offset requirement for impacts

10.1.1 Impacts on native vegetation and TECs or ECs (ecosystem credits)

All impacts to PCTs require an offset of ecosystem credits (Table 10.1).

Table 10.1 Impacts that require an offset – ecosystem credits

Vegetation zone	PCT name	TEC	Impact area (ha)	Current VI score	Future VI score	Change in VI score	Biodiversity risk weighting	Number of ecosystem credits required
462_Moderate	PCT 462 Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion	No	16.35	64.3	0	-64.3	1.5	394
531_Moderate	PCT 531 Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion	No	7.32	62.7	0	-62.7	1.5	172
588_Moderate	PCT 588 White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion	No	3.59	63.1	0	-63.1	1.75	71
592_High	PCT 592 Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion	No	51.51	78.1	0	-78.1	1.75	1,258
594_Moderate	PCT 594 Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion	No	5.71	59.3	0	-59.3	1.75	148
							Total credits	**2,043**

10.1.2 Impacts on threatened species and their habitat (species credits)

Table 10.2 identifies impacts on threatened species (species credits) that require an offset.

Table 10.2 Impacts that require an offset – species credits

Common name	Scientific name	BC Act status	EPBC Act status	Loss of habitat (ha) or individuals	Biodiversity risk weighting	Number of species credits required
Tylophora linearis	*Tylophora linearis*	Vulnerable	Endangered	1.29 ha	2	45
Scant Pomaderris	*Pomaderris queenslandica*	Endangered	Not listed.	0.5 ha	2	20
Koala	*Phascolarctos cinereus*	Endangered	Endangered	84.48	2	3,048
Squirrel Glider	*Petaurus norfolcensis*	Vulnerable	Not listed	84.48	2	3,048
Pale-headed Snake	*Hoplocephalus bitorquatus*	Vulnerable	Not listed	84.48	2	3,048
					Total credits	**9,209**

10.1.3 *Indirect and prescribed impacts*

Indirect and prescribed impacts that remain after measures to avoid, minimise and mitigate have been applied, may be offset using additional biodiversity credits (above the credit requirement generated by the BAM-C for direct impacts) and/or other conservation measures. It is considered that there are no indirect or prescribed impacts that remain after measures to avoid, minimise and mitigate impacts have been applied.

10.2 Impacts that do not need further assessment

In accordance with BAM section 9.3(1), areas within the subject land that does not contain native vegetation do not need to be assessed for ecosystem credits. BAM section 9.3(2) states that areas of land that do not contain native vegetation must still be assessed for threatened species habitat in accordance with Chapter 5 of the BAM and prescribed biodiversity impacts in accordance with Chapter 6 of the BAM. The subject land contains cleared areas of access tracks and borehole exploration pads (Figure 15.12). These cleared areas are unlikely to provide suitable habitat for threatened species.

As outlined in Appendix D of the BAM, if native vegetation (including individuals of a threatened flora species) have been planted for functional, aesthetic, horticultural or plantation forestry purposes (e.g., windbreaks in agricultural landscapes, roadside plantings (including street trees, median strips, roadside batters), landscaping in parks, gardens and sport fields/complexes, macadamia plantations or Teatree farms) then only an assessment of planted native vegetation for threatened species habitat is required.

No areas of non-native vegetation or planted native trees or grassland occur within the subject land.

10.3 Offsetting strategy

The offset obligations will be met through implementing a combination of the following offset delivery options, being:

- the purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register
- establishing a biodiversity stewardship site(s) on lands with like for like biodiversity values to those impacted by MOD 10
- through making a payment into the Biodiversity Conservation Fund.

11 Biodiversity credit report

11.1 Ecosystem credits

The required ecosystem credit obligation to be retired for MOD 10, as determined using the BAM-C, is detailed in Table 11.1.

Table 11.1 Ecosystem credit class and matching credit profile

Ecosystem credit	PCT name	PCT vegetation class	PCT vegetation formation	Associated TEC or EEC	Offset trading group (BAM section 10.2, Tables 4 and 5)	Total ecosystem credits to be retired	
						Non-HBT credits	HBT credits
PCT 462	Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion	Western Slopes Dry Sclerophyll Forests	KF_CH5B Dry Sclerophyll Forests (Shrubby sub-formation)	Not a TEC	Western Slopes Dry Sclerophyll Forests (<50% cleared)	0	394
PCT 588	White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion	North-west Slopes Dry Sclerophyll Woodlands	KF_CH5A Dry Sclerophyll Forests (Shrub/grass sub-formation)	Not a TEC	North-west Slopes Dry Sclerophyll Woodlands (≥50% – <70% cleared)	0	71
PCT 592	Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion	Western Slopes Dry Sclerophyll Forests	KF_CH5B Dry Sclerophyll Forests (Shrubby sub-formation)	Not a TEC	Western Slopes Dry Sclerophyll Forests (≥50% – <70% cleared)	0	1,258
PCT 594	Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion	North-west Slopes Dry Sclerophyll Woodlands	KF_CH5A Dry Sclerophyll Forests (Shrub/grass sub-formation)	Not a TEC	North-west Slopes Dry Sclerophyll Woodlands (≥50% – <70% cleared)	0	148
PCT 531	Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion	Western Slopes Dry Sclerophyll Forests	KF_CH5B Dry Sclerophyll Forests (Shrubby sub-formation)	Not a TEC	Western Slopes Dry Sclerophyll Forests (<50% cleared)	0	172

11.2 Species credits

The required species credit obligation to be retired for MOD 10, as determined using the BAM-C, is detailed in Table 11.2.

Table 11.2 Species credit class and matching credit profile

Species credit	BC Act status	EPBC Act status	Kingdom	Vegetation zones – area (ha)	Area of impact (ha)	Total species credits to be retired
Tylophora linearis / Tylophora linearis	Vulnerable	Endangered	Plant	531_Mod – 0.68ha 592_High – 0.61ha	1.29	45
Scant Pomaderris / *Pomaderris queenslandica*	Endangered	Not listed	Plant	592_High – 0.5ha	0.5	20
Phascolarctos cinereus / Koala	Endangered	Endangered	Mammal	462_Mod – 16.35ha 531_Mod – 7.32ha 588_Mod – 3.59ha 592_High – 51.51ha 594_Mod – 5.71ha	84.48	3,048
Petaurus norfolcensis / Squirrel Glider	Vulnerable	Not listed	Mammal	462_Mod – 16.35ha 531_Mod – 7.32ha 588_Mod – 3.59ha 592_High – 51.51ha 594_Mod – 5.71ha	84.48	3,048
Hoplocephalus bitorquatus / Pale-headed Snake	Vulnerable	Not listed	Reptile	462_Mod – 16.35ha 531_Mod – 7.32ha 588_Mod – 3.59ha 592_High – 51.51ha 594_Mod – 5.71ha	84.48	3,048

12 Conclusion

BCOPL seeks a Modification to SSD Approval 09_0182 under section 4.55 of the EP&A Act to recover known coal resources and to extend mining operations to the northwest beyond the approved Mine Disturbance Boundary. MOD 10 is situated on land that is outside of the approved Mine Disturbance Boundary at BCM but is located entirely within the Project Boundary, as defined in EPBC 2009/5256, EPBC 2021/8875 and SSD 09_0182 (as modified). This BDAR has been prepared to meet the requirements of the BAM established under section 6.7 of the BC Act. This BDAR describes the biodiversity values present in the Modification Disturbance Footprint (referred to as subject land) and provides an assessment of impacts to threatened species and ecological communities, recommends appropriate mitigation and management measures and details biodiversity credit liability associated with unavoidable impacts to biodiversity values.

The subject land is approximately 86.32 ha and contained 84.48 ha of native vegetation and 1.84 ha of previous disturbance associated with access tracks and borehole exploration pads. Native vegetation within the subject land has been assigned to five PCTs, which were in moderate condition except for PCT 592, which was considered high condition. The PCTs recorded in the subject land, included:

- PCT 462 Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion.
- PCT 531 Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion.
- PCT 588 White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion.
- PCT 592 Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion.
- PCT 594 Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion.

No threatened ecological communities listed under the BC Act or EPBC Act, or SAII species were recorded in the subject land.

Impacts on threatened species have been determined in accordance with the BAM based on predicted or ecosystem credit species and species credit species. Impacts resulting from MOD 10 on threatened species include:

- A total of 28 threatened fauna species identified as predicted ecosystem credit species.
- A total of two threatened flora species credit species identified as affected by MOD 10, including:
  - 1.29 ha of habitat for *Tylophora linearis*, which is listed as Vulnerable under the BC Act
  - 0.5 ha of habitat for *Pomaderris queenslandica*, which is listed as Vulnerable under the BC Act.
- A total of three threatened fauna species credit species identified as affected by MOD 10, including:
  - 84.48 ha of habitat for Koala, which is listed as Endangered under the BC Act
  - 84.48 ha of habitat for Pale-headed Snake, which is listed as Vulnerable under the BC Act
  - 84.48 ha of habitat for Squirrel Glider, which is listed as Vulnerable under the BC Act.

The unavoidable impacts resulting from MOD 10 were calculated in accordance with the BAM using the BAM-C. A total of 2,043 ecosystem credits and 9,209 species credits are required to offset the residual impacts.

One threatened species of plant, *Tylophora linearis*, which is listed as Endangered under the EPBC Act, was recorded in the subject land during the targeted flora searches. This species was observed in association with PCT 531 and PCT 592. MOD 10 will impact 1.29 ha of habitat for the species, including the removal of approximately 30 aerial stems.

One threatened fauna species, Corben's Long-eared Bat, which is listed as Vulnerable under the EPBC Act, was recorded in the subject land during targeted survey. However, 12 species were considered to have a moderate or higher likelihood of occurring in the subject land based on the availability of habitat. Several of these have previously been recorded in the larger Leard State Forest remnant, including Brown Treecreeper, Diamond Firetail, Swift Parrot, White-throated Needletail and Koala. The Southern Whiteface and Hooded Robin are typically recorded in open and mosaic habitats along the periphery of the Leard State Forest, and the Painted Honeyeater is regularly recorded immediately south of the southern boundary of the Leard State Forest in association with Weeping Myall Woodland.

Assessments of significance have been prepared for *Tylophora linearis,* Border Thick-tailed Gecko, Brown Treecreeper (eastern subspecies), Corben's Long-eared Bat, Diamond Firetail, Koala, Large-eared Pied Bat, Painted Honeyeater, Regent Honeyeater, South-eastern Hooded Robin, Spotted-tailed Quoll, Swift Parrot, and White-throated Needletail in accordance with the *Matters of National Environmental Significance – Significant Impact Guidelines 1.1* (DoE 2013) for impacts on threatened species. These assessments concluded that MOD 10 is likely to have a significant impact on the following MNES:

- *Nyctophilus corbeni* (Corben's Long-eared Bat)
- *Anthochaera phrygia* (Regent Honeyeater)
- *Lathamus discolor* (Swift Parrot).

No migratory species were recorded during the field surveys, however, the subject land provides aerial foraging habitat for the Fork-tailed Swift and White-throated Needletail, both of which have previously been recorded in aerial space over the Leard State Forest. MOD 10 is considered unlikely to substantially modify, destroy or isolate an area of important habitat for any EPBC Act listed migratory species and is unlikely to disrupt the lifecycle of an ecologically significant proportion of a population of migratory birds.

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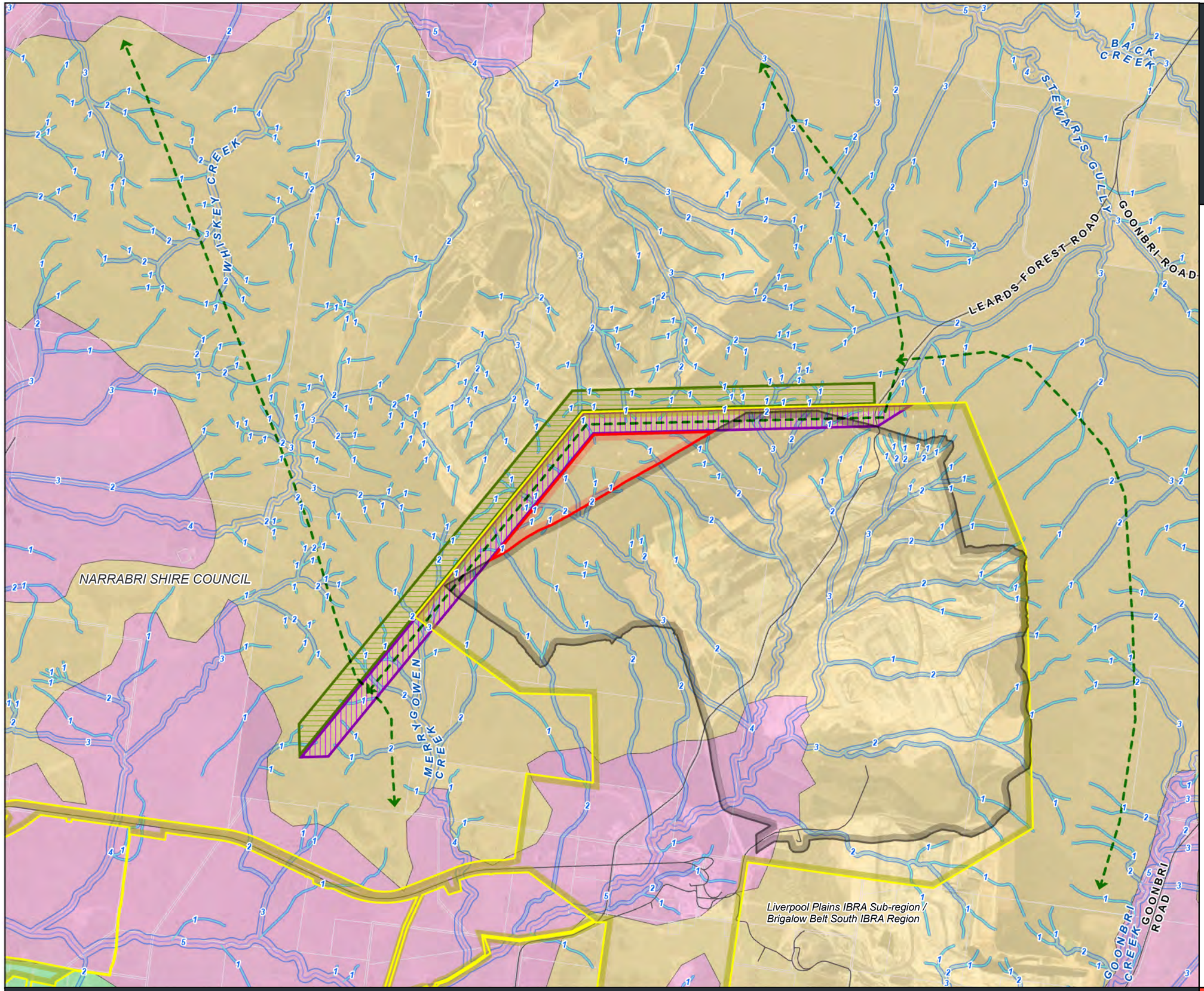
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15 Figures



Boggabri Coal Mine Modification 10 BDAR

Figure 15.1
Site Map

Legend

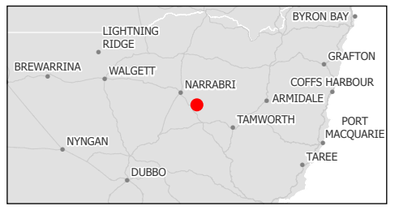
- Roads
- Habitat Connectivity
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Maules Creek Vegetation Corridor
- Boggabri Coal Vegetation Corridor
- Cadastre

Strahler Stream Order

- 1
- 2
- 3
- 4
- 5
- Riparian Corridor

Mitchell Landscapes

- Bugaldie Uplands
- Liverpool Alluvial Plains
- Upper Namoi Swamps and Lagoons



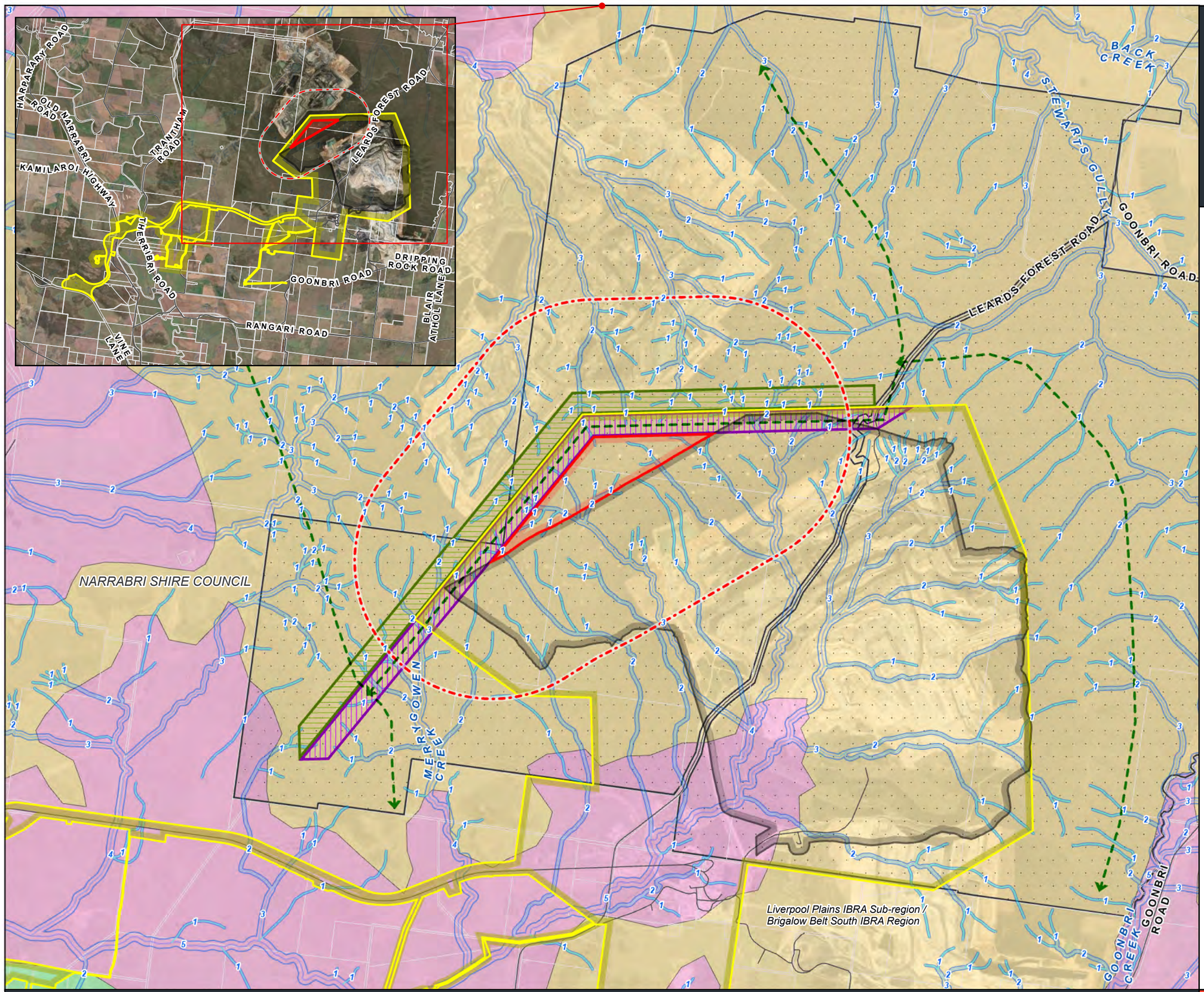
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Boggabri Coal Mine Modification 10 BDAR

Figure 15.2
Location Map

Legend

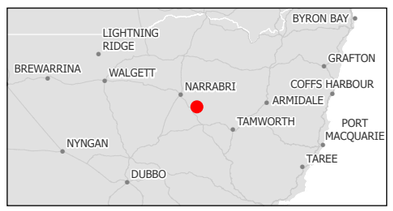
- Roads
- Habitat Connectivity
- Subject Land
- Assessment Area (1500m buffer)
- Approved Mine Disturbance Boundary
- Project Boundary
- Maules Creek Vegetation Corridor
- Boggabri Coal Vegetation Corridor
- Leard State Forest
- Cadastre

Strahler Stream Order

- 1
- 2
- 3
- 4
- 5
- Riparian Corridor

Mitchell Landscapes

- Bugaldie Uplands
- Liverpool Alluvial Plains
- Upper Namoi Swamps and Lagoons



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Coordinate system: GDA 1994 MGA Zone 56
Scale ratio correct when printed at A3

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Imagery: World Imagery: Earthstar Geographics,Commonwealth of Australia, Government of New South Wales

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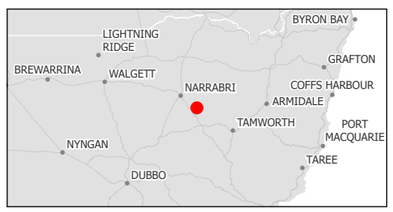


Boggabri Coal Mine
Modification 10 BDAR

Figure 15.3
Development Layout

Legend

- Watercourses
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Cadastre



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Meters

Coordinate system: GDA 1994 MGA Zone 56
Scale ratio correct when printed at A3

1:10,000 Date: 14/03/2025

Imagery:World Imagery: Maxar, Commonwealth of Australia, Government of New South Wales

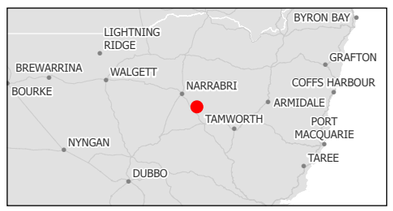
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Boggabri Coal Mine
Modification 10 BDAR

Figure 15.4
Approved Mining Operations

Legend

- Roads
- Watercourses
- Coal Mine Lease Title Boundaries
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Maules Creek Coal Mine Project Approval Boundary
- Tarrawonga Coal Mine Project Approval Boundary
- Boggabri Coal Mine Rehabilitation Areas
- Conservation Agreement Areas
- Cadastre



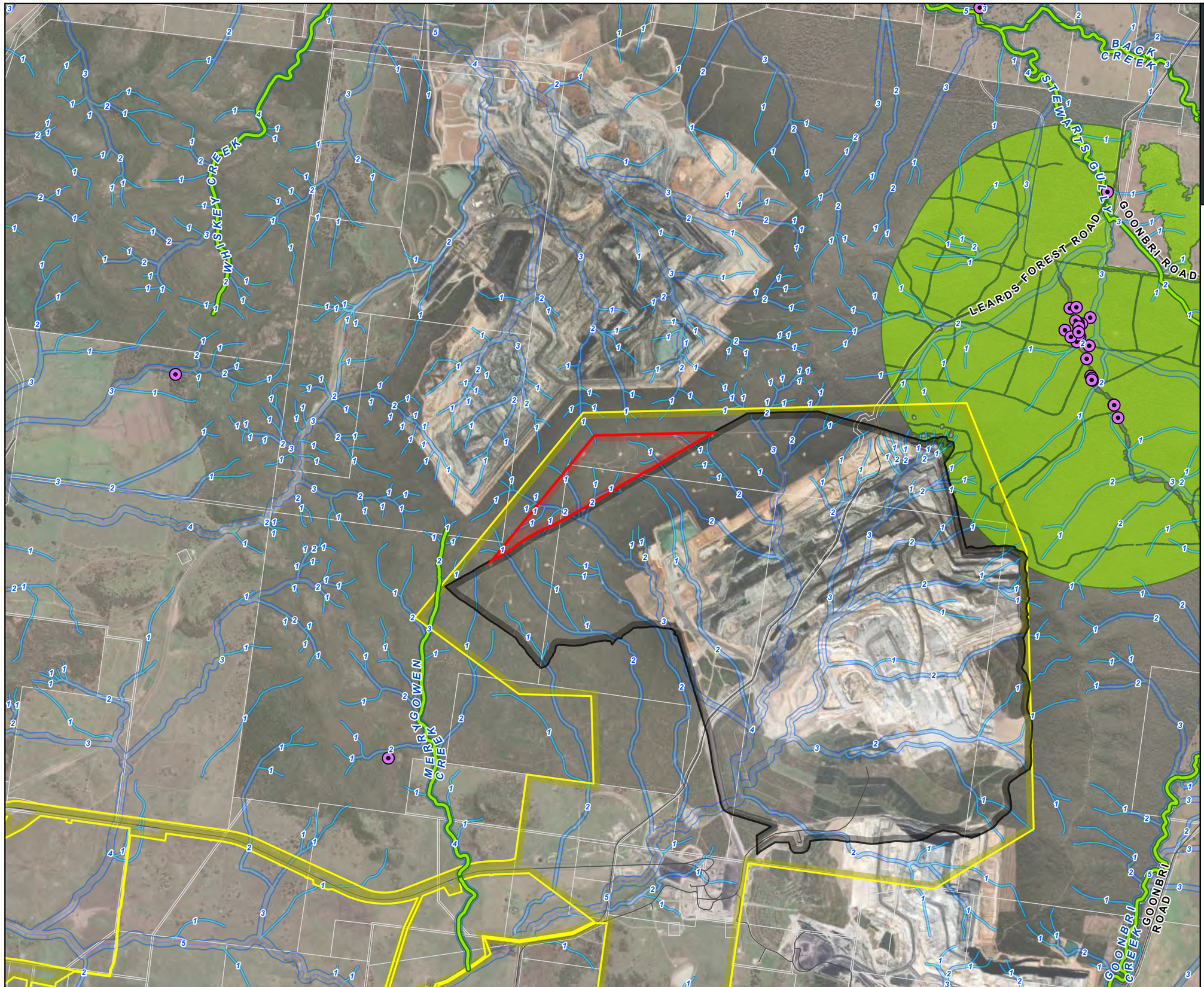
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Boggabri Coal Mine Modification 10 BDAR

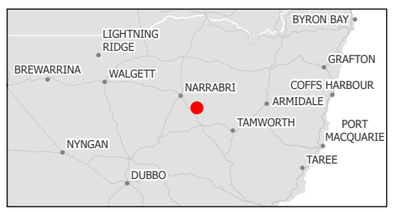
Figure 15.5
Biodiversity Values Map

Legend

- Swift Parrot - NSW BioNet
- Roads
- Biodiversity Values
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Cadastre

Strahler Stream Order

- 1
- 2
- 3
- 4
- 5
- Riparian Corridor



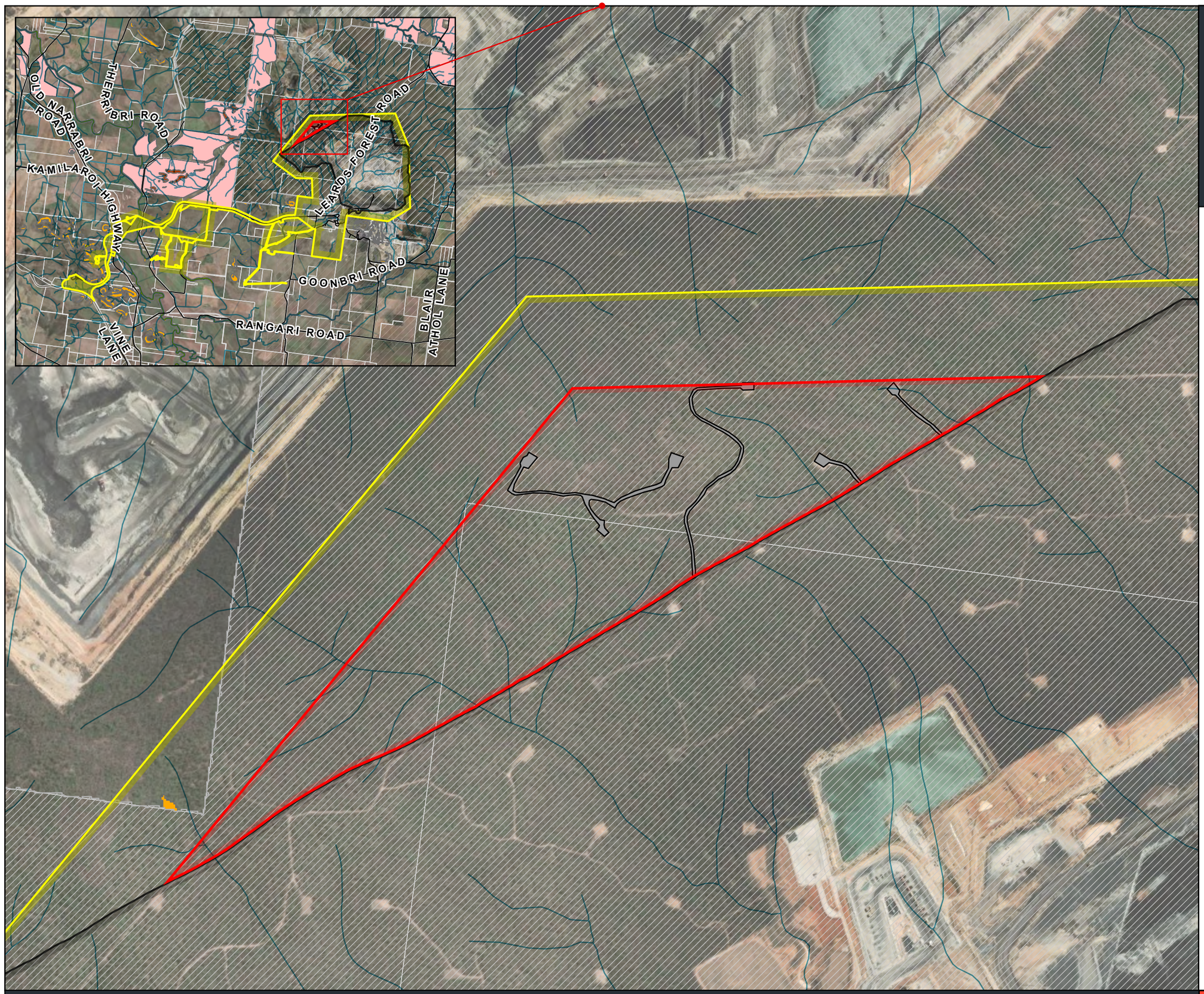
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Boggabri Coal Mine Modification 10 BDAR

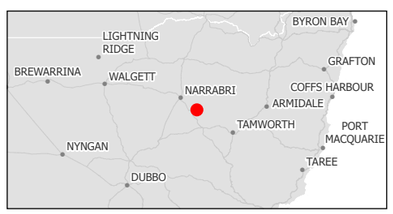
Figure 15.6
Excluded Impacts

Legend

- Roads
- Watercourses
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Excluded Land
- Cadastre

Native Vegetation Regualtory Areas

- Category 2 - Sensitive and vulnerable regulated lands areas of overlap
- Category 2 - Sensitive regulated land
- Category 2 - Vulnerable regulated land
- Land excluded from the LLS Act



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Meters

Coordinate system: GDA 1994 MGA Zone 56
Scale ratio correct when printed at A3

1:10,000 Date: 14/03/2025

Imagery:World Imagery: Earthstar Geographics
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Boggabri Coal Mine
Modification 10 BDAR

Figure 15.7
Flora Field Survey Locations - Spring 2023

Legend

- BAM Plot Locations
- Flora Survey Tracks Spring
- Watercourses
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Cadastre

Biodiversity Corridors

- Maules Creek Vegetation Corridor
- Boggabri Coal Vegetation Corridor

Plant Community Types

- PCT 462
- PCT 531
- PCT 588
- PCT 592
- PCT 594



0 240 480
Meters

Coordinate system: GDA 1994 MGA Zone 56
Scale ratio correct when printed at A3

1:10,000 Date: 14/03/2025

Imagery:World Imagery: Maxar, Commonwealth of Australia, Government of New South Wales

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Boggabri Coal Mine
Modification 10 BDAR

Figure 15.8
Flora Field Survey Locations - Summer 2024

Legend

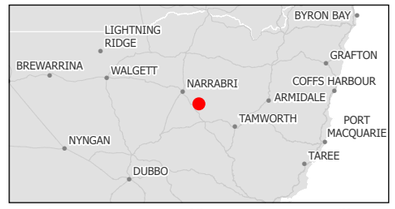
- BAM Plot Locations
- Flora Survey Tracks Summer
- Watercourses
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Cadastre

Biodiversity Corridors

- Maules Creek Vegetation Corridor
- Boggabri Coal Vegetation Corridor

Plant Community Types

- PCT 462
- PCT 531
- PCT 588
- PCT 592
- PCT 594



0 240 480
Meters

Coordinate system: GDA 1994 MGA Zone 56
Scale ratio correct when printed at A3

1:10,000 Date: 14/03/2025

Imagery:World Imagery: Maxar,Commonwealth of Australia, Government of New South Wales

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Boggabri Coal Mine
Modification 10 BDAR

Figure 15.9
Fauna Field Survey Locations - Winter 2023

Legend

- Watercourses
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Cadastre

Fauna Survey Locations Winter

- Bird Survey
- Koala SAT Survey
- Call Playback (nocturnal bird and mammals)
- Large Hollow Stag-watched
- Call Playback (large forest owl)
- Large Hollow
- Call Playback (large forest owl 6 nights)
- Habitat Assessment

Fauna Survey Tracks Winter

- Large hollow searches / Targeted raptor nest search / Targeted winter blossom nomad search
- Spotlighting
- Owl spotlighting

Plant Community Types

- PCT 462
- PCT 531
- PCT 588
- PCT 592
- PCT 594



0 240 480
Meters

Coordinate system: GDA 1994 MGA Zone 56
Scale ratio correct when printed at A3

1:10,000 Date: 14/03/2025

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Boggabri Coal Mine
Modification 10 BDAR

Figure 15.10
Fauna Field Survey Locations - Spring 2023

Legend

- Watercourses
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Cadastre

Fauna Survey Locations Spring

- Targeted Pink-tailed Legless Lizard Search
- Bird Survey
- Camera Trapping
- Koala SAT Survey

Fauna Survey Tracks Spring

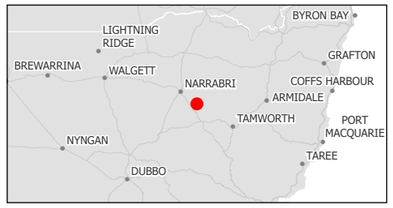
- Targeted raptor nest search

Biodiversity Corridors

- Maules Creek Vegetation Corridor
- Boggabri Coal Vegetation Corridor

Plant Community Types

- PCT 462
- PCT 531
- PCT 588
- PCT 592
- PCT 594



0 240 480
Meters

Coordinate system: GDA 1994 MGA Zone 56
Scale ratio correct when printed at A3

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Boggabri Coal Mine
Modification 10 BDAR

Figure 15.11
Fauna Field Survey Locations
Summer 2023/24

Legend

- Watercourses
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Cadastre

Fauna Survey Locations Summer

- Anabat Survey
- Bird Survey
- Call playback (nocturnal bird and arboreal mammals)
- Harp Trapping

Fauna Survey Tracks Summer

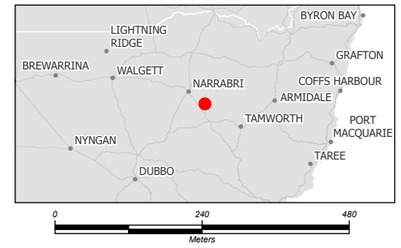
- Spotlight transect
- Border Thick-tailed Gecko Targeted spotlight

Biodiversity Corridors

- Maules Creek Vegetation Corridor
- Boggabri Coal Vegetation Corridor

Plant Community Types

- PCT 462
- PCT 531
- PCT 588
- PCT 592
- PCT 594

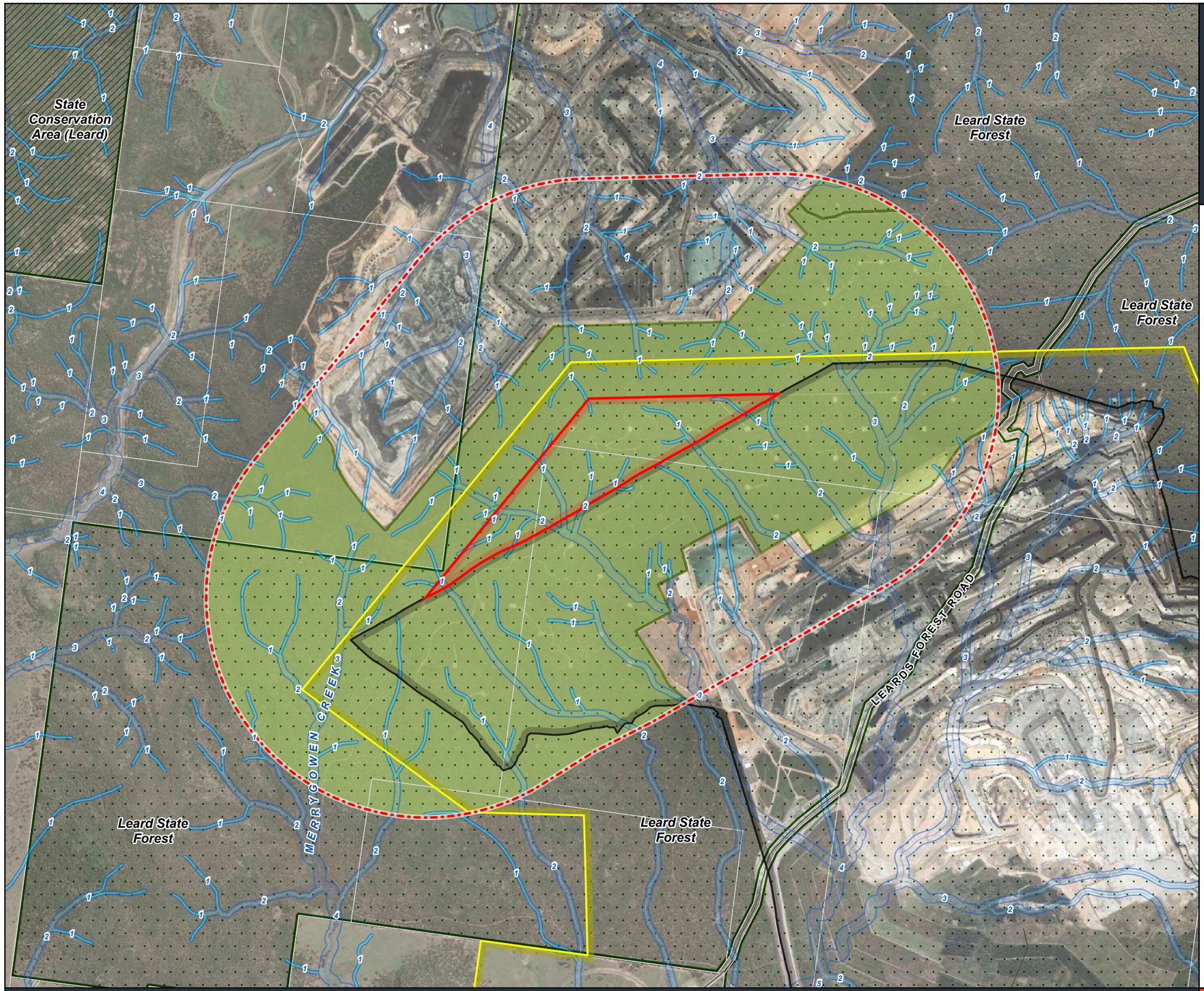


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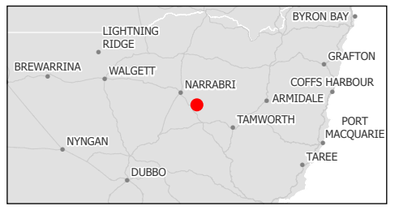
Figure 15.12
Native Vegetation Extent

Legend

- Roads
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Native Vegetation Extent
- Assessment Area (1500m buffer)
- State Conservation Area (Leard)
- Leard State Forest
- Cadastre

Strahler Stream Order

- 1
- 2
- 3
- 4
- 5
- Riparian Corridor



0 610 1,220
Meters

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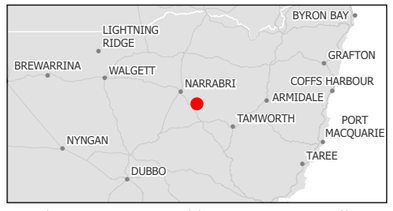
Figure 15.13
Plant Community Types

Legend

- Watercourses
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Cadastre

Plant Community Types

- PCT 462 - Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
- PCT 531 - Narrow-leaved Ironbark - pine - Brown Bloodwood shrub/ grass open forest in the north west of the Nandewar Bioregion
- PCT 588 - White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
- PCT 592 - Narrow-leaved Ironbark - cypress pine - White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion
- PCT 594 - Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion



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Modification 10 BDAR

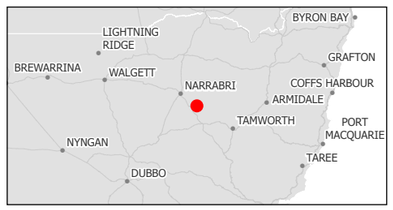
Figure 15.14
Vegetation Zones

Legend

- Watercourses
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Cadastre

Plant Community Types

- PCT 462 - High condition
- PCT 531 - High condition
- PCT 588 - High condition
- PCT 592 - High condition
- PCT 594 - High condition



0 240 480
Meters

Coordinate system: GDA 1994 MGA Zone 56
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Boggabri Coal Mine
Modification 10 BDAR

Figure 15.15
Tylophora linearis Species Polygons

Legend

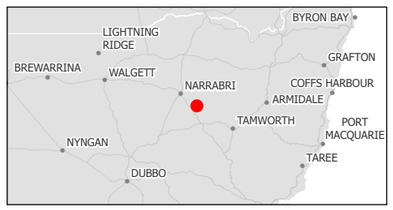
- *Tylophora linearis* Locations
- Roads
- Watercourses
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- *Tylophora linearis* Species Polygon
- Cadastre

Biodiversity Corridors

- Maules Creek Vegetation Corridor
- Boggabri Coal Vegetation Corridor

Plant Community Types

- PCT 462
- PCT 531
- PCT 588
- PCT 592
- PCT 594



Coordinate system: GDA 1994 MGA Zone 56
Scale ratio correct when printed at A3

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Boggabri Coal Mine
Modification 10 BDAR

Figure 15.16
Pomaderris queenslandica
Species Polygons

Legend

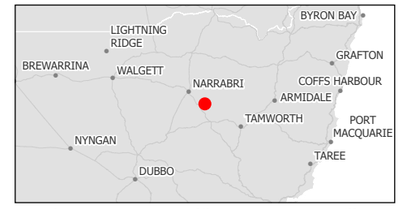
- *Pomaderris queenslandica* Location
- Roads
- Watercourses
- *Pomaderris queenslandica* Location Halo
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- *Pomaderris queenslandica* Species Polygon
- Cadastre

Biodiversity Corridors

- Maules Creek Vegetation Corridor
- Boggabri Coal Vegetation Corridor

Plant Community Types

- PCT 462
- PCT 531
- PCT 588
- PCT 592
- PCT 594



Coordinate system: GDA 1994 MGA Zone 56
Scale ratio correct when printed at A3

1:10,000 Date: 14/03/2025

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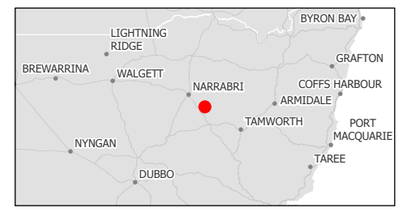
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Boggabri Coal Mine
Modification 10 BDAR

Figure 15.17
Koala (*Phascolarctos cinereus*)
Species Polygons

Legend

- Watercourses
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Koala (*Phascolarctos cinereus*) Species Polygon - Listed as Endangered under both the BC Act and EPBC Act
- Cadastre



Coordinate system: GDA 1994 MGA Zone 56
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Boggabri Coal Mine
Modification 10 BDAR

Figure 15.18
Squirrel Glider (*Petaurus norfolcensis*)
Species Polygons

Legend

- Watercourses
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Squirrel Glider (*Petaurus norfolcensis*) Species Polygon - Vulnerable under the BC Act
- Cadastre



Coordinate system: GDA 1994 MGA Zone 56
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Boggabri Coal Mine
Modification 10 BDAR

Figure 15.19
Pale-headed Snake
(*Hoplocephalus bitorquatus*)
Species Polygons

Legend

- Watercourses
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Pale-headed Snake (*Hoplocephalus bitorquatus*) Species Polygon - Listed as Vulnerable under the BC Act
- Cadastre



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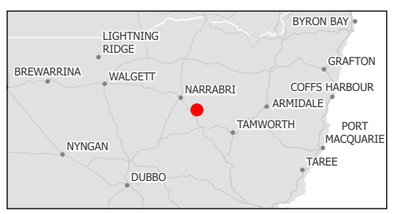
C:\Users\AUSW507321\WSP O365\Boggabri GIS-Ecology - General\5_Shared\54_Production\Maps\2025\BDAR\BDAR2025_DS_AllFigures_r1v3.aprx | Author: DS | QA: AC

Boggabri Coal Mine
Modification 10 BDAR

Figure 15.20a
Final Impacts Likely to Occur on Subject Land

Legend

- Watercourses
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Fauna Direct Impacts
- Species Polygons for Koala (*Phascolarctos cinereus*), Squirrel Glider (*Petaurus norfolcensis*) and Pale-headed Snake (*Hoplocephalus bitorquatus*)
- Cadastre



Coordinate system: GDA 1994 MGA Zone 56
Scale ratio correct when printed at A3

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Boggabri Coal Mine
Modification 10 BDAR

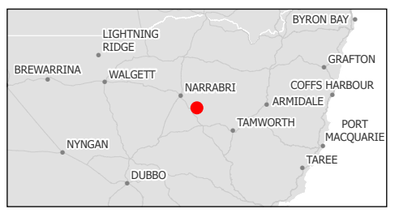
Figure 15.20b
Final impacts likely to occur on Subject Land for flora

Legend

- Subject Land
- Boggabri Coal Mine Federal Approval Boundary
- Boggabri Coal Mine Project Approval Boundary
- *Pomaderris queenslandica* Species Polygon
- Cadastre
- Watercourses
- Flora Direct Impacts
- *Tylophora linearis* Species Polygon

Plant Community Types

- PCT 462
- PCT 531
- PCT 588
- PCT 592
- PCT 594



0 240 480
Meters

Coordinate system: GDA 1994 MGA Zone 56
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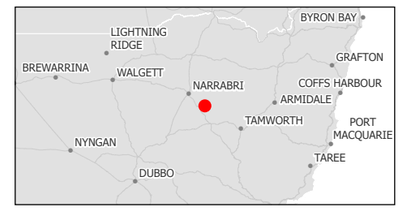
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Boggabri Coal Mine
Modification 10 BDAR

Figure 15.21
Thresholds for Assessing and Offsetting Impacts

Legend

- Watercourses
- Subject Land
- Approved Mine Disturbance Boundary
- Project Boundary
- Direct Impacts
- Areas not requiring further assessment / areas not requiring an offset
- Cadastre



0 240 480
Meters

Coordinate system: GDA 1994 MGA Zone 56
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Appendix A

BDAR requirements compliance

Table A.1 Assessment of compliance with BDAR minimum information requirements

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
Introduction	Chapters 2 and 3	**Information**	
		Introduction to the biodiversity assessment including:	–
		☒ brief description of the proposal	Section 1.1.1
		☒ identification of subject land boundary, including: ☒ operational footprint ☒ construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure	Section 1.1.1 Section 1.1.4
		☒ general description of the subject land	Section 1.1.4
		☒ sources of information used in the assessment, including reports and spatial data	Section 1.5
		☒ identification and justification for entering the BOS	Section 1.2
		Maps and tables	
		☒ Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure	Figure 15.1 Figure 15.3
Landscape	Sections 3.1 and 3.2, Appendix E	**Information**	
		Identification of site context components and landscape features, including:	–
		☒ general description of subject land topographic and hydrological setting, geology and soils	Section 1.1.4 Section 3.2.4
		☒ per cent native vegetation cover in the assessment area (as described in BAM section 3.2)	Section 3.3
		☒ IBRA bioregions and subregions (as described in BAM subsection 3.1.3(2.))	Section 3.2.1
		☒ rivers and streams classified according to stream order (as described in BAM subsection 3.1.3(3.) and Appendix E)	Section 3.2.2
		☒ wetlands within, adjacent to and downstream of the site (as described in BAM subsection 3.1.3(3.))	Section 3.2.2
		☒ connectivity of different areas of habitat (as described in BAM subsection 3.1.3(5–6.))	Section 3.2.3

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☒ karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM subsections 3.1.3(7.) and 3.1.3(12.))	Section 3.2.4
		☒ areas of outstanding biodiversity value occurring on the subject land and assessment area (as described in BAM subsection 3.1.3(8–9.))	Section 3.2.5
		☒ any additional landscape features identified in any SEARs for the proposal	Section 3.2.7
		☒ NSW (Mitchell) landscape on which the subject land occurs	Section 3.2.6
		☒ details of field reconnaissance undertaken to confirm the extent and condition of landscape features and native vegetation cover (as described in Operational Manual Stage 1 section 2.4)	Section 2.1 Section 2.4.2
		Maps and tables	
		☒ Site Map ☒ Property boundary ☒ Boundary of subject land ☒ Cadastre of subject land (including labelling of Lot and DP or section plan if relevant) ☒ Landscape features identified in BAM subsection 3.1.3	Figure 15.1 Figure 15.3
		☒ Location Map ☒ Digital aerial photography at 1:1,000 scale or finer ☒ Boundary of subject land ☒ Assessment area (i.e., the subject land and either 1500 m buffer area or 500 m buffer for linear development) ☒ Landscape features identified in BAM subsection 3.1.3 ☒ Additional detail (e.g., local government area boundaries) relevant at this scale	Figure 15.2
		Landscape features identified in BAM subsection 3.1.3 and to be shown on the Site Map and/or Location Map include:	–
		☒ IBRA bioregions and subregions ☒ rivers, streams and estuaries ☒ wetlands and important wetlands ☒ connectivity of different areas of habitat	Figure 15.1 Figure 15.2

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☒ karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features	
		☒ areas of outstanding biodiversity value occurring on the subject land and assessment area	
		☒ any additional landscape features identified in any SEARs for the proposal	
		☒ NSW (Mitchell) landscape on which the subject land occurs	
		Data – to be provided with final report	
		☒ All report maps as separate jpeg files	Uploaded to BAM-C
		Individual digital shape files of:	Uploaded to BAM-C
		☒ subject land boundary	Uploaded to BAM-C
		☒ assessment area (i.e., subject land and 1500 m buffer area) boundary	Uploaded to BAM-C
		☒ cadastral boundary of subject land	Uploaded to BAM-C
		☒ areas of native vegetation cover	Uploaded to BAM-C
		☒ landscape features	Uploaded to BAM-C
Native vegetation	Chapter 4, Appendix A and Appendix H	**Information**	
		☒ Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM section 4.1(1–3.) and subsection 4.1.1)	Section 4.1 Figure 15.12
		☒ Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM subsection 4.1.2)	Section 4.1.2
		☒ Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM section 4.1(3.) and subsection 4.1.1)	Section 2.2.2
		☒ Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM section 4.2	Section 2.2.3

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☒ Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM subsection 1.4.2 and Appendix A)	N/A
		For each PCT within the subject land, describe:	–
		☒ PCT name and ID	Section 4.2 Figure 15.13
		☒ vegetation class	Section 4.2
		☒ extent (ha) within subject land	Section 4.2 Table 4.1
		☒ evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM section 4.2(1–3.))	Section 4.2
		☒ plant species relied upon for identification of the PCT and relative abundance of each species	Section 4.2 Appendix D
		☒ if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM subsection 4.2.2(1–2.))	Section 4.2 Figure 15.13
		☒ estimate of per cent cleared value of PCT (BAM subsection 4.2.1(5.))	Section 4.2
		Describe the vegetation integrity assessment of the subject land, including:	–
		☒ identification and mapping of vegetation zones (as described in BAM subsection 4.3.1)	Section 4.4 Figure 15.14
		☒ description of vegetation zones within the subject land (as described in Operational Manual Stage 1 Table 2 and subsection 3.3.2)	Section 4.4 Figure 15.14 Section 4.5.2
		☒ area (ha) of each vegetation zone	Section 4.4
		☒ assessment of patch size (as described in BAM subsection 4.3.2)	Section 4.4
		☒ survey effort (i.e., number of vegetation integrity survey plots) as described in BAM subsection 4.3.4(1–2.)	Section 4.4 Section 4.5.1

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☒ use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM subsection 4.3.3(5.))	Section 4.5.3
		Where use of more appropriate local benchmark data is proposed (as described in BAM subsection 1.4.2, BAM subsection 4.3.3(5.) and BAM Appendix A):	–
		☐ identify the PCT or vegetation class for which local benchmark data will be applied ☐ identify published sources of local benchmark data (if benchmarks obtained from published sources) ☐ describe methods of local benchmark data collection (if reference plots used to determine local benchmark data)	N/A. Refer to Section 4.5.3
		☐ provide justification for use of local data rather than BioNet Vegetation Classification benchmark values	Section 4.5.3
		☐ provide written confirmation from the decision-maker that they support the use of local benchmark data	N/A
		Maps and tables	
		☒ Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of all areas of native vegetation including areas that are ground cover only, cleared areas (as described in BAM section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM subsection 4.1.2)	Figure 15.12
		☒ Map of PCTs within the subject land (as described in BAM section 4.2(1.))	Figure 15.13
		☒ Map of vegetation zones within the subject land (as described in BAM subsection 4.3.1)	Figure 15.14
		☒ Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCT boundaries	Figure 15.7
		☒ Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	N/A
		☒ Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM subsection 4.3.2)	Figure 15.14 Table 4.14

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		Table of current vegetation integrity scores for each vegetation zone within the site and including:	–
		☒ composition condition score ☒ structure condition score ☒ function condition score ☒ presence of hollow bearing trees	Section 4.5.2 Table 4.15
		Data – to be provided with final report	
		☒ All report maps as separate jpeg files	Uploaded to BAM-C
		☒ Plot field data (MS Excel format)	Uploaded to BAM-C
		☒ Plot field datasheets	Appendix D
		Digital shape files of:	–
		☒ PCT boundaries within subject land	Uploaded to BAM-C
		☒ TEC boundaries within subject land	Uploaded to BAM-C
		☒ vegetation zone boundaries within subject land	Uploaded to BAM-C
		☒ floristic vegetation survey and vegetation integrity plot locations	Uploaded to BAM-C
Threatened species	Chapter 5	**Information**	
		Identify ecosystem credit species likely to occur on the subject land, including:	–
		☒ list of ecosystem credit species derived from the BAM-C (as described in BAM subsection 5.1.1 and section 5.2(1.))	Section 5.1.2
		☒ justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM subsections 5.2.1 and 5.2.2)	Section 5.1.1
		☒ justification for addition of any ecosystem credit species to the list	Section 5.1.2

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		Identify species credit species likely to occur on the subject land, including:	–
		☒ list of species credit species derived from the BAM-C (as described in BAM subsection 5.1.1)	Section 5.1.3 Table 5.4 Table 5.5
		☒ justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM subsections 5.2.1 and 5.2.2)	Section 5.1.3
		☒ justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM subsection 5.2.2)	Section 5.1.3
		☒ justification for addition of any species credit species to the list	Section 5.1.3
		From the list of candidate species credit species, identify:	–
		☒ species assumed present within the subject land (if relevant) (as described in BAM subsection 5.2.4(2.a.)) ☒ species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM subsection 5.2.4(2.d.)) ☒ species for which targeted surveys are to be completed to determine species presence (BAM subsection 5.2.4(2.b.)) ☒ species for which an expert report is to be used to determine species presence (BAM subsection 5.2.4(2.c.))	Section 5.2 Table 5.6 Table 5.7
		Present the outcomes of species credit species assessments from:	–
		☒ threatened species survey (as described in BAM section 5.2.4)	Section 5.3 Table 5.8 Table 5.9
		☒ expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM subsection 5.2.4, section 5.3, Box 3)	Section 5.4

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		Where survey has been undertaken include detailed information on:	–
		☒ survey method and effort (as described in BAM section 5.3)	Section 2 Section 5.3
		☒ justification of survey method and effort (e.g., citation of peer-reviewed literature) if approach differs from the department's taxa-specific survey guides or where no relevant guideline has been published	Section 5.3 Table 5.8 Table 5.9
		☒ timing of survey in relation to requirements in the TBDC or the department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys	Section 5.3 Table 5.8 Table 5.9
		☒ survey personnel and relevant experience	Declarations ii
		☒ describe any limitations to surveys and how these were addressed/overcome	Section 2.6
		Where an expert report has been used in place of survey (as described in BAM section 5.3, Box 3), include:	N/A
		☐ justification of the use of an expert report ☐ identify the expert, provide evidence of their expert credentials and departmental approval of expert status ☐ all requirements of Box 3 have been addressed in the expert report	Section 5.4
		Where use of local data is proposed (BAM subsection 1.4.2):	N/A
		☐ identify relevant species ☐ identify data to be amended ☐ identify source of information for local data, e.g., published literature, additional survey data, etc. ☐ justify use of local data in preference to VIS Classification or TBDC data	Section 5.5
		☐ provide written confirmation from the decision-maker that they support the use of local data	N/A
		Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that:	–
		☒ the unit of measure for each species is documented	Section 5.6 Table 5.10 Table 5.11

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		for species assessed by area:	–
		☒ the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM subsection 5.2.5)	Section 5.6 Table 5.10 Table 5.11 Figure 15.15 Figure 15.16 Figure 15.17 Figure 15.18 Figure 15.19
		☒ a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied	Section 5.6 Table 5.10
		for species assessed by counts of individuals:	–
		☒ the number of individual plants present on the subject land (as described in BAM subsection 5.2.5(3.))	Section 5.6 Table 5.10 Table 5.11 Figure 15.15
		☒ the method used to derive this number (i.e., threatened species survey or expert report) and evidence-based justification for the approach taken	Section 5.6 Table 5.10 Table 5.11 Figure 15.15
		☒ the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land	Section 5.6 Table 5.10 Table 5.11 Figure 15.15
		☒ Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM section 5.4)	Section 5.6 Table 5.10

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		Maps and tables	
		☒ Table showing ecosystem credit species in accordance with BAM subsection 5.1.1, and identifying:	
		☒ the ecosystem credit species removed from the list	Table 5.3
		☒ the sensitivity to gain class of each species	Table 5.3
		☒ Table detailing species credit species in accordance with BAM section 5.2 and identifying:	Table 5.4 Table 5.5
		☒ the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or microhabitat features are not present	Table 5.4 Table 5.5
		☒ the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map	Table 5.6 Table 5.7
		☒ Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM subsection 5.2.6) and biodiversity risk weighting (BAM section 5.4)	Section 5.6 Table 5.10 Table 5.11
		☒ Map indicating the GPS coordinates of all individuals of each species recorded within the subject land and the species polygon for each species (as described in BAM subsection 5.2.5)	Figure 15.15 Figure 15.16 Figure 15.17 Figure 15.18 Figure 15.19
		Data – to be provided with final report	
		☒ Digital shape files of suitable habitat identified for survey for each candidate species credit species	Uploaded to BAM-C
		☒ Survey locations including GPS coordinates of any plots, transects, grids	Uploaded to BAM-C
		☒ Digital shape files of each species polygon including GPS coordinates of located individuals	Uploaded to BAM-C
		☒ Species polygon map in jpeg format	Uploaded to BAM-C
		☒ Expert reports and any supporting data used to support conclusions of the expert report	Uploaded to BAM-C
		☐ Field datasheets detailing survey information including prevailing conditions, date, time, equipment used, etc.	No field datasheets used in excel format

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
Prescribed impacts	Chapter 6	**Information**	
		Identify potential prescribed biodiversity impacts on threatened entities, including:	–
		☒ karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM subsection 6.1.1) ☒ occurrences of human-made structures and non-native vegetation (as described in BAM subsection 6.1.2) ☒ corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM subsection 6.1.3) ☒ waterbodies or any hydrological processes that sustain threatened entities (as described in BAM subsection 6.1.4)	Section 6 Table 6.1
		☒ protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM subsection 6.1.5)	Section 6 Table 6.1
		☒ where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM subsection 6.1.6)	Section 6 Table 6.1
		☒ Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts	Section 6 Table 6.1
		☒ Describe the importance of habitat features to the species including, where relevant, impacts on life cycle or movement patterns (e.g., subsection 6.1.3)	Section 6 Table 6.1
		Where the proposed development is for a wind farm:	–
		☒ identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM subsection 6.1.5)	N/A
		☒ provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM subsection 6.1.5(2–3.)	N/A
		☒ predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM subsection 6.1.5(4.))	N/A

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		Where the proposal may result in vehicle strike:	–
		☒ identify a list of threatened fauna or protected fauna species that are part of a TEC and at risk of vehicle strike due to the proposal	Section 6 Table 6.1
		Maps and tables	
		☒ Map showing location of any prescribed impact features (i.e., karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	Figure 15.1 Figure 15.2
		☒ Map showing location of potential vehicle strike locations	Figure 15.1
		☒ Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only)	Figure 15.1 Figure 15.2
		Data – to be provided with final report	
		☐ Digital shape files of prescribed impact feature locations	–
		☐ Prescribed impact features map in jpeg format	–
Avoid and minimise impacts	Chapter 7	**Information**	
		Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative:	–
		☒ modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology	Section 7.2 Table 7.3
		☒ routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route	Section 7.2 Table 7.3
		☒ alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	Section 7.2 Table 7.3
		☒ alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site	Section 7.2 Table 7.3

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☒ Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM sections 7.1 and 7.2)	Section 7.2
		☒ Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM subsection 7.2.1(3.))	Section 7.2 Table 7.3
		☒ Detail measures or options considered but not implemented because they are not feasible and/or practical (e.g., due to site constraints)	N/A
		Maps and tables	
		☒ Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	Table 7.5
		☒ Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation	N/A
		☒ Maps demonstrating indirect impact zones where applicable	Figure 15.20
		Data – to be provided with final report	
		Digital shape files of:	–
		☐ alternative and final proposal footprint	–
		☐ direct and indirect impact zones	–
		☐ Maps in jpeg format	–
Assessment of impacts	Chapter 8, Sections 8.1 and 8.2	**Information**	
		☒ Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM section 8.1)	Table 8.1

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM section 8.2):	–
		☒ description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal	Section 8.2 Table 8.5
		☒ documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications	Section 8.2 Table 8.5
		☒ reporting any limitations or assumptions, etc. made during the assessment	Section 8.2 Table 8.5
		☒ identification of the threatened entities and their habitat likely to be affected	Section 8.2 Table 8.5
		Assessment of prescribed biodiversity impacts (as described in BAM section 8.3) including:	–
		assessment of the nature, extent frequency, duration and timing of impacts on the habitat of threatened species or ecological communities associated with:	–
		☒ karst, caves, crevices, cliffs, rocks and other features of geological significance	Section 8.3 Table 8.6
		☒ human-made structures	Section 8.3 Table 8.6
		☒ non-native vegetation	Section 8.3 Table 8.6
		☒ connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Section 8.3 Table 8.6
		☒ movement of threatened species that maintains their life cycle	Section 8.3 Table 8.6
		☒ water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities	Section 8.3 Table 8.6
		☒ assessment of the impacts of wind turbine strikes on protected animals	N/A

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☒ assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	Section 8.3.1
		☒ evaluate the consequences of prescribed impacts	Section 8.3 Table 8.6
		☒ describe impacts that are uncertain	Section 8
		☒ document limitations to data, assumptions and predictions	Section 2.6 Section 12
		Maps and tables	
		☒ Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	Table 8.4
		Data	
		N/A	–
Mitigation and management of impacts	Chapter 8, Sections 8.4 and 8.5	**Information**	
		Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM sections 8.4 and 8.5 including:	–
		☒ techniques, timing, frequency and responsibility ☒ identify measures for which there is risk of failure ☒ evaluate the risk and consequence of any residual impacts	Table 8.8
		☒ document any adaptive management strategy proposed	Section 8.5
		Identification of measures for mitigating impacts related to:	–
		☒ displacement of resident fauna (as described in BAM subsection 8.4.1(2.)) ☒ indirect impacts on native vegetation and habitat (as described in BAM subsection 8.4.1(3.)) ☒ mitigating prescribed biodiversity impacts (as described in BAM subsection 8.4.2)	Section 8.4

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☒ Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM section 8.5)	Section 8.4
		Maps and tables	
		☒ Table of measures to be implemented before, during and after construction to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	Table 8.8
		Data	
		N/A	–
Impact summary	Chapter 9	**Information**	
		Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM section 9.1) including:	–
		☒ addressing all criteria in subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land	Section 9
		☒ for each TEC, report the extent of the TEC in NSW	Section 9
		☒ addressing all criteria in subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land	Section 9
		☒ for each threatened species, report the population size in NSW	Section 9
		☒ documenting assumptions made and/or limitations to information ☒ documenting all sources of data, information, references used or consulted ☒ clearly justifying why any criteria could not be addressed	Section 9 Section 2.6 Section 12
		☒ Identification of impacts requiring offset in accordance with BAM section 9.2	Table 10.1 Table 10.2
		☒ Identification of impacts not requiring offset in accordance with BAM subsection 9.2.1(3.)	Section 10.2
		☒ Identification of areas not requiring assessment in accordance with BAM section 9.3	Section 10.2

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		Maps and tables	
		☒ Map showing the extent of TECs at risk of an SAII within the subject land	N/A
		☒ Map showing location of threatened species at risk of an SAII within the subject land	N/A
		Map showing location of:	–
		☒ impacts requiring offset	Figure 15.21
		☒ impacts not requiring offset	Figure 15.21
		☒ areas not requiring assessment	Figure 15.21
		Data – to be provided with final report	
		Digital shape files of:	–
		☒ extent of TECs at risk of an SAII within the subject land	Uploaded to BAM-C
		☒ location of threatened species at risk of an SAII within the subject land	Uploaded to BAM-C
		☒ boundary of impacts requiring offset	Uploaded to BAM-C
		☒ boundary of impacts not requiring offset	Uploaded to BAM-C
		☒ boundary of areas not requiring assessment	Uploaded to BAM-C
		☒ Maps in jpeg format	Uploaded to BAM-C
Impact summary	Chapter 10	**Information**	
		Ecosystem credits and species credits that measure the impact of the development on biodiversity values, including:	–
		☒ future vegetation integrity score for each vegetation zone within the subject land (Equation 25 and Equation 26 in BAM Appendix H) ☒ change in vegetation integrity score (BAM subsection 8.1.1) ☒ number of required ecosystem credits for the direct impacts of the proposal on each vegetation zone within the subject land (BAM subsection 10.1.2)	Table 10.1

BDAR section	BAM ref.	BAM requirement	Page reference(s) in the BDAR
		☒ biodiversity risk weighting for each	Table 10.1 Table 10.2
		☒ number of required species credits for each candidate threatened species that is directly impacted on by the proposal (BAM subsection 10.1.3)	Table 10.2
		Maps and tables	
		☒ Table of PCTs requiring offset and the number of ecosystem credits required	Table 10.1
		☒ Table of threatened species requiring offset and the number of species credits required	Table 10.2
		Data – to be completed immediately prior to final report	
		☒ Submitted proposal in the BAM Calculator	Submitted
Biodiversity credit report	Chapter 10	**Information**	
		☒ Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM section 10.2)	Table 11.1 Table 11.2
		☐ BAM credit report in pdf format – final to be included in final report	Appendix F
		Maps and tables	
		☐ Table of credit class and matching credit profile	Table 11.1 Table 11.2
		Data	
		☐ BAM credit report in pdf format – final to be included in final report	Appendix F

Appendix B

Likelihood of occurrence tables



Table B.1 Likelihood of occurrence for fauna species

Scientific Name	Common Name	BC Act	EPBC Act	Source	Habitat Suitability	Likelihood of Occurrence
Bats						
Chalinolobus dwyeri	Large-eared Pied Bat	V	E	BioNet PMST BAM-C (Species credit species)	**Habitat requirements** 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. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594 and PCT531	**Moderate**. Suitable habitat within subject land and known to occur in locality. However, breeding habitat was not identified within the subject land.
Chalinolobus picatus	Little Pied Bat	V	–	BAM-C (Ecosystem credit species)	**Habitat requirements** 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. Feeds on moths and possibly other flying invertebrates. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594 and PCT 531.	**Moderate**. Suitable habitat within subject land. Hollow-bearing trees provide potential roosting habitat.
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	–	BioNet	**Habitat requirements** Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures. Usually solitary but also recorded roosting communally, probably insectivorous.	Low. Species occurs east of the Great Dividing Range.
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	–	BioNet	**Habitat requirements** Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Breeding or roosting colonies can number from 100 to 150,000 individuals. Hunt in forested areas, catching moths and other flying insects above the treetops.	**Recorded**. No potential roosting habitats were recorded within the subject land.
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	BioNet BAM-C PMST	**Habitat requirements** 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. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592 PCT 594 and PCT 531.	**Recorded**. Species known from Leard State Forest and previously captured within and immediately adjacent to the subject land.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	BioNet BAM-C PMST	**Habitat requirements** Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594, PCT 531.	Low. Potential foraging habitat within subject land, however this species is not known to inhabit this area. No records of the species in the broader locality.

Scientific Name	Common Name	BC Act	EPBC Act	Source	Habitat Suitability	Likelihood of Occurrence
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	–	BioNet BAM-C	**Habitat requirements** Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Breeding has been recorded from December to mid-March, when a single young is born. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594 and PCT 531.	**Recorded**. Hollow-bearing trees provide potential roosting habitat.
Vespadelus troughtoni	Eastern Cave Bat	V	–	BioNet BAM-C	**Habitat requirements** Very little is known about the biology of this uncommon species. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest. Little is understood of its feeding or breeding requirements or behaviour.	**Recorded**. No potential roosting habitats occur within the subject land.
Birds						
Anthochaera phrygia	Regent Honeyeater	CE	CE	BAM-C PMST	**Habitat requirements** The Regent Honeyeater is a flagship threatened woodland bird whose conservation will benefit a large suite of other threatened and declining woodland fauna. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 588, PCT 592 and PCT 594.	**Moderate**. Potential foraging habitat occurred in the subject land but this species is not known to inhabit this area. Despite detailed target surveys, this species was not recorded. The subject land is not mapped on the Important Habitat Map for Regent Honeyeater.
Aphelocephala leucopsis	Southern Whiteface	V	V	BioNet PMST BAM-C	**Habitat requirements** Southern whitefaces live in a wide range of open woodlands and shrublands where there is an understorey of grasses or shrubs, or both. These areas are usually in habitats dominated by acacias or eucalypts on ranges, foothills and lowlands, and plains. Southern whiteface forage almost exclusively on the ground, favouring habitat with low tree densities and a herbaceous understorey litter cover. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 588 and PCT 592.	Low. No suitable habitat recorded within the subject land. This species' is an open country bird and habitat associated with the site does not contain an open habitat structure frequented by this species. The species has been recorded at several sites in the wider locality, but those habitats are consistently very open in structure. The forested nature of vegetation, considering tree and shrub densities in the subject land prevent this species' occupation.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	–	BioNet BAM-C	**Habitat requirements** Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forests or rainforests. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594 and PCT 531.	**Recorded**.

Scientific Name	Common Name	BC Act	EPBC Act	Source	Habitat Suitability	Likelihood of Occurrence
Botaurus poiciloptilus	Australasian Bittern	E	E	PMST	**Habitat requirements** In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (Typha spp.) and spikerushes (Eleocharis spp.). Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds. **Habitat within the subject land (BAM-C)** No predicted habitats assigned through BAM-C.	Low. No suitable habitats occur within the subject land.
Calidris ferruginea	Curlew Sandpiper	E	CE	PMST	**Habitat requirements** 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. mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes, and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters. **Habitat within the subject land (BAM-C)** No predicted habitats assigned through BAM-C.	Low. Suitable habitat does not occur in the subject land.
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	V	V	BioNet BAM-C PMST	**Habitat requirements** 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. Feeds almost exclusively on the seeds of several species of sheoak (Casuarina and Allocasuarina species), shredding the cones with the massive bill.	Low. Suitable habitat does not occur in the subject land and the species was not recorded during targeted survey.
Chthonicola sagittata	Speckled Warbler	V	–	BioNet BAM-C	**Habitat requirements** The Speckled Warbler lives in a wide range of 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. Large, relatively undisturbed remnants are required for the species to persist in an area. The diet consists of seeds and insects, with most foraging taking place on the ground around tussocks and under bushes and trees. Pairs are sedentary and occupy a breeding territory of about ten ha, with a slightly larger home-range when not breeding. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594 and PCT 531.	**Recorded**.
Circus assimilis	Spotted Harrier	V	–	BioNet BAM-C	**Habitat requirements** It occurs in grassy open woodland, including mallee remnants, inland riparian woodland, grassland, and shrub-steppe. It is found most commonly in native grassland but also occurs in agricultural land, foraging over open habitats, including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn), with young remaining in the nest for several months. Preys on terrestrial mammals (e.g., bandicoots, bettongs, and rodents), birds and reptiles, occasionally insects and rarely carrion. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 588, PCT 592, PCT 594 and PCT 531.	Low. The subject land is unlikely to provide suitable habitat for this species.

Scientific Name	Common Name	BC Act	EPBC Act	Source	Habitat Suitability	Likelihood of Occurrence
Climacteris picumnus victoriae	Brown Treecreeper	V	V	BioNet BAM-C PMST	**Habitat requirements** 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. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594, and PCT 531.	**Moderate**. Although this species is known from Leard State Forest, the ironbark dominated communities present limit the suitability of habitat recorded in the subject land. However, the occasional use of these habitats cannot be entirely discounted. Whilst the species retains a metapopulation in Leard State Forest, particularly where White Box communities dominate, and the species' presence cannot be considered as completely improbable, the open forest structure and tree and shrub density in the subject land place strong limitations on this species habitation.
Daphoenositta chrysoptera	Varied Sittella	V	–	BioNet BAM-C	**Habitat requirements** Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years. A generation length is estimated to be five years. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594 and PCT 531.	**Recorded**.
Ephippiorhynchus asiaticus	Black-necked Stork	E	–	BioNet	**Habitat requirements** Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries. Storks usually forage in water 5-30cm deep for vertebrate and invertebrate prey. Eels regularly contribute the greatest biomass to their diet, but they feed on a wide variety of animals, including other fish, frogs and invertebrates (such as beetles, grasshoppers, crickets and crayfish). Black-necked Storks build large nests high in tall trees close to water. Trees usually provide clear observation of the surroundings and are at low elevation (reflecting the floodplain habitat). In NSW, breeding activity occurs May–January; incubation May–October; nestlings July–January; fledging from September. Parents share nest duties and in one study about 1.3–1.7 birds were fledged per nest. The NSW breeding population has been estimated at about 75 pairs. Territories are large and variable in size. They have been estimated to average about 9,000 ha, ranging from 3,000 to 6,000 ha in high quality habitat and 10,000 to 15,000ha in areas where habitat is poor or dispersed.	Low. No suitable habitats occur within the subject land.
Falco hypoleucos	Grey Falcon	V	V	PMST	**Habitat requirements** 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. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey. **Habitat within the subject land (BAM-C)** No predicted habitats assigned through BAM-C.	Low. No suitable habitat recorded in the subject land and species not recorded previously in the broader locality.

Scientific Name	Common Name	BC Act	EPBC Act	Source	Habitat Suitability	Likelihood of Occurrence
Falco subniger	Black Falcon	V	–	BioNet BAM-C	**Habitat requirements** Limited information is available on habitat requirements for this species. **Distribution** The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. Some reports of 'Black Falcons' on the tablelands and coast of New South Wales are likely to be referable to the Brown Falcon. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kilometres (Marchant & Higgins 1993). The Black Falcon occurs as solitary individuals, in pairs, or in family groups of parents and offspring (OEH, 2024). **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 592.	**Moderate**. The subject land is likely to provide habitat for this species.
Glossopsitta pusilla	Little Lorikeet	V	–	BioNet BAM-C	Forages primarily in the canopy of open forest and woodland, yet also finds food in Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g., paddocks, roadside remnants and urban trees also help sustain viable populations of the species. Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards;3. Gregarious, travelling and feeding in small flocks (<10), though often with other lorikeets. Flocks numbering hundreds are still occasionally observed and may have been the norm in past centuries. Roosts in treetops, often distant from feeding areas. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Entrance is small (3 cm) and usually high above the ground (2–15 m). These nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees often chosen, including species like Nesting season extends from May to September. In years when flowering is prolific, Little Lorikeet pairs can breed twice, producing 3–4 young per attempt. However, the survival rate of fledglings is unknown. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594 and PCT 531.	**Recorded**.
Grantiella picta	Painted Honeyeater	V	V	BioNet BAM-C PMST	**Habitat requirements** 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. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, sheoak, paperbark or mistletoe branches. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594, and PCT 531.	**Moderate**. The subject land provides potential foraging habitat for this species.
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	–	BAM-C	**Habitat requirements** Habitats are characterised by the presence of large areas of open water, including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 588, PCT 592, PCT 594 and PCT 531.	Low. The subject land provided limited habitat for this species and it was not recorded during targeted survey.

Scientific Name	Common Name	BC Act	EPBC Act	Source	Habitat Suitability	Likelihood of Occurrence
Hieraaetus morphnoides	Little Eagle	V	–	BioNet BAM-C	**Habitat requirements** Occupies open eucalypt forest, woodland or open woodland. Sheoak or woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Lays two or three eggs during spring and young fledge in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594 and PCT 531.	**Recorded**.
Hirundapus caudacutus	White-throated Needletail	V	V	BioNet BAM-C PMST	**Habitat requirements** Widespread in eastern and south-eastern Australia. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. It is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional. **Habitat Description** Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. They also commonly occur over heathland, but less often over treeless areas, such as grassland or swamps. When flying above farmland, they are more often recorded above partly cleared pasture, plantations or remnant vegetation at the edge of paddocks. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 588, PCT 462, PCT 592, PCT 594, and PCT 531.	**High**. A summer migratory species intermittently observed foraging over canopies of Leard State Forest. Unlikely to roost in woodland habitats, although the species has been recorded as roosting in the Pilliga to the west on at least one occasion.
Lathamus discolor	Swift Parrot	E	CE	BioNet BAM-C PMST	**Habitat requirements** Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south-west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany (Eucalyptus robusta), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*). Commonly used lerp infested trees include Inland Grey Box (*E. macrocarpa*), Grey Box (*E. moluccana*) and Blackbutt (*E. pilularis*). **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594, and PCT 531	**Moderate**. Swift Parrot has been recorded foraging on White Box blossom in Leard State Forest during profuse flowering events and the species use of marginal foraging habitat recorded in the subject land cannot be discounted.
Leipoa ocellata	Malleefowl	E	V	PMST	**Habitat requirements** 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. 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. **Habitat within the subject land (BAM-C)** No predicted habitats assigned through BAM-C.	Low. Lack of suitable habitat in the subject land. No records in locality.

Scientific Name	Common Name	BC Act	EPBC Act	Source	Habitat Suitability	Likelihood of Occurrence
Lophochroa leadbeateri leadbeateri	Major Mitchell's Cockatoo	V	E	PMST	**Habitat requirements** In NSW it is found regularly as far east as about Bourke and Griffith, and sporadically further east than that. Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines. Nesting in tree hollows occurs throughout the second half of the year; nests are at least 1 km apart, with no more than one pair every 30 km^2. Breeding habitat occurs in the form of living or dead tree with hollows greater than 10 cm diameter. **Habitat within the subject land (BAM-C)** No predicted habitats assigned through BAM-C.	Low. Lack of suitable habitat in the subject land. No records in locality.
Lophoictinia isura	Square-tailed Kite	V	–	BioNet BAM-C	**Habitat requirements** Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. 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. Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. Appears to occupy large hunting ranges of more than 100 km^2. Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594 and PCT 531.	**Moderate**. The subject land provides potential habitat for this species.
Melanodryas cucullata cucullata	South-eastern Hooded Robin	E	E	BioNet BAM-C PMST	**Habitat requirements** 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. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594 and PCT 531.	**Moderate**. Although this species is known from the periphery of Leard State Forest, where preferred open grassy woodland habitats prevail, the ironbark dominated communities present limit the suitability of habitat recorded in the subject land. Whilst, the occasional use of these habitats cannot be entirely discounted and the species' presence cannot be considered as completely improbable, the open forest structure and tree and shrub density in the subject land place strong limitations on this species' habitation.
Melithreptus gularis gularis	Black-chinned Honeyeater	V	–	BioNet BAM-C	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*E. sideroxylon*) White Box (*E. albens*) Inland Grey Box (*E. macrocarpa*) 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. A gregarious species usually seen in pairs and small groups of up to 12 birds. Feeding territories are large making the species locally nomadic. Recent studies have found that the Black-chinned Honeyeater tends to occur in the largest woodland patches in the landscape as birds forage over large home ranges of at least 5 ha. Moves quickly from tree to tree, foraging rapidly along outer twigs, underside of branches and trunks, probing for insects. Nectar is taken from flowers, and honeydew is gleaned from foliage. Breeds solitarily or co-operatively, with up to five or six adults, from June to December. The nest is placed high in the crown of a tree, in the uppermost lateral branches, hidden by foliage. It is a compact, suspended, cup-shaped nest. Two or three eggs are laid and both parents and occasionally helpers feed the young. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 592 and PCT 531.	**Moderate**. The subject land provides potential habitat for this species.

Scientific Name	Common Name	BC Act	EPBC Act	Source	Habitat Suitability	Likelihood of Occurrence
Neophema chrysostoma	Blue-winged Parrot	V	V	BioNet PMST	**Habitat requirements** Blue-winged Parrots inhabit a range of habitats, including coastal, sub-coastal and inland areas, through to semi-arid zones, where they prefer grasslands and grassy woodlands. They are often found near wetlands and also occupy altered environments, such as paddocks, airfields and golf courses. **Habitat within the subject land (BAM-C)** No predicted habitat assigned through BAM-C.	Low. No preferred habitat associated with the subject land and no records in the locality.
Neophema pulchella	Turquoise Parrot	V	–	BioNet BAM-C	**Habitat requirements** Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. 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. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594 and PCT 531.	**Recorded**.
Ninox connivens	Barking Owl	V	–	BioNet BAM-C	**Habitat requirements** 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 and species. During nesting season, the male perches in a nearby tree overlooking the hollow entrance. Preferentially hunts small arboreal mammals such as Squirrel Gliders and Common Ringtail Possums, but when loss of tree hollows decreases these prey populations the owl becomes more reliant on birds, invertebrates and terrestrial mammals such as rodents and rabbits. Can catch bats and moths on the wing, but typically hunts by sallying from a tall perch.	**Moderate**. The subject land provides potential habitat for this species. Although this species was not recorded during targeted survey, it is known from the Leard State Forest and the subject land is likely to form part of a larger home range.
Petroica boodang	Scarlet Robin	V	–	BioNet BAM-C	**Habitat requirements** The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. The Scarlet Robin breeds on ridges, hills and foothills of the western slopes, the Great Dividing Range and eastern coastal regions; this species is occasionally found up to 1000 metres in altitude. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594 and PCT 531.	Low to moderate. The subject land provides limited potential habitat for this species.
Petroica phoenicea	Flame Robin	V	–	BioNet BAM-C	**Habitat requirements** Breeds in upland tall, moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. The ground layer of the breeding habitat is dominated by native grasses, and the shrub layer may be either sparse or dense. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgelands at high altitudes. In winter, birds migrate to drier more open habitats in the lowlands (i.e., valleys below the ranges, and to the western slopes and plains). In winter lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees. In winter, occasionally seen in heathland or other shrublands in coastal areas. Birds forage from low perches, from which they sally or pounce onto small invertebrates which they take from the ground or off tree trunks, logs and other coarse woody debris. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 592 and PCT 531.	Low to moderate. The subject land provides limited potential habitat for this species.

Scientific Name	Common Name	BC Act	EPBC Act	Source	Habitat Suitability	Likelihood of Occurrence
Polytelis swainsonii	Superb Parrot	V	V	PMST	**Habitat requirements** Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. 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. May forage up to 10 km from nesting sites, primarily in grassy box woodland. **Habitat within the subject land (BAM-C)** No predicted habitat.	Low. No preferred habitat recorded in the subject land and no records in the broader locality.
Pomatostomus temporalis temporalis	Grey-crowned Babbler	V	–	BioNet	**Habitat requirements** Inhabits open Box-Gum Woodlands on the slopes and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions. Nests are usually located in shrubs or sapling eucalypts, although they may be built in the outermost leaves of low branches of large eucalypts. Nests are maintained year-round, and old nests are often dismantled to build new ones.	Low to moderate. The subject land provides limited potential habitat for this species.
Rostratula australis	Australian Painted Snipe	E	E	PMST	**Habitat requirements** 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. The nest consists of a scrape in the ground, lined with grasses and leaves. Breeding is often in response to local conditions; generally occurs from September to December.	Low. The subject land is unlikely to provide habitat for this species.
Stagonopleura guttata	Diamond Firetail	V	V	BioNet BAM-C PMST	**Habitat requirements** 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. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum (*Eucalyptus pauciflora*) Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 592, PCT 594, PCT 588, PCT 462 and PCT 531.	**Moderate**. This species prefers grassy woodland habitats where its preferred foraging plants occur, and while much of the habitat within the subject land preclude its existence by the dominance of shrubby understories, there are small grassy areas that may provide foraging resources for this species.
Tyto novaehollandiae	Masked Owl	V	–	BioNet BAM-C	**Habitat requirements** 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. The typical diet consists of tree-dwelling and ground mammals, especially rats.	**Moderate**. The subject land provides potential habitat for this species.
Calidris acuminata	Sharp-tailed Sandpiper	–	V, M	PMST	**Habitat requirements** Occurs in a variety of habitats: tidal mudflat, mangrove swamps, saltmarshes, shallow fresh, brackish, salt inland swamps and lakes; flooded and irrigated paddocks, sewage farms and commercial saltfields. **Habitat within the subject land (BAM-C)** No predicted habitats assigned through BAM-C.	Low. Suitable habitat does not occur in the subject land.
Gallinago hardwickii	Latham's Snipe	–	V, M	PMST	**Habitat requirements** Occurs in freshwater or brackish wetlands generally near protective vegetation cover. This species feeds on small invertebrates, seeds and vegetation. It migrates to the northern hemisphere to breed.	Low. Suitable habitat does not occur in the subject land.

Scientific Name	Common Name	BC Act	EPBC Act	Source	Habitat Suitability	Likelihood of Occurrence
Marsupials						
Aepyprymnus rufescens	Rufous Bettong	V	–	BAM-C	**Habitat requirements** Rufous Bettongs inhabit a variety of forests, from tall, moist eucalypt forests to open woodland, with a tussock grass understorey. A dense cover of tall native grasses is the preferred shelter. They sleep during the day in cone-shaped nests constructed of grass in a shallow depression at the base of a tussock or fallen log. At night, they feed on grasses, herbs, seeds, flowers, roots, tubers, fungi, and insects.	Low. This species was not recorded during targeted survey.
Cercartetus nanus	Eastern Pygmy-possum	V	–	BAM-C	**Habitat requirements** 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. They may occupy small patches of vegetation in fragmented landscapes and although the species prefers habitat with a rich shrub understory, they are known to occur in grassy woodlands and the presence of Eucalypts alone is sufficient to support populations in low densities	**Moderate**. The subject land provides potential habitat for this species.
Dasyurus maculatus maculatus	Spotted-tailed Quoll	V	E	PMST	**Habitat requirements** Found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. 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. Females occupy home ranges up to about 750 ha and males up to 3,500 ha. Are known to traverse their home ranges along densely vegetated creeklines. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594 and PCT 531.	**Moderate**. Suitable habitat recorded in the subject land.
Macropus dorsalis	Black-striped Wallaby	E	–	BAM-C	**Habitat requirements** Preferred habitat is characterised by dense woody or shrubby vegetation within three metres of the ground. This dense vegetation must occur near a more open, grassy area to provide suitable feeding habitat. On the north-west slopes, associated with dense vegetation, including brigalow, ooline and semi-evergreen vine thicket. On the north coast, closely associated with dry rainforest but also occur in moist eucalypt forest with a rainforest understorey or a dense shrub layer. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594 and PCT 531.	Low. Not recorded during targeted survey.
Petaurus australis	Yellow-bellied Glider	V	V	BAM-C	**Habitat requirements** The Yellow-bellied Glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. It occurs in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils, feeding on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. They live in small family groups of two to six individuals, are nocturnal and den in hollows of large trees. Yellow-bellied Gliders are very mobile and occupy large home ranges between 20 and 85 ha to encompass dispersed and seasonally variable food resources. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594	Low. Not recorded during targeted survey.

Scientific Name	Common Name	BC Act	EPBC Act	Source	Habitat Suitability	Likelihood of Occurrence
Petaurus norfolcensis	Squirrel Glider	V	–	BioNet BAM-C	**Habitat requirements** 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. Live in family groups of a single adult male one or more adult females and offspring. Require abundant tree hollows for refuge and nest sites. Diet varies seasonally and consists of gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.	**Moderate**. The subject land provides potential habitat for this species and the species has previously been recorded in the Leard State Forest.
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	BioNet BAM-C	**Habitat requirements** Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Shelter or bask during the day in rock crevices, caves and overhangs and are most active at night when foraging. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462.	Low. Preferred habitat (i.e., rocky escarpments, outcrops and cliffs) not associated with the subject land and there are no records for the species in the locality.
Phascolarctos cinereus	Koala	E	E	BioNet PMST BAM-C	**Habitat requirements** Inhabit eucalypt woodlands and forests. 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. Some preferred species include Forest Red Gum, Grey Gum. In coastal areas, Tallowwood and Swamp Mahogany are important food species, while in inland areas White Box, Bimble Box and River Red Gum are favoured. Home range size varies with quality of habitat, ranging from less than two ha to several hundred ha in size. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 462, PCT 588, PCT 592, PCT 594 and PCT 531.	**Moderate**. Previously recorded in Leard State Forest in association with fertile grassy woodlands. Potential habitat recorded in the subject land.
Reptiles						
Anomalopus mackayi	Five-clawed Worm-skink	E	V	PMST	**Habitat requirements** Suitable habitats consist of grassland and woodlands on alluvial, cracking clay soils or self-mulching, friable basalt soils n New South Wales. **Habitat within the subject land (BAM-C)** No predicted habitat in the subject land.	Low. The subject land occurs outside the modelled distribution of the Five-clawed Worm-skink, as presented in the Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles, and preferred habitats do not occur therein.
Aprasia parapulchella	Pink-tailed Worm-lizard	V	V	PMST BAM-C	**Habitat requirements** Favours forest and woodland areas with boulders, rock slabs, fallen timber and deep leaf litter. Occupied sites often have a dense tree canopy that helps create a sparse understorey. Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks; the burrows have been constructed by and are often still inhabited by small black ants and termites. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 599 and PCT 1383.	Low. Outside the known distribution for this species. No records within locality and targeted searches of the subject land did not record the species.

Scientific Name	Common Name	BC Act	EPBC Act	Source	Habitat Suitability	Likelihood of Occurrence
Hemiaspis damelii	Grey Snake	E	E	PMST	**Habitat requirements** The Grey Snake's habitat in northern inland NSW is largely unknown; however, Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions and Brigalow woodlands and associated waterbodies are probable, as these habitats are similar the species' known habitat in Queensland. Key attributes of Grey Snake habitat are the floodplains and ephemeral wetlands that provide breeding habitat for the frog species that constitute their main prey item, and the heavy clay soils which provide cracks and crevices that the species uses for foraging and shelter. **Habitat within the subject land (BAM-C)** No predicted habitat in the subject land.	Low. Preferred habitat does not occur in the subject land.
Hoplocephalus bitorquatus	Pale-headed Snake	V	–	BioNet BAM-C	**Habitat requirements** The Pale-headed Snake is a highly cryptic species that can spend weeks at a time hidden in tree hollows. It is found mainly in dry eucalypt forests and woodlands, cypress forests, and occasionally in rainforest or moist eucalypt forests. In drier environments, it appears to favour habitats close to riparian areas. During the day, it shelters between loose bark and tree trunks or in hollow trunks and limbs of dead trees.	**Moderate**. The subject land provides potential habitat for this species and the species is known from the Leard State Forest.
Uvidicolus sphyrurus	Border Thick-tailed Gecko	V	V	PMST BAM-C	**Habitat requirements** As implied by another of its common names (Granite Thick-tailed Gecko), this species often occurs on steep rocky or scree slopes, especially granite. Recent records from basalt and metasediment slopes and flats indicate its habitat selection is broader than formerly thought and may have extended into areas that were cleared for agriculture. Favours forest and woodland areas with boulders, rock slabs, fallen timber and deep leaf litter. Occupied sites often have a dense tree canopy that helps create a sparse understorey. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 592, PCT 594, PCT 588, PCT 462 and PCT 531.	**Moderate**. Marginal habitat within subject land. Subject land lacks preferred habitat of steep rocky or scree slopes with presence of granite. Species not recorded during targeted survey.
Rodents						
Pseudomys pilligaensis	Pilliga Mouse	V	V	BAM-C	**Habitat requirements** Within the Pilliga region this species is largely restricted to low-nutrient deep sand soils which are recognised as supporting a distinctive vegetation type referred to as the Pilliga Scrub. Recent studies indicate that the Pilliga Mouse is found in greatest abundance in recently burnt moist gullies, areas dominated by broombush and areas containing an understorey of kurricabah (*Acacia burrowii*) with a bloodwood (*Corymbia trachyphloia*) overstorey. Consistent features of the latter two habitats were: a relatively high plant species richness; a moderate to high density of low-level shrub cover; and a moist groundcover of plants, litter and fungi. The gully where the highest rates of capture were encountered had an extensive cover of low grasses and sedges, with little shrub cover and large areas of ash-covered ground. **Habitat within the subject land (BAM-C)** Predicted habitat in PCT 592 and PCT 594.	Low. Preferred habitat not associated with the subject land and there are no records for the species in the locality.

Notes: some species returned from the database searches such as turtles, fish, sharks and pelagic birds have been excluded from this assessment, as the study area does not provide any habitat for these species.

Distribution and habitat requirement information adapted from Australian Government Department of Agriculture, Water and the Environment SPRAT http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl and NSW Environment and Heritage Threatened Species Data Collection https://www.environment.nsw.gov.au/threatenedspeciesapp/

Key: EP = endangered population, CE = critically endangered, E = endangered, V = vulnerable, M = migratory.

Table B.2 Likelihood of occurrence for flora species

Scientific name	Common Name	BC Act	EPBC Act[1]	SAII	Source[2]	Habitat Suitability[3]	Likelihood of Occurrence
Bertya opponens	Coolabah Bertya	–	V	Yes	PlantNet	**Habitat Description** Coolabah Bertya occurs in a range of habitats including stony mallee ridges and cypress pine forest on red soils. The wide variation in habitat type between the populations makes the identification of critical habitat very difficult. Consideration of disturbance regimes and grazing management are probably more important to the survival of populations in the long term. Associated species at Jacks Creek State Forest include *Eucalyptus chloroclada, Callitris glaucophylla* and *Eucalyptus fibrosa*. **Habitat within the subject land** Associated PCTs in the form of PCT 594, PCT 592, PCT 588 in the subject land.	Low. Despite associated PCTs, the subject land occurs outside the species known distribution (nearest records at the Pilliga).
Cadellia pentastylis	Ooline	V	V	No	PMST PlantNet	**Habitat Description** Forms a closed or open canopy mixing with eucalypt and cypress pine species. There appears to be a strong correlation between the presence of Ooline and low- to medium-nutrient soils of sandy clay or clayey consistencies, with a typical soil profile having a sandy loam surface layer, grading from a light clay to a medium clay with depth. **Habitat within the subject land** No associated PCTs recorded within the subject land.	Low. Although recorded in the locality, no suitable habitat occurs within the subject land.
Commersonia procumbens	–	V	V	No	PlantNet	**Habitat requirements** Grows in sandy sites, often along roadsides, and is mainly confined to the Dubbo-Mendooran-Gilgandra region, but also known in the Pilliga, Mount Kaputar National Park, north east of Gulgong and near Denmen. Additional populations have been found in Goonoo SCA in response fires. Recorded from *Eucalyptus dealbata* and *Eucalyptus sideroxylon* communities, *Melaleuca uncinate* scrub, under mallee eucalypts with a *Calytrix tetragona* understorey, and in a recently burnt Ironbark and Callitris area. Also recorded from *Eucalyptus fibrosa* subsp. *nubila*, *Eucalyptus dealbata*, *Eucalyptus albens* and *Callitris glaucophylla* woodlands north of Dubbo. **Habitat within the subject land** Associated PCTs in the form of PCT 594, PCT 592, PCT 531 in the subject land.	Low. Despite associated PCTs, the subject land occurs outside the species known distribution (nearest records in the Pilliga and at Mount Kaputar National Park).
Dichanthium setosum	Bluegrass	V	V	No	BAM-C PMST PlantNet BioNet	**Habitat requirements** Associated with heavy basaltic black soils and red-brown loams with clay subsoil. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. It is often collected from disturbed open grassy woodlands on the northern tablelands, where the habitat has been variously grazed, nutrient-enriched and water-enriched. Associated species include *Eucalyptus albens, Eucalyptus melanophloia, Eucalyptus melliodora, Eucalyptus viminalis, Myoporum debilis, Aristida ramosa, Themeda triandra, Poa sieberiana, Bothriochloa ambigua, Leptorhynchos squamatus, Lomandra* aff. *longifolia, Ajuga australis, Calotis hispidula and Austrodanthonia, Dichopogon, Brachyscome, Vittadinia, Wahlenbergia* and *Psoralea* species. **Habitat constraints** Associated PCTs in the form of PCT 594, PCT 592, PCT 588 in the subject land. Preferred habitat generally absent from the subject land.	Low. Despite associated PCTs and records in the broader locality, the subject land does not contain habitat preferred by the species (i.e., heavy basaltic soils, disturbed pasture and grassy woodlands). Rather the subject land occurs on skeletal soils that have poor nutrient content which are unlikely to provide suitable habitat for the species. Further, the species has not been recorded in similar habitats previously within Leard State Forest despite extensive surveys having been completed over the past decade.

Scientific name	Common Name	BC Act	EPBC Act[1]	SAII	Source[2]	Habitat Suitability[3]	Likelihood of Occurrence
Eriocaulon australasicum	Austral Pipewort	–	E	Yes	PlantNet	**Habitat Description** Known in NSW from widely separated populations: a very early "Murray River" collection and recent collections near Braidwood and in the Pilliga. Type habitat described as "wet places along the Murray towards junction of Murrumbidgee". In populations near Braidwood and in the Pilliga, it grows in mud in ephemeral water bodies. **Habitat within the subject land** No associated PCTs recorded within the study area.	Low. No potential habitat recorded and species has not been recorded in the locality. subject land occurs outside the species known distribution.
Euphrasia arguta	–	CE	CE	Yes	PMST	**Habitat Description** *Euphrasia arguta* was rediscovered in the Nundle area of the NSW north western slopes and tablelands in 2008. Prior to this, it had not been collected for 100 years. Historic records of the species noted the following habitats: 'in the open forest country around Bathurst in sub humid places', 'on the grassy country near Bathurst', and 'in meadows near rivers'. Plants from the Nundle area have been reported from eucalypt forest with a mixed grass and shrub understorey; here, plants were most dense in an open disturbed area and along the roadside, indicating the species had regenerated following disturbance. **Habitat within the subject land** No associated PCTs recorded within the subject land.	Low. No potential habitat recorded. The species is not known from the locality and has not been recorded in the Brigalow Belt South IBRA bioregion (EES species profile).
Homopholis belsonii	Belson's Panic	E	V	No	PMST PlantNet	**Habitat Description** It occurs on the northwest slopes and plains of NSW, mostly between Wee Waa, Goondiwindi and Glen Innes. It also occurs in Queensland, mainly in the Brigalow Belt South bioregion. Grows in dry woodland (e.g., Belah) often on poor soils, although sometimes found in basalt-enriched sites north of Warialda and in alluvial clay soils. **Habitat constraints** No associated PCTs recorded within the subject land.	Low. No potential habitat recorded and the subject land occurs outside the species known distribution (known from Narrabri region north to QLD, except for one isolated record at Manilla).
Lepidium aschersonii	Spiny Peppercress	V	V	No	BAM-C PlantNet BioNet	**Habitat Description** Found on ridges of gilgai clays dominated by Brigalow (*Acacia harpophylla*), Belah (*Casuarina cristata*), Buloke (*Allocasuarina luehmanii*) and Grey Box (*Eucalyptus microcarpa*). In the south has been recorded growing in Bull Mallee (*Eucalyptus behriana*). Often the understorey is dominated by introduced plants. The species grows as a component of the ground flora, in grey loamy clays. Vegetation structure varies from open to dense, with sparse grassy understorey and occasional heavy litter. **Habitat within the subject land** No associated PCTs or preferred habitat (i.e., grey loamy gilgai clays) recorded within the subject land.	Low. Despite recent records in the locality, the subject land did not contain any associated PCTs and no preferred habitat was recorded therein.
Lepidium monoplocoides	–	E	E	No	PMST PlantNet	**Habitat Description** 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. **Habitat within the subject land** No associated PCTs or preferred habitat recorded within the subject land.	Low. No suitable habitat recorded and subject land outside species known distribution.

Scientific name	Common Name	BC Act	EPBC Act[1]	SAII	Source[2]	Habitat Suitability[3]	Likelihood of Occurrence
Lepidium peregrinum	Wandering Peppercress	–	E	Yes	PlantNet	**Habitat Description** Thought to be extinct until recently rediscovered in NSW and Queensland. Targeted searches conducted in 2001 confirmed the species occurs in scattered refugia in north-eastern NSW (near Tenterfield) and south-eastern Queensland. Occurs in an open riparian forest on the banks of the Tenterfield creek at Clifton. Sandy alluvium is the main soil type at the site. Associated species at the Clifton site are dominated by *Eucalyptus camaldulensis* and *Casuarina cunninghamiana,* with a variably dense shrubby understorey. **Habitat within the subject land** No associated PCTs or preferred habitat (i.e., sandy alluvium soils in open riparian forest) recorded within the subject land.	Low. No suitable habitat recorded and subject land outside species known distribution (known only from the Tenterfield region in NSW).
Monotaxis macrophylla	Large-leafed Monotaxis	E	–	No	BAM-C	**Habitat Description** The distribution and supposed rarity of *Monotaxis macrophylla* within NSW is related to the occurrence of fire. At least within NSW, the species has not been found in the absence of fire (NSW Department of Planning and Environment, 2024). There is a great diversity in the associated vegetation within NSW (less though in Queensland), encompassing coastal heath, arid shrubland, forests and montane heath from almost sea level to 1300 m altitude (NSW Department of Planning and Environment, 2024). *Monotaxis macrophylla* displays the properties of a fire ephemeral species in many ways. Germination is stimulated by the passage of fire, individual plants have a short life span, a large biomass is produced in a short period of time, flowering occurs shortly after germination, and populations do not persist in the absence of fire (NSW Department of Planning and Environment, 2024). Flowers in August. Plants have a short life span and do not seem to persist longer than six months. Plants germinate, attain heights of up to 50 cm and reach flowering stage within 2 to 3 months (NSW Department of Planning and Environment, 2024). In only a few months after germination, the species was observed to produce a thick sward that dominated the community, yielding a very large biomass in a short time. Many hundreds of plants have been observed growing with *Muehlenbeckia costata* on recently burnt rock outcrops. Plants are recorded as common but localised in populations. In the northern NSW sites, *Monotaxis macrophylla* was locally abundant on outcrops especially where burnt (NSW Department of Planning and Environment, 2024). Grows on rocky ridges and hillsides (NSW Department of Planning and Environment, 2024). **Habitat within the subject land** Associated with all the PCTs recorded within the subject land, 462, 531, 592, 594 and 588.	**Moderate**. The subject land provides potential habitat for this species.
Prasophylum sp. *Wybong*	A leek-orchid	–	CE	No	PMST	**Habitat Description** The species is known from seven populations in open eucalypt woodland and grassland in NSW. The species' area of occupancy is estimated to be 1.5 km^2 with an estimated population sized based on surveys in 2006 of 460 mature individuals. The distribution of this species overlaps with the White Box-Yellow Box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland EPBC Act-listed threatened ecological community. **Habitat within the subject land** Associated PCT's are listed as (in progress) and occur within the subject land PCT 588, 594. Preferred open grassy habitat generally absent from the subject land.	Low. No suitable habitat recorded and subject land outside species known distribution

Scientific name	Common Name	BC Act	EPBC Act[1]	SAII	Source[2]	Habitat Suitability[3]	Likelihood of Occurrence
Pultenaea setulosa	–	–	V	No	PlantNet	**Habitat Description** *Pultenaea setulosa* is confined to Queensland where it occurs in the Marlborough district and south to Rockhampton and Mt Fairview. *Pultenaea setulosa* is restricted to hillsides and ridges with serpentinite soils. It occurs in open eucalypt forest of Red Ironbark (*Eucalyptus fibrosa*), Glen Geddes Bloodwood (*Corymbia xanthope*) and Clarkson's Bloodwood (*Corymbia clarksoniana*).	Not applicable. Although recorded within the Leard State Forest this species is only listed as a threatened species under the EPBC Act in QLD where it is confined to the Marlborough district and south to Rockhampton and Mt Fairview.
Swainsona murrayana	Slender Darling Pea	V	V	No	BAM-C PMST PlantNet	**Habitat Requirements** The species has been collected from clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams. 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. **Habitat within the subject land** No associated PCTs or preferred habitat was recorded in the subject land.	Low. Whilst this species has been recorded within the wider locality no preferred habitat was recorded within the subject land.
Thesium australe	Austral Toadflax	V	V	No	BAM-C PMST	**Habitat requirements** Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*). **Habitat within the subject land** Associated PCT's are listed as (in progress) and occur within the subject land. PCT 588, PCT 594.	Low. Whilst this species has been recorded within the wider locality no preferred habitat was recorded within the subject land.
Tylophora linearis	–	V	E	No	BAM-C PMST PlantNet BioNet	**Habitat Requirements** 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*. **Habitat within the subject land** Associated PCT's are listed as (in progress) and occur within the subject land PCT 462, PCT 588, PCT 592, PCT 594	**Recorded**. Species has previously been recorded in the development footprint in suitable habitat (PCT 462 and PCT 592).
Cyperus conicus	Cyperus conicus	E	–		BAM-C	**Habitat Requirements** It grows in open woodland on sandy soil. Recorded from forest in the Pilliga area, growing in sandy soil with *gracilis*, *C. squarrosus*, and *fulvus*. Interstate habitats include floodplains, creek beds and banks, swamps, run-on areas and various watercourses, near or in dams and bores, and in vegetation communities such as swamps, open Box woodland and sedgelands.	Low.
Digitaria porrecta	Finger Panic Grass	E	–		BioNet	**Habitat Requirements** In NSW, the most frequently recorded associated tree species are *Eucalyptus albens* and *Acacia pendula*. Common associated grasses and forbs in NSW sites include *aristiglumis*, *Enteropogon acicularis*, *Cyperus bifax*, *Hibiscus trionum* and *gracilis*.	Low.
Polygala linariifolia	Native Milkwort	E	–		BAM-C	**Habitat Requirements** Sandy soils in dry eucalypt forest and woodland with a sparse understorey. The species has been recorded from the Inverell and Torrington districts growing in dark sandy loam on granite in shrubby forest of caleyi, *Eucalyptus dealbata* and in yellow podsolic soil on granite in layered open forest. In the Pilliga area, this species has been recorded in Fuzzy Box woodland, White Cypress Pine-Bulloak – Ironbark woodland, Rough-barked Apple riparian forb-grass open forest, and Ironbark – Brown Bloodwood shrubby woodland.	Low.

Scientific name	Common Name	BC Act	EPBC Act[1]	SAII	Source[2]	Habitat Suitability[3]	Likelihood of Occurrence
Diuris tricolor	Pine Donkey Orchid	V	–		BAM-C	**Habitat Requirements** Disturbance regimes are not known, although the species is usually recorded from disturbed habitats. Associated species include *Callitris glaucophylla*, *Eucalyptus populnea*, *Eucalyptus intertexta* Ironbark and shrubland. The understorey is often grassy with herbaceous plants such as species.	Low.
Pomaderris queenslandica	Scant Pomaderris	E	–		BioNet BAM-C	**Habitat Requirements** Found in moist eucalypt forest or sheltered woodlands with a shrubby understorey, and occasionally along creeks.	**Recorded** Species was recorded within the subject land in PCT 592.

Notes: some species returned from the database searches such as turtles, fish, sharks and pelagic birds have been excluded from this assessment, as the study area does not provide any habitat for these species.

Distribution and habitat requirement information adapted from Australian Government Department of Agriculture, Water and the Environment SPRAT http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl and NSW Environment and Heritage Threatened Species Data Collection https://www.environment.nsw.gov.au/threatenedspeciesapp/

Key: EP = endangered population, CE = critically endangered, E = endangered, V = vulnerable, M = migratory

Appendix C

Matters of National Environmental Significance

C1 Introduction

The *Matters of National Environmental Significance Significant Impact Guidelines 1.1 EPBC Act* (Significant Impact Guidelines) is designed to inform proponents who propose to undertake an action (development), to decide whether they should submit a referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW). The purpose of the significant impact assessments is to inform an EPBC Referral to the Commonwealth Minister of Environment to assess MOD 10's eligibility as a controlled action under the EPBC Act. Under the EPBC Act an action will require approval from the Minister if the action has, will have, or is likely to have, a significant impact on an Matters of National Environmental Significance (MNES).

Tests of significance have been conducted for threatened species, populations and communities that were recorded in the subject land during field surveys or were identified as having a moderate or higher potential to occur in the subject land area based on the presence of habitat. Those EPBC Act listed species specifically noted in the SEARs have also been assessed. For threatened biodiversity listed under the EPBC Act, significance assessments have been completed following the Significant Impact Guidelines. The Significant Impact Guidelines state that a 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment that is affected, and upon the intensity, duration, magnitude and geographic extent of the impacts. Importantly, for a significant impact to be likely, it is not necessary for a significant impact to have a greater than 50 per cent chance of happening; it is sufficient if a significant impact on the environment is a real or not remote chance or possibility. If there is scientific uncertainty about the impacts of an action and potential impacts are serious or irreversible, the precautionary principle is applicable.

The Significant Impact Guidelines provide definitions for specific terms used throughout the significant impact assessment criteria contained in the Significant Impact Guidelines as follows:

- population of a species
- important population
- habitat critical to the survival of a species or ecological community
- important habitat for migratory species
- ecologically significant proportion (migratory species)
- population of a migratory species
- invasive species.

These definitions are key considerations when conducting a significant impact assessment for threatened and migratory species listed under the EPBC Act. The definition for each is presented below.

C1.1 Population of a species

A 'population of a species' is defined under the EPBC Act as an occurrence of the species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to:

- a geographically distinct regional population, or collection of local populations, or
- a population, or collection of local populations, that occurs within a particular bioregion.

C1.2 Important population

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

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

C1.3 Habitat critical to the survival of a species or ecological community

'*Habitat critical to the survival of a species*' is defined by the Significant Impact Guidelines as habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to:

- habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or
- habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.

Critical habitat can be further explained as an identified area of viable habitat that contains habitat attributes that are essential for the conservation of a threatened species. These areas are typically under a regime of special protection and management to ensure the critical habitat remains a stronghold for the species to ensure its long-term survival and viability in the wild. Critical habitat may also include an area of land not currently occupied by the species but can act as a sanctuary by possessing the necessary whole of life cycle habitat attributes to facilitate the recovery of a declining population of the species.

C1.4 Important habitat for migratory species

An area of 'important habitat' for a migratory species is:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or
- habitat that is of critical importance to the species at particular life-cycle stages, and/or
- habitat utilised by a migratory species which is at the limit of the species range, and/or
- habitat within an area where the species is declining.

C1.5 Ecologically significant proportion (migratory species)

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an 'ecologically significant proportion' of the population varies with the species (each circumstance will need to be evaluated). Some factors that should be considered include the species' population status, genetic distinctiveness and species-specific behavioural patterns (for example, site fidelity and dispersal rates).

C1.6 Population of a migratory species

'Population', in relation to migratory species, means the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries including Australia.

C1.7 Invasive species

An *'invasive species'* is an introduced species, including an introduced (translocated) native species, which out-competes native species for space and resources or which is a predator of native species. Introducing an invasive species into an area may result in that species becoming established. An invasive species may harm listed threatened species or ecological communities by direct competition, modification of habitat or predation.

C2 Summary of project impacts

C2.1 Summary of project description

Boggabri Coal Mine (BCM) has operated since 2006 and currently operates in accordance with State Significant Development (SSD) 09_0182, which was originally granted for the continuation of operations at the BCM on 18 July 2012 under the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act). The continued mining operations project is also undertaken pursuant to EPBC 2009/5256, which was granted by the then Minister for Sustainability, Environment, Water Population and Communities on 11 February 2013.

The Project Layout of the currently approved mining operations at BCM is shown in Figure 15.4. Figure 15.4 also illustrates the approved Mine Disturbance Boundary (Federal Approval Boundary on Figure 15.4) within the Project Boundary, which encompasses all aspects of the mining operations and associated activities which are currently approved under SSD 09_0182 (as modified) for the BCM.

Boggabri Coal Operations Pty Ltd (BCOPL) (on behalf of Idemitsu Australia Pty Ltd (IA) and its joint venture partners) is seeking to modify its approved mining operations at BCM to recover known coal resources within the approved Project Boundary and to extend mining to the northwest beyond the approved Mine Disturbance Boundary (MOD 10). MOD 10 will entail the recovery of coal down to the base of the Templemore Seam (as is approved as part of EPBC 2021/8875). The mine footprint for MOD 10 does not extend into the "vegetation/biodiversity corridor" as conditioned within SSD 09_0182 and EPBC 2009/5256.

The Proposed Action Boundary, referred to throughout Appendix C, is consistent with the subject land, as defined in the main body of the report. The Proposed Action Boundary is displayed in Figure 15.3 and other figures throughout Section 15 as the subject land.

C2.1.1 Location

The Proposed Action is located in the Gunnedah Basin within the North West Region of NSW. The Proposed Action is situated within the Leard State Forest (used for forestry and mining purposes) approximately 15 km north east of Boggabri, 57 km from Gunnedah and 66 km from Narrabri (being the primary town centres servicing the mining industry within the Gunnedah Basin).

C2.1.2 Key components

The key components of the MOD 10 include:

- an additional 84.48 ha of disturbance in the Proposed Action Boundary (subject land), increasing the total approved mining disturbance at BCM
- mining to the basal Templemore Seam
- recovery of an additional 30 Mt of Run of Mine (ROM) coal at the currently approved production rate, which will produce approximately 25 Mt of additional product coal
- mining life to extend to 2040 (i.e., an additional 4 years from that proposed by Modification 8).

MOD 10 does not propose any disturbance within the 500 m wide Vegetation Corridor between the BCM and MCCM as stipulated within SSD 09_0182 or EPBC 2009/5257. The Proposed Action Boundary or subject land for MOD 10 is displayed in Figure 15.3.

The Proposed Action will allow the continuation of open-cut mining within the mining authorities held for the BCM and remain entirely within the currently approved Project Boundary.

C2.1.3 Construction staging

SSD 09_0182 has been modified on eight separate occasions to date with one modification (Modification 1) being withdrawn. These modifications are described as follows:

- Modification 1 – sought approval for emergency trucking operations, however, this application was subsequently withdrawn.
- Modification 2 – facilitated the processing and associated transport of up to 3 Mtpa of ROM coal from the adjacent TCM as approved in February 2015.
- Modification 3 – enabled construction of a permanent mine access road, use of overburden as a base material for the rail spur embankment, use of an offsite laydown area and use of in-pit fuel storage facilities. Modification 3 was approved in March 2014.
- Modification 4 – adjustment of the project boundary, alterations to existing infrastructure within the mine, facilitate the construction of a security fence and firebreak and use of additional portable fuel storages within operational area. Modification 4 was approved in March 2015.
- Modification 5 – enabled the construction of six bores, two that would supply water for use in the coal process and mining operations and four contingency production bores that would supply water for use at the mine. Modification 5 included ancillary infrastructure required for the bores, such as powerlines, access tracks and water transfer pipelines. Modification 5 was approved in August 2016.
- Modification 6 – facilitated a minor administrative amendment to condition 12, schedule 2 to address the current underutilisation of the Boggabri Rail Spur Line. Modification 6 was approved in July 2017.
- Modification 7 – for the realignment of a small section of the project boundary with TCM, enabled the transport of small tonnages of coal by road for testing and marketing purposes, enabled BCOPL to undertake exploration activities within the approved disturbance area, enabled the use of an approved stockpile dedicated to TCM for its own product coal and allowed biodiversity offsets to be secured through alternative mechanisms. Modification 7 was approved in May 2019.
- Modification 8 – was granted on 22 January 2024 and provided approval for a stepdown in mining operations below the Merriown Coal Seam from 2025 to recover an additional 28.1 Mt of ROM coal, a three-year mine life extension (until the end of 2036), increase in the peak workforce at BCM to be 876 full time equivalent employees, and variations to the previously approved Final Landform Design.
- Modification 9 – was granted on 2 March 2023 to construct new Pre-Shift Infrastructure at a location closer to the active mining area, to utilise a mobile rock crushing facility within the approved Mine Disturbance Boundary and for minor administrative changes.
- Modification 11 – was granted on 19 July 2024 to extend the existing Workshop and Store Facilities at BCM within the approved Mine Infrastructure Area.

C2.1.4 Disturbance area

The Proposed Action is an extension to the existing BCM brownfield site, in a well-established open cut coal mining area within the Leard State Forest. It is located immediately adjacent to the active mining operations at TCM and MCCM, both of which are operated by Whitehaven Coal, and forms part of the BTM Complex.

The Proposed Action Boundary or subject land is be located on land that is outside of the approved disturbance areas at BCM, but is located entirely within the Project Boundary, as defined in EPBC 2009/5256, EPBC 2021/8875, and SSD 09_0182 (as modified).

C2.1.5 Subject land

Under the Narrabri Local Environment Plan 2012 (Narrabri LEP), the whole of the land on which the components of MOD 10 are proposed to be carried out is zoned RU1 (Primary Production) and RU3 (Forestry). All administration, workshop, coal handling and processing, and transport infrastructure associated with the BCM and will continue to be relied upon for the four additional years is located on land zoned RU1 (as currently approved).

The Land Use Table for RU1 land in the Narrabri LEP lists ‘open cut mining’ as permissible with consent. The Land Use Table for RU3 land in the Narrabri LEP states that 'aquaculture’ is permitted with consent. Accordingly, pursuant to clause 2.9(1)(b)(i) of the Resources and Energy SEPP, mining can be carried out with development consent on RU3 land, as ‘aquaculture’ (i.e., ‘agriculture’) is a permissible land use on this land under the Narrabri LEP.

The Proposed Action is therefore consistent with the current land use immediately within and adjacent to the Proposed Action Boundary. The Proposed Action is also entirely consistent with the NSW Government’s intended purpose for the land as recognised by the mining authorities held over the entirety of the Proposed Action Boundary and its land use zoning for development (i.e., Zone 4 – forestry and mining) under the Brigalow and Nandewar Community Conservation Area Act 2005 (BNC Act).

The Proposed Action Boundary is displayed in Figure 15.3 and other figures throughout Section 15 as the subject land.

C2.2 Summary of measures to avoid and minimise

C2.2.1 Project development

The approved operations at the BCM are undertaken in accordance with SSD 09_0182, EPBC 2009/5256, the Environment Protection Licence (EPL), mining tenements, and the Environmental Management System (EMS) which includes various Environmental Management Plans and Strategies. These existing approval documents specify the requirement to prepare and implement a number of management and mitigation measures to ensure that potential impacts from the approved operations are appropriately avoided and/or minimised.

It is envisaged that the current measures in place at BCM will continue to generally be appropriate for the proposed changes sought by the Proposed Action to minimise and manage the impacts on biodiversity resulting from the continuation of mining operations into the Proposed Action Boundary. For example, tree clearing works required in the Proposed Action Boundary or subject land will be undertaken in accordance with Appendix B – Clearing and Fauna Management Procedure as detailed in BCMs approved Biodiversity Management Plan (WSP, 2018b). Ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation/ habitat on or adjacent to the Proposed Action Boundary will also continue to be conducted in accordance with BCMs Rehabilitation Management Plan (RMP) (James Bailey & Associates, 2024) and Biodiversity Management Plan (BMP) (WSP, 2018b). A summary of management plans for BCM is provided in Section 1.5.3.

C2.3 Summary of project impacts

C2.3.1 Threatened species

A likelihood of occurrence assessment for all potential BC Act or EPBC Act listed entities is provided in Appendix B. Based on this detailed assessment, it is considered that the following EPBC Act listed entities had at least a moderate likelihood of occurring within the Proposed Action Boundary:

- *Tylophora linaris*
- *Anthochaera Phrygia* (Regent Honeyeater)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Climacteris picumnus victoriae* (Brown Treecreeper (eastern subspecies))
- *Dasyurus maculatus maculatus* (Spotted-tailed Quoll)
- *Grantiella picta* (Painted Honeyeater)
- *Hirundapus caudacutus* (White-throated Needletail)
- *Lathamus discolor* (Swift Parrot)
- *Melanodryas cucullata cucullata* (South-eastern Hooded Robin)
- *Nyctophilus corbeni* (Corben's Long-eared Bat)
- *Phascolarctos cinereus* (Koala)
- *Stagonopleura guttata* (Diamond Firetail)
- *Uvidicolus sphyrurus* (Border Thick-tailed Gecko).

In terms of the BAM, a summary of impacts to ecosystem credit threatened species are presented in Table C.1. A summary of species credit impacts is summarised in Table C.2 and Table C.3.

Table C.1 Summary of project impacts on ecosystem credit MNES threatened species

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Regent Honeyeater (foraging)	*Anthochaera phrygia*	CE	CE	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 588, 592, 594	High
Southern Whiteface	*Aphelocephala leucopsis*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 588, 592	Moderate
South-eastern Glossy Black-Cockatoo (foraging)	*Calyptorhynchus lathami lathami*	V	V	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	Habitat constraint: Allocasuarina and Casuarina species did not occur in the subject land.	Not applicable	High
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	High
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	Moderate

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Painted Honeyeater	*Grantiella picta*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	Moderate
White-throated Needletail	*Hirundapus caudacutus*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	High
Swift Parrot (foraging)	*Lathamus discolor*	E	CE	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	Moderate
South-eastern Hooded Robin	*Melanodryas cucullata cucullata*	E	E	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	Moderate
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☒ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	High

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Yellow-bellied Glider	*Petaurus australis*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	This species has been excluded as it does not occur in the Leard State Forest. A review of the NSW BioNet Atlas indicates that the closest records occur greater than 100 km from the subject land to the north-east (Copeton, NSW) and south-east (Wallabahdah, NSW). In 16 years of construction activities supervised by experienced ecologists in the Leard State Forest, this species has not been recorded.	PCTs 462, 588, 592, 594	High
Pilliga Mouse	*Pseudomys pilligaensis*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 592, 594	High
Grey-headed Flying-fox (foraging)	*Pteropus poliocephalus*	V	V	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	High

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID	Sensitivity to gain class
		BC Act	EPBC Act						
Diamond Firetail	*Stagonopleura guttata*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCTs 462, 531, 588, 592, 594	Moderate

Table C.2 Summary of project impacts on flora species credit MNES threatened species

Common name	Scientific name	Listing status		Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act				
Bluegrass	*Dichanthium setosum*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 531, 588, 592, 594
Austral Toadflax	*Thesium australe*	V	V	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	Species retained.	PCT 588, 594
Tylophora linearis	*Tylophora linearis*	V	E	☒ BAM-C ☐ TBDC ☒ Previous survey ☒ Current survey	Yes	Species retained.	PCT 462, 531, 588, 592, 594

Table C.3 Summary of project impacts on fauna species credit MNES threatened species

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Regent Honeyeater (breeding)	*Anthochaera phrygia*	CE	CE	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	1 Geographic limitations – N/A. 2 Habitat constraints – No important habitat mapping present within subject land. 3 Vagrant species – N/A. 4 Microhabitats – N/A.	Not applicable
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A. Species retained.	Yes PCT 462, 531, 588, 592, 594
South-eastern Glossy Black-Cockatoo (breeding)	*Calyptorhynchus lathami lathami*	V	V	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A. Species retained.	Yes PCT 462, 531, 588, 592, 594

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	**1** Geographic limitations – N/A. **2** Habitat constraint – Leard State Forest contains lower gentle slopes without any cliffs or escarpment. No caves, overhangs, escarpments, outcrops, crevices or old mines and tunnels occur within 2 km of the subject land. **3** Vagrant species – N/A. **4** Microhabitats – N/A.	N/A.
Swift Parrot (breeding)	*Lathamus discolor*	E	CE	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	**1** Geographic limitations – N/A. **2** Habitat constraints – No important habitat mapping present within subject land. **3** Vagrant species – N/A. **4** Microhabitats – N/A.	Not applicable

Common name	Scientific name	Listing status		Dual credit species	Sources	Species retained for further assessment?	Reason for exclusion from further assessment	Vegetation zone ID species retained within, including PCT ID
		BC Act	EPBC Act					
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	**1** Geographic limitations – N/A. **2** Habitat constraints – No rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines occur within 1km of the subject land. Leard State Forest contains lower gentle slopes without any cliffs or escarpment. **3** Vagrant species – N/A. **4** Microhabitats – N/A	Not applicable
Koala	*Phascolarctos cinereus*	E	E	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A. Species retained.	Yes PCT 462, 531, 588, 592, 594
Grey-headed Flying-fox (breeding)	*Pteropus poliocephalus*	V	V	Yes	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	No	**1** Geographic limitations – N/A. **2** Habitat constraints – No breeding camps observed. **3** Vagrant species – N/A. **4** Microhabitats – N/A	Not applicable
Border Thick-tailed Gecko	*Uvidicolus sphyrurus*	V	V	No	☒ BAM-C ☐ TBDC ☐ Previous survey ☐ Current survey	Yes	N/A. Species retained.	Yes PCT 462, 531, 588, 592, 594

Following targeted surveys, one MNES species credit flora species and one MNES species credit fauna species were either recorded or assumed present. A summary of project impacts on MNES species credit species is provided in Table C.4. It is acknowledged that two additional MNES species credit species, being Swift Parrot and Regent Honeyeater, are retained as an ecosystem credit.

Table C.4 Summary of project impacts on species credit MNES threatened species

Common name	Scientific name	BC Act status	EPBC Act status	Loss of habitat (ha) or individuals	Number of species credits required
Tylophora linearis	*Tylophora linearis*	Vulnerable	Endangered	1.29 ha	45
Koala	*Phascolarctos cinereus*	Endangered	Endangered	84.48	3,048

C2.4 Summary of offset requirements

Details on the residual impacts to MNES are outlined in Sections 10 and 11 of the BDAR. A summary of ecosystem credits required to offset the residual impacts associated with the MOD 10 are presented in Table C.5 with species credit requirements summarised in

Table C.6.

The ecosystem credit requirements encapsulate the impacts to EPBC Act listed ecosystem credit species.

Table C.5 MOD 10 impacts that require an offset – ecosystem credits

Plant Community Type	Credits required
PCT 462 – Dwyer's Red Gum – White Cypress Pine – Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion	394
PCT 531 – Narrow-leaved Ironbark – Black Cypress Pine – Motherumbah woodland in the Kaputar area in the Nandewar Bioregion	172
PCT 588 – White Box – White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion	71
PCT 592 – Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion PCT 592 – Narrow-leaved Ironbark – cypress pine – White Box shrubby open forest in the Brigalow Belt South Bioregion and Nandewar Bioregion	1,258
PCT 594 – Silver-leaved Ironbark – White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion	148
Total	**2,043**

Table C.6 MOD 10 impacts that require an offset – species credits

Species name	Credits required
Tylophora linearis / Tylophora linearis	45
Phascolarctos cinereus / Koala	3,048
Total	**3,107**

C3 Assessment of significance

C3.1 Threatened ecological communities subject to assessment

The EPBC Act Protected Matters Search Tool (PMST) predicted that eight EPBC Act listed TECs have potential to occur within the Proposed Action Boundary. None of these EPBC Act listed TECs have been recorded within the Proposed Action Boundary.

C3.2 Threatened flora species subject to assessment

Using a combined database search (BioNet, BAM-C, and PMST), to determine predicted habitat or identified known habitat within the subject land, 14 threatened flora species were listed under the EPBC Act. Of these, one species, *Tylophora linearis* was identified to have at least a moderate likelihood of occurrence and was the subject of targeted surveys. This species was recorded within the subject land.

C3.2.1 Tylophora linearis

Status

Tylophora linearis is listed as Endangered under the EPBC Act.

Relevant Commonwealth guidelines, policy statements including listing advice, conservation advice and recovery plan

A summary of the relevant Commonwealth guidelines and policy statements available for this species is as follows:

- approved conservation advice: Approved Conservation Advice for *Tylophora linearis* (Department of Environment Water Heritage and the Arts, 2008)
- there is no listing advice available for this species
- there is no adopted or made Recovery Plan for this species
- no Threat Abatement Plan has been identified as being relevant for this species (Commonwealth Department of Climate Change Energy the Environment and Water, 2024d).

Specific impacts

Tylophora linearis is known to grow on flats and hills in dry scrub, open forest and dry woodlands in association with *Eucalyptus albens*, *Callitris glaucophylla*, *Callitris endlicheri*, *Eucalypts fibrosa*, *Eucalyptus sideroxylon* and *Allocasuarina luehmannii* (Department of Planning and Environment, 2023c).

Five Plant Community Types (PCTs) mapped within the Proposed Action Boundary are identified as being associated habitat for the species in DPE's Threatened Biodiversity Database Collection (TBDC). These PCTs include PCT 531, PCT 592, PCT 462, PCT 588 and PCT 594, which collectively cover approximately 84.48 ha of the Proposed Action Boundary.

Targeted searches for *Tylophora linearis* in the Proposed Action Boundary were completed in January 2024. These surveys identified three sparse patches with approximately 30 aerial stems in PCT 531 (0.61 ha) and PCT 592 (0.68 ha) (Figure 15.15 of main document).

EPBC Act significant impact assessment

The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013b).

An action is likely to have a significant impact on a critically endangered or 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

The Proposed Action will result in the direct removal of approximately 1.29 ha of known habitat for this species in the form of PCT 531 and PCT 592, which was occupied by 30 individual stems. The habitat and individuals to be removed occur on the periphery of a larger sub-population that will be retained as part the Leard State Forest boundary (biodiversity) corridor, which is a 500 m wide strip of remnant native vegetation separating BCM and MCCM.

Thousands of *Tylophora linearis* have been recorded throughout Leard State Forest and the locality as part of previous surveys. Within Leard State Forest the species has been recorded from a range of vegetation types, including PCT 592, PCT 88, PCT 434, PCT 1380, PCT 588, and PCT 462. Previous studies done by Niche Environment and Heritage within Leard State Forest, Leard Conservation Area and other adjoining offset properties have modelled that the population is likely to contain 1.04 million plants within the region (Hunter Eco, 2016). The small number of individuals to be removed would represent approximately <0.001% of the estimated regional population.

The Proposed Action is unlikely to have significant impact on a local population, given the surrounding records and habitat. The Proposed Action is therefore unlikely to lead to a long-term decrease in the size of the population of this species.

Reduce the area of occupancy of the species

Tylophora linearis has been recorded within the Proposed Action Boundary, however, this species has been recorded widely throughout Leard State Forest. The Proposed Action will result in direct removal of approximately 1.29 ha of known habitat for this species in the form of PCT 531 and PCT 592.

The area of occupancy of *Tylophora linearis* in NSW is estimated to be approximately 36 km^2 (approximately 3,600 ha). These occurrences are widely spread resulting in the species having an area of occurrence of approximately 65,000 km^2 in NSW (NSW Scientific Committee, 2021).

The Proposed Actions impact of 1.29 ha equates to approximately <0.01% of the species area of occupancy across NSW.

Fragment an existing population into two or more populations

Tylophora linearis has been recorded within the Proposed Action Boundary, however, this species has been recorded widely throughout Leard State Forest, including the Leard State Forest Vegetation Corridor, which is a 500 m wide strip of remnant native vegetation separating BCM and MCCM. The Proposed Action will result in direct removal of approximately 1.29 ha of known habitat for this species in the form of PCT 531 and PCT 592.

With thousands of *Tylophora linearis* recorded throughout Leard State Forest, the impact occurring at the periphery of sub-population in an area which will also be subject to clearing (therefore not dissecting any areas of habitat in two or more) and this species relying on wind or insects for seed dispersal, the Proposed Action is unlikely to fragment an existing population of this species into two or more populations.

Adversely affect habitat critical to the survival of a species

No Critical Habitat as defined under section 207A of the EPBC Act has been identified for *Tylophora linearis* or included in the Register of Critical Habitat. Habitat critical to the survival of a species refers to areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary proposed development

- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment, 2013b).

Disrupt the breeding cycle of a population

Based on literature and investigations completed on *Tylophora linearis* throughout Leard State Forest, it is considered likely that the species is capable of reproducing both vegetatively (asexually) and via the production and germination of seed (sexually). The species is known to produce viable 'plumed' seeds that are likely dispersed by wind or insects and can disperse vegetatively within sub-populations. It is also suspected that the species is pollinated by insects like other members of the Apocynaceae family. Based on observations within Leard State Forest, the species does not always produce seed on an annual basis.

Although the Proposed Action would involve the removal of approximately 1.29 ha of known habitat and a small number of individuals a substantial percentage of the population would remain with the Leard State Forest Vegetation Corridor, which is a 500 m wide strip of remnant native vegetation separating BCM and MCCM. Further, previous studies done by Niche Environment and Heritage within Leard State Forest, Leard Conservation Area and other adjoining properties have modelled that the population is likely to contain 1.04 million plants within the region (Hunter Eco, 2016). The small number of individuals to be removed equates to approximately <0.001% of the estimated population. This remaining portion of the local population would remain and continue to allow the species to enact its breeding cycle.

The Proposed Action may incrementally increase indirect impacts such a dust and edge effects, however these impacts are unlikely to significantly exacerbate impacts which already occur within the locality. As such, these impacts are unlikely to significantly impact the species breeding cycle.

As these processes are unlikely to be significantly affected by the Proposed Action, it is conceded that the breeding cycle for *Tylophora linearis* population are unlikely to be significantly affected.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Proposed Action will impact upon approximately 1.29 ha of known habitat in the Proposed Action Boundary. However, this does not constitute a significant proportion of the habitat available within the region, and as such is unlikely to result in a decline in the species.

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 Proposed Action is unlikely to significantly increase the spread of existing invasive species or contribute to the introduction of new species that are harmful to *Tylophora linearis*. If appropriate weed control management plans are implemented, impacts to potential habitat or any populations that are potentially present can be minimised.

Mitigation measures would be implemented to minimise the likelihood of introducing invasive species into the habitat of this species including:

- preventing access to areas of habitat through the demarcation of clearing limits using continuous high visibility fencing
- preventing access to areas of habitat through the establishment of no-go zones
- providing washing down procedures to reduce the spread of weeds via vehicles and machinery
- monitoring programs for noxious and problematic weeds and pests, including in the Vegetation Corridor, to ensure the requirements of *Biosecurity Act 2015* and the Weed and Pest Management Plan in the approved BMP (WSP, 2018b) are met.
- controlling noxious and problematic weeds should they be found.

Introduce disease that may cause the species to decline, or

This species is not known to be under threat from disease. Despite this, mitigation measures have been included to minimise the likelihood of spread of pathogens into the habitat of these species. Measures include:

- preventing access to areas of habitat through erection of temporary fencing
- implementing washing down procedures to minimise the risk of the spread of pathogens via vehicles and machinery
- cleaning of vehicle tyres, undersides and radiator grills before leaving a property, cleaning of footwear and minimising soil movement between locations.

Interfere with the recovery of the species.

A EPBC Act recovery plan has not been prepared for the species, however, management actions as part of the saving our species program have been identified. The Proposed Action may incrementally contribute to the following:

- uncertainty of future land management practices – ensure land management is sympathetic to the long-term requirements of the species
- disturbance due to infrastructure – minimise the impact of on-site infrastructure.

The Proposed Action may also contribute to one regional and local priority recovery and threat abatement action identified in the EPBC ACT Approved Conservation Advice for *Tylophora linearis* being 'habitat loss, disturbance and modification'.

Despite this, impacts associated with the Proposed Action are unlikely to significantly interfere with identified management actions.

Conclusion

Based on targeted survey completed in January 2024, the Proposed Action will result in the direct removal of approximately 1.29 ha of known habitat for this species, including the application of a Biodiversity Assessment Method 30 m buffer applied to all records. Surveys completed identified that the species occurred in PCT 531 and PCT 592 in the Proposed Action Boundary, and that 30 individual stems would be affected.

Thousands of *Tylophora linearis* have been recorded throughout the Leard State Forest as part of previous surveys. Within the Leard State Forest, including the Leard State Forest Vegetation Corridor, the species has been recorded from a range of vegetation types including PCT 592, PCT 88, PCT 434, PCT 1380, PCT 588 and PCT 462. The Proposed Action is unlikely to have significant impact on any existing local population, given the surrounding records and habitat within the Leard State Forest and adjacent Biodiversity Offset Areas.

It is considered unlikely that the Proposed Action would lead to a long-term decrease in a local population, fragment an existing population, adversely affect critical habitat for these species, disrupt the breeding cycle of the species, introduce or lead to the establishment of invasive species to a degree that would result in the decline of the species.

Given this, the Proposed Action is considered unlikely to lead to a significant impact on this species or its habitat.

NSW Assessment Bilateral requirements

For each of the EPBC Act listed threatened species and migratory species likely to be impacted by the action the EIS must provide a separate:

Description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plan

A description of habitat for this species, important populations, habitat critical for survival and relevant Commonwealth documents are provided above, with a map showing the modelled distribution of the species provided in Figure C.1. A map showing the field verified locations of this species within the subject land is provided in Figure 15.15 in the main BDAR document.

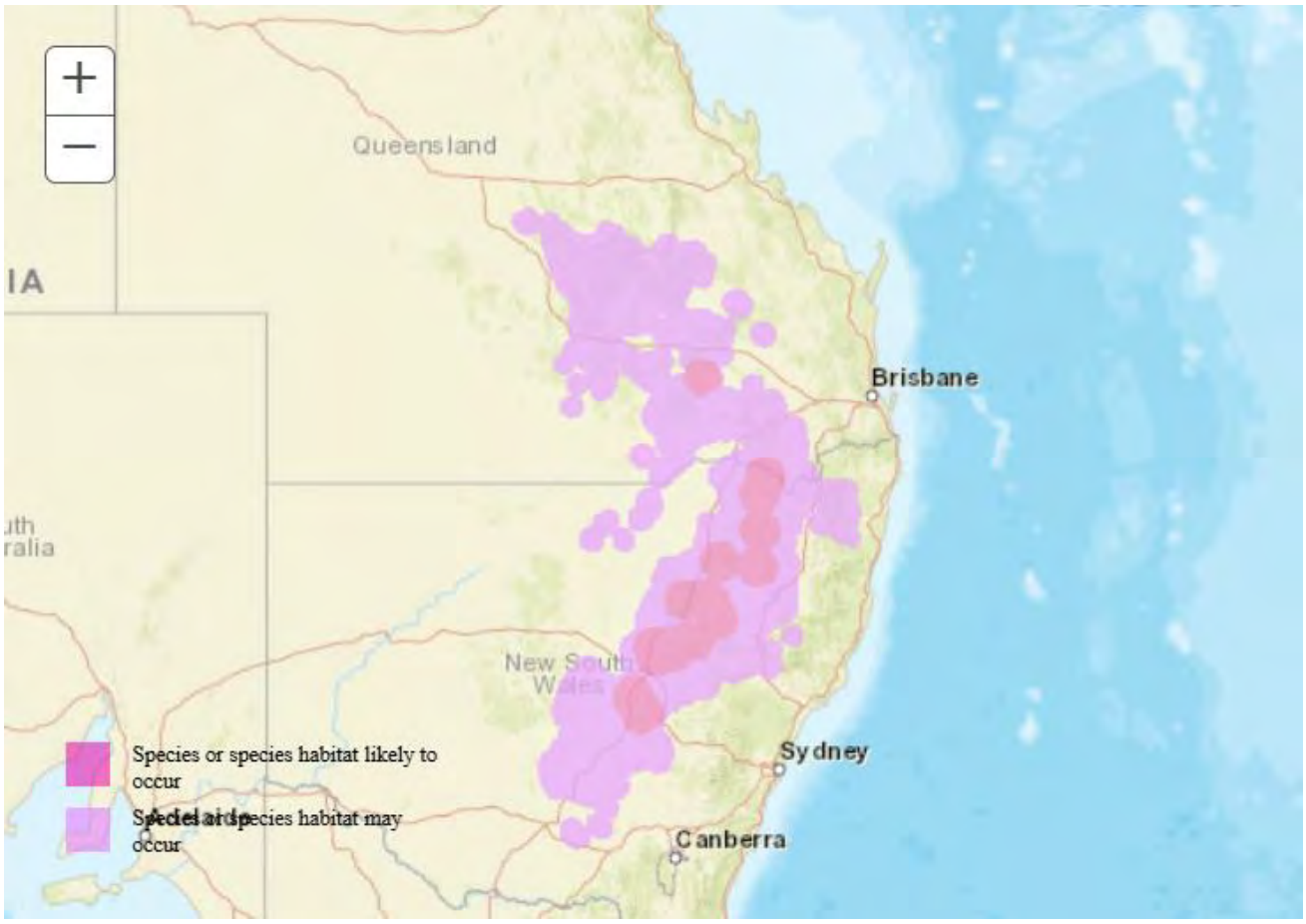


Figure C.1 Current distribution map for *Tylophora linearis* (Commonwealth Department of Climate Change Energy the Environment and Water, 2024d)

Details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements

Prior to survey, habitat constraints and microhabitats for candidate threatened flora (species credit) species as listed within the NSW Threatened Biodiversity Data Collection (TBDC) was undertaken. In addition, a review of previous ecological survey and assessment and monitoring of the Leard State Forest, Vegetation Corridor, and subject land was undertaken.

Field survey techniques were used to undertake targeted seasonal surveys in general accordance with *Surveying threatened plants and their habitats: NSW guide for the Biodiversity Assessment Method* (Department for Planning Industry and Environment, 2020):

- two-phase grid-based systematic survey
- parallel field traverses of microhabitats.

Further details of these surveys are provided in in Section 2.3 of the BDAR. The field survey techniques used to undertake surveys were also in general accordance with the NSW Biodiversity Assessment Method (Department of Planning Industry and Environment, 2020a) with a detailed field verification method provided in Section 2.3 of the BDAR.

Description of the specific impacts and its regard to the full national extent of the species or community's range

The direct impacts to this species include impact on approximately 1.29 ha of known habitat for this species, including the application of a Biodiversity Assessment Method 30 m buffer applied to the 30 individual stems identified.

Description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action

The proposed avoidance and mitigation measures are outlined in Section 7 and Section 8.4 of the BDAR. Regarding specific measures for this species, the following relevant mitigation measures are recommended for any related residual impacts:

- positioning of the subject land to not impact the Vegetation Corridor and larger extent of known *Tylophora linearis* population
- demarcation of clearing boundaries using continuous high visibility flagging (or similar)
- establishment of no-go zones to protect mapped patches of known habitat during construction and operation.

Identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account

The residual direct impacts to *Tylophora linearis* includes 1.29 ha of known habitat, including the application of a Biodiversity Assessment Method 30 m buffer applied to the 30 individual stems identified.

A description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established

Details of offset requirements and obligations for this species as a result of residual impacts due MOD 10 is addressed in Section 10.1.2 of the BDAR.

Details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts

The BDAR specifically addresses Section 10 of the BAM and provides information on the application of the no net loss standard and MOD 10 biodiversity offset obligations.

Details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites

Section 11 of the BDAR outlines the biodiversity credit requirements for MOD 10. The offset obligations will be met through implementing a combination of the following offset delivery options, being:

- the purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register
- establishing a biodiversity stewardship site(s) on lands with like for like biodiversity values to those impacted by MOD 10

– through making a payment into the Biodiversity Conservation Fund.

C3.3 Threatened fauna species subject to assessment

Attachment 1 of the Secretary's Environmental Assessment Requirements (SEARs) outlines the original list of EPBC Act listed threatened fauna species likely to be impacted by the Proposed Action. Combined with database searches (BioNet, BAM-C and PMST), there is predicted habitat or identified known habitat within the subject land for 12 threatened fauna species listed under the EPBC Act that have been identified to have a moderate or higher likelihood of occurrence (Table C.7). One species, White-throated Needletail, is also listed as a migratory species under the EPBC Act.

Section 5 of the BDAR provides a description of the habitat requirements for each EPBC Act listed species, and the reasoning for inclusion and exclusion of EPBC Act listed species in this assessment. Details of the scope, timing and methodology of the targeted surveys used for EPBC Act listed threatened fauna species and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements is provided in the significance assessments of each species in the provided below.

The EPBC Act listed threatened fauna species that were identified to have a moderate or higher likelihood of occurrence and were the subject of targeted surveys are outlined in Table C.7. Significance assessments for these species have been completed following the *Matters of National Environmental Significance - Significant Impact Guidelines 1.1* (Department of the Environment Water Heritage and the Arts, 2013).

Table C.7 Listed EPBC Act threatened fauna species considered for assessment

Scientific name	Common name	EPBC Act[1]	Direct impact (ha)	Biodiversity credits required	Associated PCTs (BAM-C)	Significant impact?
Anthochaera phrygia	Regent Honeyeater	CE	Associated ecosystem impacts: 60.81	Associated ecosystem credits: 1,477	588, 592, 594	Yes –MOD 10 is likely to have a significant impact on this species.
Chalinolobus dwyeri	Large-eared Pied Bat	E	Not applicable Habitat constraints absent. No caves, overhangs, escarpments, outcrops, crevices or old mines and tunnels occur within 2km of the subject land.	Not applicable	Not applicable	No –MOD 10 is unlikely to have a significant impact on this species.
Climacteris picumnus victoriae	Brown Treecreeper (south-eastern)	V	Associated ecosystem impacts: 84.48	Associated ecosystem credits: 2,043	462, 531, 588, 592, 594	No –MOD 10 is unlikely to have a significant impact on this species.
Grantiella picta	Painted Honeyeater	V	Associated ecosystem impacts: 84.48	Associated ecosystem credits: 2,043	462, 531, 588, 592, 594	No –MOD 10 is unlikely to have a significant impact on this species.

Scientific name	Common name	EPBC Act[1]	Direct impact (ha)	Biodiversity credits required	Associated PCTs (BAM-C)	Significant impact?
Hirundapus caudacutus	White-throated Needletail	V, M	Associated ecosystem impacts: 84.48	Associated ecosystem credits: 2,043	462, 531, 588, 592, 594	No –MOD 10 is unlikely to have a significant impact on this species.
Lathamus discolor	Swift Parrot	CE	Associated ecosystem (foraging) impacts: 84.48 Species credit (breeding) impacts: No important habitat mapping will be impacted.	Associated ecosystem (foraging) credits: 2,043 Species credit (breeding) impacts: No important habitat mapping will be impacted, therefore there are no species credit impacts.	462, 531, 588, 592, 594	Yes –MOD 10 is likely to have a significant impact on this species.
Melanodryas cucullata cucullata	Hooded Robin (South-Eastern)	E	Associated ecosystem impacts: 84.48	Associated ecosystem credits: 2,043	462, 531, 588, 592, 594	No –MOD 10 is unlikely to have a significant impact on this species.
Stagonopleura guttata	Diamond Firetail	V	Associated ecosystem impacts: 84.48	Associated ecosystem credits: 2,043	462, 531, 588, 592, 594	No –MOD 10 is unlikely to have a significant impact on this species.
Dasyurus maculatus maculatus	Spotted-tailed Quoll (Southern Subspecies)	E	Associated ecosystem impacts: 84.48	Associated ecosystem credits: 2,043	462, 531, 588, 592, 594	No –MOD 10 is unlikely to have a significant impact on this species.
Nyctophilus corbeni	Corben's Long-eared Bat	V	Associated ecosystem impacts: 84.48	Associated ecosystem credits: 2,043	462, 531, 588, 592, 594	Yes – the proposal is unlikely to have a significant impact on this species.
Phascolarctos cinereus	Koala	E	Species credit impacts: 84.48	Species credits: 3,048	462, 531, 588, 592, 594	No –MOD 10 is unlikely to have a significant impact on this species.

Scientific name	Common name	EPBC Act[1]	Direct impact (ha)	Biodiversity credits required	Associated PCTs (BAM-C)	Significant impact?
Uvidicolus sphyrurus	Border Thick-tailed Gecko	V	Not applicable Species credit species only. Not included due to targeted surveys.	Not applicable Species credit species only. No species credits included due to targeted surveys.	462, 531, 588, 592, 594	No –MOD 10 is unlikely to have a significant impact on this species.

(1) Threat status under the EPBC Act: V = vulnerable, E = endangered, CE = critically endangered.

C3.3.1 Regent Honeyeater

Status

The Regent Honeyeater (*Anthochaera phrygia*) is listed as Critically Endangered under the EPBC Act.

Description

The Regent Honeyeater is a nomadic and partially migratory woodland bird, which has a patchy distribution between south-east Queensland and central Victoria. Within NSW, the species is confined to two key breeding regions, at Capertee Valley and the Bundarra-Barraba region, as well as fragmented woodlands in the surrounding area (Office of Environment & Heritage, 2024). Some predictable seasonal movements have been observed, and breeding varies regions and corresponds with flowering of key eucalypt and mistletoe species.

The species is predominantly found along inland slopes of the Great Dividing Range in areas containing moist, fertile soils. It prefers box-ironbark eucalypt woodland and dry sclerophyll forest, but also inhabits riparian vegetation including She-oak (*Casuarina* spp.). Lowland coastal forest may also act as a refuge habitat during periods of drought, and they may also be found in remnant patches of farmland and urban areas (Threatened Species Scientific Committee, 2015a). The Regent Honeyeater shows a preference for woodland that features a high canopy cover, significantly high numbers of mature trees, and an abundance of mistletoe (Office of Environment & Heritage, 2024).

The species' National Recovery Plan identifies the following as key tree and mistletoe species for the Regent Honeyeater: Mugga (or Red) Ironbark (*Eucalyptus sideroxylon*), Yellow Box (*E. melliodora*), White Box (*E. albens*), Yellow Gum (*E. leucoxylon*), Spotted Gum (*Corymbia maculata*), Swamp Mahogany (*E. robusta*) Needle-leaf Mistletoe (*Amyema cambagei*) on River She-oak (*Casuarina cunninghamiana*) Box Mistletoe (*A. miquelii*) Long-flower Mistletoe (*Dendrophthoe vitellina*). The Regent Honeyeater's diet consists primarily of nectar from the aforementioned key species, however it can include invertebrates and their exudates as well as occasionally fruit. As taller and larger diameter trees typically produce more nectar these are preferred for foraging, while tall mature Eucalypts and She-oaks are selected for nesting as well as occasionally the haustoria of mistletoe (Office of Environment & Heritage, 2024).

This species roosts communally in small groups or large flocks, in trees with dense foliage, and foraging trees are rarely used for roosting (Threatened Species Scientific Committee, 2015a). Breeding appears to correspond with the flowering of key eucalypt and mistletoe species and varies between regions, usually occurring from August to January. Cup shapes nests are constructed usually in the canopy of mature trees with rough bark, and a clutch consists of 2 to 3 eggs (Threatened Species Scientific Committee, 2015a).

Listed threats include:

- clearing, fragmentation and degradation of habitat, particularly the removal of large mature trees important for feeding or breeding
- competition for resources with birds such as the Noisy Minor and (*Manorina melanocephala*) and Noisy Friarbird (*Philemon corniculatus*), and nest predation by Pied Currawongs (*Strepera graculina*) (Threatened Species Scientific Committee, 2015a).

Relevant Commonwealth guidelines, policy statements including listing advice, conservation advice and recovery plan

A summary of the relevant Commonwealth guidelines and policy statements available for this species is as follows:

- the approved Conservation Advice *Anthochaera phrygia* Regent Honeyeater (Threatened Species Scientific Committee, 2015a) was reviewed as part of this assessment
- there is no Listing Advice for this species
- The National Recovery Plan for the Regent Honeyeater (*Anthochaera phrygia*) (Department of the Environment, 2016) was reviewed as part of this assessment.

Relevant adopted/made threat abatement plans include:

- threat abatement plan for competition and land degradation by rabbits (Department of the Environment and Energy, 2016).

Relevant survey guidelines for this species include:

- Survey Guidelines for Australia's Threatened Birds (Department of the Environment, 2010).

Specific impacts

This species has not been recorded in Leard State Forest and surrounding Biodiversity Offset Areas during 12 years of field surveys encompassing the most likely habitat areas for this species locally. However, box/ironbark forest habitat occurs within the Proposed Action Boundary and there are old records for this species in the wider locality. The Proposed Action will result in the direct removal of up to 60.81 ha of box/ironbark habitat through associated PCTs, including PCT 588, PCT 592 and PCT 594 (Department of Planning and Environment, 2023a).

While the habitats within the Proposed Action Boundary are not assessed as being highly significant for Regent Honeyeaters, due to their upslope topographical location, less than fertile soil profiles and lack of important blossom producing tree and shrub species, Regent Honeyeaters are a forest and woodland species requiring continuous wooded habitats to navigate through the landscape between widely separated blossoming events. For this reason, the woodland has value in bolstering the width of the corridor of vegetation linking the eastern and western sections of Leard State Forest. Nevertheless, the species has only very rarely been observed in the wider locality and no records exist in the Leard State Forest.

EPBC Act significant impact assessment

The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013b).

An action is likely to have a significant impact on a Critically Endangered or 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 of a species

Approximately 60.81 ha of potential box/ironbark habitat for the Regent Honeyeater would be affected by the Proposed Action. There are no records in databases of Regent Honeyeater being observed in the Leard State Forest, although they almost certainly would have occurred in the past within lowland grassy forests dominated by *E. albens* (White Box) and potentially *E. pilligaensis* (Pilliga Box) where more fertile substrates occurred before their populations were very significantly reduced to current numbers.

The area to be impacted is dominated by *E. crebra* (Narrow-leaved Ironbark). While habitat in the Proposed Action Boundary has the potential to be used by the Regent Honeyeater, perhaps during regional movements, it is not likely to be of high importance to this species due to its lack of preferred foraging resources; namely, locally important nectar-producing trees, such as *E. albens* (White Box) and *E. melliodora* (Yellow Box). Within the Proposed Action Boundary there is no *E. melliodora* stands and *E. albens* is very sparse, being limited to a few very small groupings of individual

trees. Throughout its range the Regent Honeyeater is not defined by *E. crebra* forests, although it does occur in *E. crebra* forests when there are preferred species present, such as *E. albens*, *E. melliodora*, locally and *Corymbia maculata* (Spotted Gum), *E. fibrosa* (Ironbark), *E. siderophloia* (Northern Grey Ironbark) and an undescribed Stringybark sp. occurring with *E. crebra in* Lower Hunter Region forests. In areas west of the ranges, apart from *E. albens* and *E. melliodora*, Regent Honeyeaters also uses *E. sideroxylon* (Mugga Ironbark), which does not occur in Leard State Forest habitats.

In over 12 years of surveys targeting both Regent Honeyeaters and Swift Parrots, during winter periods when White Box blossom is present, no Regent Honeyeaters have been observed to use White Box blossom in the wider Boggabri region, including areas where high quality foraging habitats occur, both within Leard State Forest and in Biodiversity Offset Areas to the east and west of the forest. While the results of those surveys encompass annual flowering events when blossom is scarce, they also encompass periods when *E. albens* flowers very strongly in Leard State Forest and the surrounding region. During such periods, inflated guilds of nectarivorous birds, which require inter-regional movements to attend the blossom are present, including occasions attended by Swift Parrots. However, Regent Honeyeaters have not been detected during any such events when White Box flowers strongly in the region. While the Regent Honeyeater is a very rare species, it can usually be detected in at least low numbers in areas where blossoming events of extra-regional significance occur. However, it has not been detected in the highest quality forest areas in Leard State Forest within such significant events. The Proposed Action Boundary does not include areas that periodically attract an inflation of nectarivorous birds due to high blossom densities, to the contrary, its capability to support nectarivorous birds is limited to birds that are locally resident in low but stable numbers. Therefore, it is considered very likely that the paucity of suitable habitat within the Proposed Action Boundary precludes the intermittent presence of Regent Honeyeaters therein. Although the species rare occurrence cannot be entirely discounted, the lack of significant resources to attract the species indicates that the Proposed Action will not lead to a long-term decrease in the size of a Regent Honeyeater population.

Reduce the area of occupancy of the species

The Proposed Action is likely to affect approximately 60.81 ha of habitat that is considered unlikely to be important for the Regent Honeyeater due to a lack of records in areas of much higher quality elsewhere in the Leard State Forest. Although the Proposed Action will result in the loss of forested habitat, the loss of habitat does not include habitat attributes that are most important for the species locally.

Therefore, the Proposed Action is considered unlikely to significantly reduce the area of occupancy for the Regent Honeyeater in the locality.

Fragment an existing population into two or more populations

The Leard State Forest Vegetation Corridor is a 500 m strip of remnant native vegetation reserved in perpetuity that links the eastern section of Leard State Forest to the western sections of the forest and the Conservation Area beyond. The Proposed Action will not compromise the link between eastern and western sections of the forest such that it would fragment an existing population into two or more populations.

Adversely affect habitat critical to the survival of a species

No critical habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat. The National Recovery Plan for the Regent Honeyeater (*Anthochaera phrygia*) (Department of the Environment, 2016) states that habitat critical to the survival of the Regent Honeyeater includes:

- any breeding or foraging areas where the species is likely to occur
- any newly discovered breeding or foraging locations.

Key areas of critical habitat listed for the species (in the National Recovery Plan) includes the Bundarra-Barraba, Pilliga Woodlands, Mudgee-Wollar and the Capertee Valley and Hunter Valley areas in New South Wales, and the Chiltern and Lurg-Benalla regions of north-east Victoria, inclusive of a number of subsidiary areas within these regions. The Proposed Action Boundary does not contain any breeding areas or important foraging areas for this species, as such it is unlikely that the Proposed Action will adversely affect habitat critical to the survival of this species.

Disrupt the breeding cycle of a population

Within the Regent Honeyeaters current distribution there are four known key breeding areas where the species is regularly recorded. These are the Bundarra-Barraba, Capertee Valley and Hunter Valley districts in New South Wales, and the Chiltern area in north-east Victoria. The Proposed Action Boundary does not occur within these known breeding areas, and there are no known records for the species in the Leard State Forest. Nevertheless, this species is highly mobile and is known to disperse widely (HigginsPeter and Steele, 2001), but such movements are usually associated with blossoming resources, which are potential triggers for breeding behaviours. However, there is no current evidence to suggest that this species uses habitats associated with the Proposed Action Boundary or higher quality habitats in the locality. The 84.48 ha of potential woodland habitat likely to be affected by the Proposed Action is representative of larger patches of locally occurring resources that would be accessible to this species. Therefore, the proposed removal of about 84.48 ha of woodland habitat is unlikely to disrupt the breeding cycle of a population of the Regent Honeyeater.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Proposed Action will remove approximately 60.81 ha of native vegetation that is not considered to be important habitat for this species. The removal of approximately 60.81 ha of potential habitat is considered to be an incremental loss of woodland habitat, decreasing the amount of woodland habitat available locally. However, if present locally, the species is more likely to forage in higher quality habitat within the greater locality. Considering the mobile nature of this species and the retention of a Vegetation Corridor through the forest, this action is unlikely to isolate habitat for the species. Given the marginal condition of habitat observed, it is unlikely that the Proposed Action will modify, destroy, remove or isolate habitat for this species to the extent that is likely to cause the species to decline.

Result in invasive species that are harmful to an Endangered species becoming established in the Endangered species´ habitat

It is not likely that invasive species (such as introduced predators or weeds) that are potentially harmful to the Regent Honeyeater would become further established as a result of the Proposed Action.

Introduce disease that may cause the species to decline

It is unlikely that disease would be increased by the Proposed Action.

Interfere with the recovery of the species

Recovery strategies outlined in Regent Honeyeater Recovery Plan (Department of the Environment, 2016) include:

- improve the extent and quality of regent honeyeater habitat
- bolster the wild population with captive-bred birds until the wild population becomes self-sustaining
- increase understanding of the size, structure, trajectory and viability of the wild population
- maintain and increase community awareness, understanding and involvement in the recovery program.

The Proposed Action would be in conflict with the first objective above to a small extent, by not improving the extent of habitat for the Regent Honeyeater. It is unlikely that the impact of relatively small areas of marginal habitat would significantly exacerbate the recovery of the species and significantly impact this species.

Conclusion

The extent of native vegetation clearing and foraging habitat removal associated with the Proposed Action is small in terms of available habitat of much higher quality for the species within the region. The irregular distribution of blossom resources, which is a key driver of nomadism of this species, may cause this species to occasionally forage within the wider forest, but such resources are not strongly represented within the Proposed Action Boundary. It is considered unlikely that the Proposed Action will result in the loss of significant foraging habitat or will cause a local extinction of the Regent Honeyeater, due to the limited importance of the vegetation to the species and the lack of records in the locality. The Proposed Action is not considered likely to fragment any locally occurring populations, affect habitat critical to their survival, disrupt their breeding cycles, interfere with the recovery of these species, or remove foraging

habitat important to the species. However, the proposed development is considered to represent an incremental loss of woodland habitat that may be traversed by the species under rare circumstances. Given the impact to potential Regent Honeyeater habitat in Leard State Forest as a consequence of current mining operations in the Leard Forest Mining Precinct, the incremental loss of potential habitat depleted by cumulative impacts locally is likely to modify, destroy or remove habitat for the species. Consequently, the Proposed Action is considered to have a significant impact on the Regent Honeyeater.

NSW Assessment Bilateral requirements

For each of the EPBC Act listed threatened species and migratory species likely to be impacted by the action the EIS must provide a separate:

Description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plan

A description of habitat for this species, important populations, habitat critical for survival and relevant Commonwealth documents are provided above, with a map showing the modelled distribution of the species provided in Figure C.2.

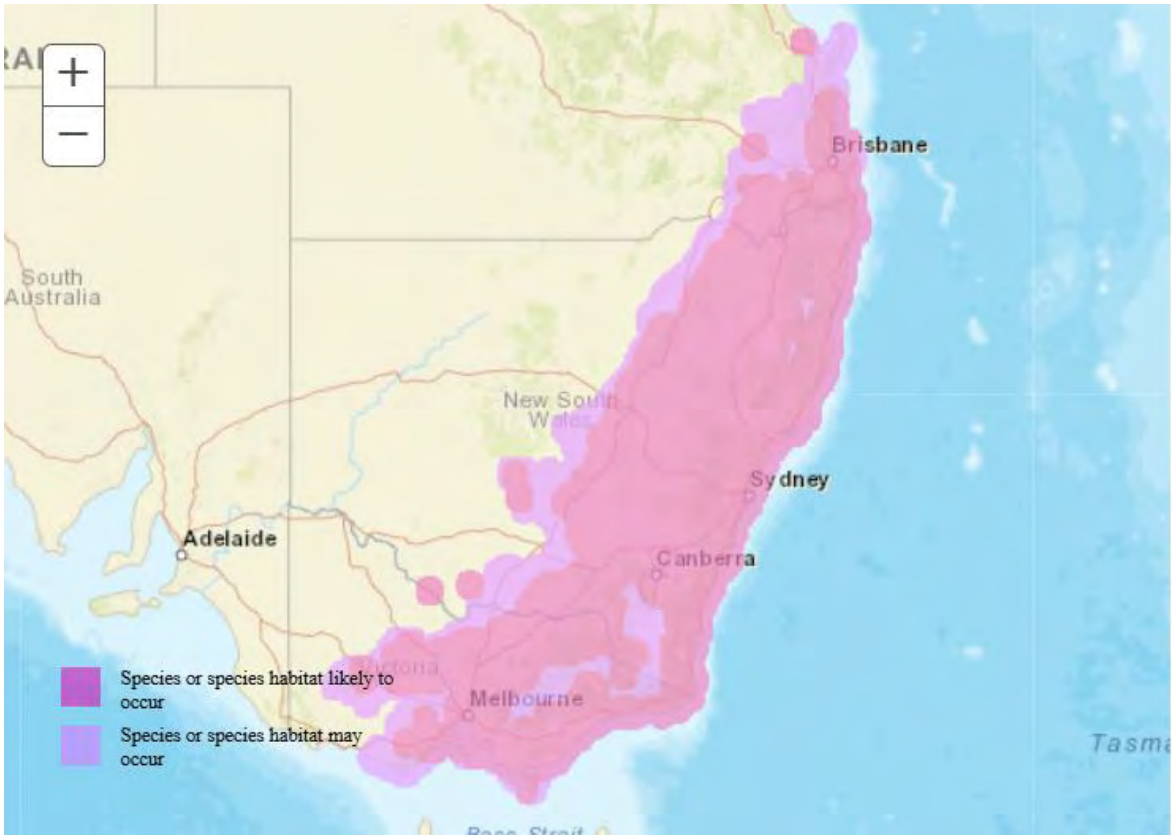


Figure C.2 Current distribution map for Regent Honeyeater
(Commonwealth Department of Climate Change Energy the Environment and Water, 2024c)

Details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements

Prior to survey, habitat constraints and microhabitats for candidate threatened fauna (species credit) species as listed within the NSW Threatened Biodiversity Data Collection was undertaken. In addition, a review of previous ecological survey and assessment and monitoring of the Leard State Forest, Vegetation Corridor, and subject land was undertaken.

Field survey techniques were used to undertake targeted seasonal surveys in general accordance with the NSW TBDC and *Survey guidelines for Australia's threatened birds (Department of the Environment, 2010)* including:

- 45 person hours of parallel bird transects in August 2023
- 26 diurnal bird surveys in August 2023.

Further details of these surveys are provided in Section 2.4 and Table 5.9 of the BDAR.

Description of the specific impacts and its regard to the full national extent of the species or community's range

The Proposed Action will result in the direct removal of up to 60.81 ha of box/ironbark habitat through associated PCTs, including PCT 588, PCT 592 and PCT 594.

While the habitats within the Proposed Action Boundary were not assessed as being highly significant for Regent Honeyeaters, due to their upslope topographical location, less than fertile soil profiles and lack of important blossom producing tree and shrub species, Regent Honeyeaters are a forest and woodland species requiring continuous wooded habitats to navigate through the landscape between widely separated blossoming events. For this reason, the woodland has value in bolstering the width of the Vegetation Corridor linking the eastern and western sections of Leard State Forest. Nevertheless, the species has only very rarely been observed in the wider locality and no records exist in the Leard State Forest. Figure C.2 illustrates the current known generalised distribution.

Description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action

The proposed avoidance and mitigation measures are outlined in Section 7 and Section 8.4 of the BDAR. Regarding specific measures for this species, the following relevant mitigation measures are recommended for any related residual impacts:

- limit annual vegetation disturbance to the minimum necessary for planned mining operations
- timing of clearing works to avoid critical life cycle events (i.e. breeding)
- demarcation of clearing boundaries using continuous high visibility flagging (or similar)
- pre-clearing surveys
- establishment of no-go zones to protect adjacent potential habitat during construction and operation.

Identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account

The residual direct impact to Regent Honeyeater includes 60.81 ha of box/ironbark habitat through associated PCTs, including PCT 588, PCT 592 and PCT 594. In over 12 years of surveys targeting both Regent Honeyeaters and Swift Parrots, during winter periods when White Box blossom is present, no Regent Honeyeaters have been observed to use White Box blossom in the wider Boggabri region, including areas where high quality foraging habitats occur, both within Leard State Forest and in Biodiversity Offset Areas to the east and west of the forest. While the results of those surveys encompass annual flowering events when blossom is scarce, they also encompass periods when *E. albens* flowers very strongly in Leard State Forest and the surrounding region. During such periods, inflated guilds of nectarivorous birds, which require inter-regional movements to attend the blossom are present, including occasions attended by Swift Parrots. However, Regent Honeyeaters have not been detected during any such events when White Box flowers strongly in the region. While the Regent Honeyeater is a very rare species, it can usually be detected in at least low numbers in areas where blossoming events of extra-regional significance occur. However, it has not been detected in the highest quality forest areas in Leard State Forest within such significant events. The Proposed Action Boundary does not include areas that periodically attract an inflation of nectarivorous birds due to high blossom densities, to the contrary, its capability to support nectarivorous birds is limited to birds that are locally resident in low but stable numbers. Therefore, it is considered very likely that the paucity of suitable habitat within the Proposed Action Boundary precludes the intermittent presence of Regent Honeyeaters therein.

A description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established

Details of offset requirements and obligations for this species as a result of residual impacts due to MOD 10 is addressed in Section 10.1.1 of the BDAR.

Details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts

The BDAR specifically addresses section 10 of the BAM and provides information on the application of the no net loss standard and MOD 10 biodiversity offset obligations.

Details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites

Section 11 of the BDAR outlines the biodiversity credit requirements for MOD 10. The offset obligations will be met through implementing a combination of the following offset delivery options, being:

- the purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register
- establishing a biodiversity stewardship site(s) on lands with like for like biodiversity values to those impacted by MOD 10
- through making a payment into the Biodiversity Conservation Fund.

C3.3.2 Large-eared Pied Bat

Status

The Large-eared Pied Bat (*Chalinolobus dwyeri)* is listed as Endangered under the EPBC Act.

Description

The Large-eared Pied Bat is patchily distributed across central-eastern New South Wales and south-eastern and central Queensland, from the area bounded by Shoalwater Bay, north of Rockhampton, south to Ulladulla (Department of Agriculture Water and the Environment, 2021). The species' area of occurrence is demarcated by areas supporting maternity roost sites, which is considerably smaller than the species' general extent, and its distribution could be considered severely fragmented with individuals occurring in small and somewhat isolated populations (Department of Agriculture Water and the Environment, 2021). Large-eared Pied Bat's main strongholds occur in the Pilliga region and Sydney sandstone region. The Large-eared Pied Bat is known to be dependent on the presence of caves, overhangs, disused mine shafts and abandoned Fairy Martin nests for roosting, which mainly occur in areas with volcanic rock and sandstone outcrop that provide escarpments for roosting (Dwyer, 1966). The Large-eared Pied Bat has been recorded foraging in a range vegetation types, including wet and dry sclerophyll forests, Callitris dominated forest, grassy woodlands, tall open forest, subtropical rainforest, sub-alpine woodland and sandstone outcrop country (Department of Agriculture Water and the Environment, 2021).

Relevant Commonwealth guidelines, policy statements including listing advice, conservation advice and recovery plan

A summary of the relevant Commonwealth guidelines and policy statements available for this species is as follows:

- Conservation Advice for *Chalinolobus dwyeri* (Large-eared Pied Bat) (Commonwealth Department of Climate Change Energy the Environment and Water, 2023a). Reviewed as part of this assessment.
- Commonwealth Listing Advice on *Chalinolobus dwyeri* (Large-eared Pied Bat) (Threatened Species Scientific Committee, 2012). Reviewed as part of this assessment.

- National recovery plan for the Large-eared Pied Bat *Chalinolobus dwyeri* (Department of Environment and Resource Management, 2011). Reviewed as part of this assessment.
- no threat abatement plan has been identified as being relevant for this species.

Relevant survey guidelines for this species include:

- Survey Guidelines for Australia's Threatened Bats (Department of the Environment Water Heritage and the Arts, 2010b).

Specific impacts

This species has not been recorded during field surveys in the Proposed Action Boundary, but the species is known to occur within the wider locality. Potential foraging habitat for this species was recorded, but there are no suitable topographies for roosting/breeding habitats within the Proposed Action Boundary or the wider Leard State Forest. This species usually limits its foraging behaviours to areas surrounding its breeding and roosting habitats. The nearest locations for such habitat features, which are suitable for roosting/breeding for this species are within the Nandewar ranges to the east. Given the extensive forests associated with the locations where this species is likely to roost/breed and the distance of such features from the Proposed Action Boundary, and their separation from Leard State Forest by large areas of open habitats, it is considered unlikely that this species would frequently use the Proposed Action Boundary or associated habitats regularly for foraging purposes. In over 10 years of biodiversity survey and assessment and monitoring within the Leard State Forest and adjacent Biodiversity Offset Areas, the Large-eared Pied Bat has only ever been recorded in association with the Nandewar Range, to the east of the Proposed Action Boundary, and specifically in association with BCMs Nioka North Biodiversity Offset Property.

The Proposed Action will remove up to 84.48 ha of potential habitat in the form of PCT 531, PCT 462, PCT 588, PCT 592, and PCT 594, which are listed in BioNet as suitable for the species.

EPBC Act significant impact assessment

The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013b).

An action is likely to have a significant impact on a Critically Endangered or 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 of a species

The Proposed Action will result in the direct removal of 84.48 ha of potential foraging habitat for the Large-eared Pied Bat. Breeding habitat will not be impacted, and consequently, it is unlikely the Proposed Action would lead to a long-term decrease in the size of a population of the species.

Reduce the area of occupancy of the species

The area of occupancy of the Large-eared Pied Bat is not known. Old estimates placed the species' extent of occurrence as 570,000 km^2 (Commonwealth Department of Climate Change Energy the Environment and Water, 2024c), but these estimates were made prior to current knowledge of restricted habitat preferences and are therefore likely to be an overestimate. Despite extensive surveys throughout the species' distribution in NSW, only four nursery roosts are known and only two of these are thought to be active. The area of occupancy in NSW during the breeding season was thought to be less than 1 km^2; however, this estimate was put forward when one active breeding site was known, and now there are two (Commonwealth Department of Climate Change Energy the Environment and Water, 2024c). The area occupied by this species would remain the same as a result of the Proposed Action. There is no real chance or possibility that the impacts from MOD 10 would reduce the area of occupancy for the Large-eared Pied Bat.

Fragment an existing population into two or more populations

The Leard State Forest Vegetation Corridor is a 500 m strip of remnant native vegetation reserved in perpetuity that links the eastern section of Leard State Forest to the western sections of the forest and the Conservation Area beyond. The Proposed Action will not compromise the link between eastern and western sections of the Leard State Forest such that it would fragment an existing population into two or more populations.

Adversely affect habitat critical to the survival of a species

No critical habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat. The *National recovery plan for the Large-eared Pied Bat Chalinolobus dwyeri* (Department of Environment and Resource Management, 2011) states that sandstone cliffs and fertile wooded valley habitat within close proximity to each other should be considered habitat critical to the survival of the Large-eared Pied Bat.

Potential impacts associated with the Proposed Action include removal of up to 84.48 ha of PCT's which represent potential foraging resources for this species. No roosting habitat (caves) will be affected by the Proposed Action. Given the significant distances of the Proposed Action Boundary from potential breeding/roosting features, and the likelihood that foraging movements are very likely limited to immediate forest habitats around such areas, it is unlikely that local forest habitats are significant to the long-term survival of the species in the locality. The Proposed Action is therefore unlikely to affect habitat of critical importance to this species.

Disrupt the breeding cycle of a population

The Proposed Action Boundary and wider Leard State Forest are not defined by topographies suitable for roosting or breeding by the Large-eared Pied Bat. This species usually limits its foraging behaviours to areas surrounding its breeding and roosting habitats. The nearest locations for such habitat features, which are suitable for roosting/breeding for this species are within the Nandewar ranges to the east. Given the extensive forests associated with the locations where this species is likely to roost/breed and the distance of such features from the Proposed Action Boundary, and their separation from Leard State Forest by large areas of open habitats, it is considered unlikely that this species would frequently use the Proposed Action Boundary or associated habitats regularly for foraging purposes. Consequently, it is not likely the Proposed Action will disrupt the breeding cycle for this species.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Proposed Action may remove up to 84.48 ha of potential foraging habitat. No roosting habitat (caves) will be affected by the Proposed Action. Given that the Proposed Action Boundary is typical of habitat in adjacent woodlands, it is unlikely that these are important to the long-term survival of the species in the locality. The Proposed Action is therefore unlikely to cause the species to decline.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species´ habitat

The Proposed Action is unlikely to result in an invasive species harmful to the Large-eared Pied Bat becoming further established in the habitat. Invasive species would be managed under the *Weed and Pest Management Strategy* in the approved BMP (WSP, 2018b).

Introduce disease that may cause the species to decline

There are no known disease issues affecting this species and the Proposed Action would be unlikely to increase the potential for significant disease vectors to affect the species.

Interfere with the recovery of the species

The National Recovery Plan (Department of Environment and Resource Management, 2011) identifies the following recovery objectives for the Large-eared Pied Bat:

- identify priority roost and maternity sites for protection
- implement conservation and management strategies for priority sites

- educate the community and industry to understand and participate in the conservation of the Large-eared Pied Bat
- research the Large-eared Pied Bat to augment biological and ecological data to enable conservation management
- determine the meta-population dynamics throughout the distribution of the Large-eared Pied Bat.

There is no real chance or possibility that the Proposed Action will adversely affect habitat critical to the survival of this species and therefore will not interfere substantially with the recovery of the species.

Conclusion

The Proposed Action is considered unlikely to have a significant impact on the species. Impacts will be limited to the removal of potential foraging resources (84.48 ha), due to a lack of breeding/roosting habitat topographies in the Proposed Action Boundary and the wider Leard State Forest. The habitat affected is a small proportion of potential habitat for the species in the locality and considerably distant from breeding/roosting habitats in the wider locality, around which individuals are most likely to concentrate their foraging efforts. Considering the mobility of this species, and the retention of vegetated corridor through Leard State Forest, the Proposed Action will not fragment or isolate any locally occurring populations. Therefore, it is unlikely that this species would be significantly affected by the Proposed Action.

NSW Assessment Bilateral requirements

For each of the EPBC Act listed threatened species and migratory species likely to be impacted by the action the EIS must provide a separate:

Description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plan

A description of habitat for this species, important populations, habitat critical for survival and relevant Commonwealth documents are provided in the section above, with a map showing the modelled distribution of the species provided in Figure C.3.

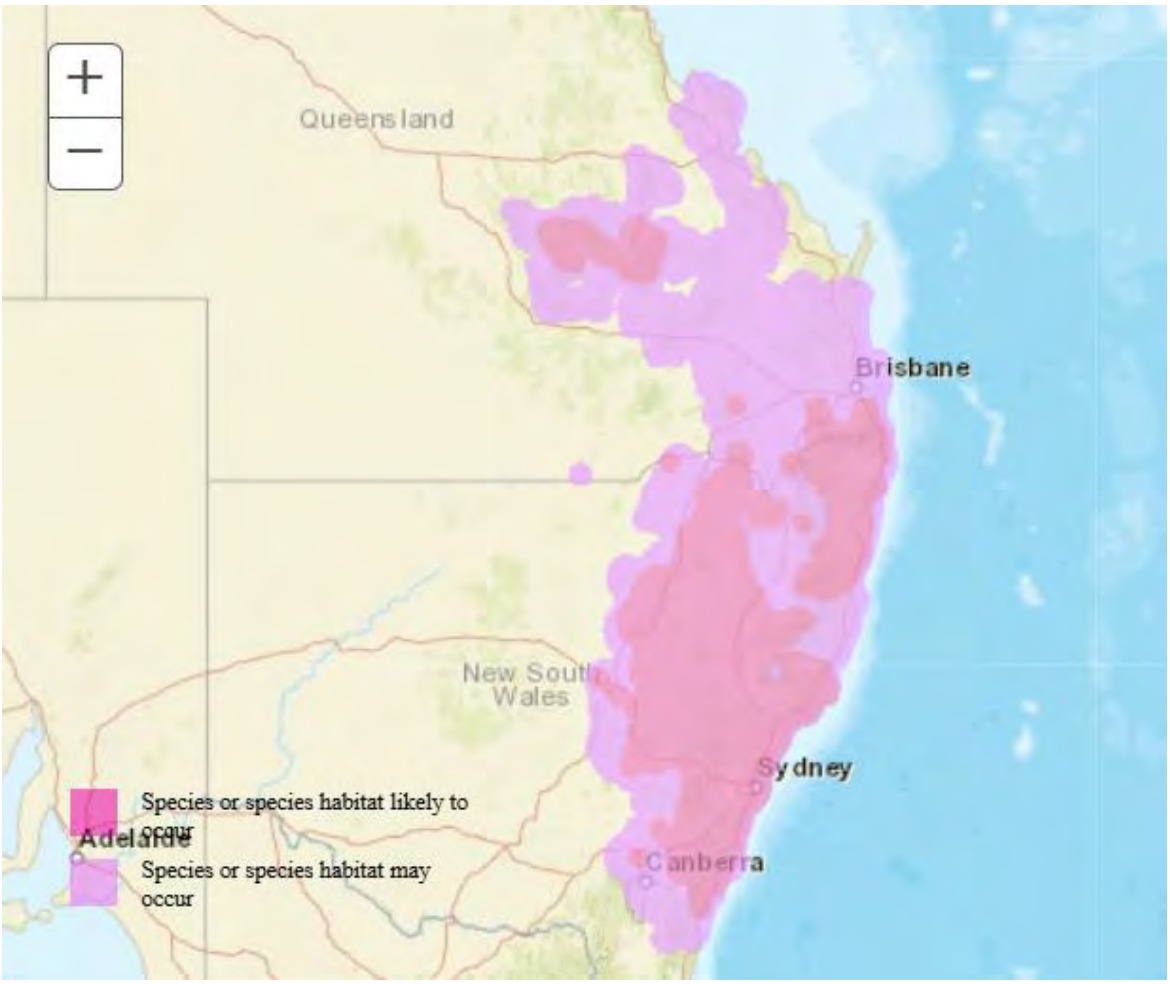


Figure C.3 Current distribution map for Large-eared Pied Bat
(Commonwealth Department of Climate Change Energy the Environment and Water, 2024c)

Details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements

Prior to survey, habitat constraints and microhabitats for candidate threatened fauna (species credit) species as listed within the NSW Threatened Biodiversity Data Collection was undertaken. In addition, a review of previous ecological survey and assessment and monitoring of the Leard State Forest, Vegetation Corridor, and subject land was undertaken.

Ultrasonic Anabat bat detection (Titley Electronics) was used to record and identify the echolocation calls of micro bats foraging across a number of native vegetation communities in the Proposed Action Boundary. Passive monitoring of these survey sites was achieved by setting Anabat bat detectors to record continuously overnight. Bat call analysis was completed, taking into consideration the guidelines of the Australasian Bat Society, with Bat calls of New South Wales (PennayLaw and Reinhold, 2004) used as a reference collection for bat call identification. Although many microchiropteran bat species are detectable through use of ultrasonic detection methodologies, the vocal differences between some species are too subtle to reliably differentiate between the various species occurring in a particular locality (e.g. Corben's Long-eared Bat). Therefore, targeted harp trapping was completed for capture and release of insectivorous bats. Site selection for the setting of harp traps included a number of rationales, such as, targeting of those habitat areas where hollow-bearing trees provide potential roosting sites and where suitable flyways were detected in woodland settings. Harp traps were set at each survey location for two-consecutive nights, with surveys conducted in calm and hot or warm weather conditions to increase the likelihood of bat activity (Office of Environment & Heritage, 2018b). Captured bats were identified to species level, sexed, measured and weighed. Bats were released immediately after processing during dark conditions.

Field survey techniques were used to undertake targeted seasonal surveys in general accordance *Survey guidelines for Australia's threatened bats* (Department of the Environment, 2010) and NSW survey guide for 'species credit' threatened bats and their habitats (Office of Environment & Heritage, 2018b) including:

- 32 ultrasonic detector nights over two separate four-night periods in January 2024
- 20 harp trap nights between in November 2023, January 2024 and November 2024
- 45 person hours of parallel transects searching for topographical features that may support roosting or breeding habitat in August 2023
- five habitat assessments.

Further details of these surveys are provided in Section 2.4 and Table 5.9 of the BDAR.

Description of the specific impacts and its regard to the full national extent of the species or community's range

The Proposed Action will result in the direct removal of up to 84.48 ha of potential foraging habitat through associated PCTs, including PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594. However, there are no suitable topographies for roosting/breeding habitats within the Proposed Action Boundary or the wider Leard State Forest. This species usually limits its foraging behaviours to areas surrounding its breeding and roosting habitats. The nearest locations for such habitat features, which are suitable for roosting/breeding for this species are within the Nandewar ranges to the east of the Proposed Action Boundary. Given the extensive forests associated with the locations where this species is likely to roost/breed and the distance of such features from the Proposed Action Boundary, and their separation from Leard State Forest by large areas of open habitats, it is considered unlikely that this species would frequently use the Proposed Action Boundary or associated habitats regularly for foraging purposes. Figure C.3 illustrates the current known generalised distribution.

Description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action

The proposed avoidance and mitigation measures are outlined in Section 7 and Section 8.4 of the BDAR. Regarding specific measures for this species, the following relevant mitigation measures are recommended for any related residual impacts:

- limit annual vegetation disturbance to the minimum necessary for planned mining operations
- timing of clearing works to avoid critical life cycle events (i.e. breeding)
- demarcation of clearing boundaries using continuous high visibility flagging (or similar)
- pre-clearing surveys
- establishment of no-go zones to protect adjacent potential habitat during construction and operation.

Identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account

The residual direct impact to Large-eared Pied Bat includes 84.48 ha of potential foraging habitat through associated PCTs, including PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594. No caves or potentially suitable roosting or breeding structures are known from the Proposed Action Boundary or wider Leard State Forest. In over 10 years of biodiversity survey and assessment and monitoring within the Leard State Forest and adjacent Biodiversity Offset Areas, the Large-eared Pied Bat has only ever been recorded in association with the Nandewar Range, to the east of the Proposed Action Boundary, and specifically in association with BCMs Nioka North Biodiversity Offset Property.

A description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established

Details of offset requirements and obligations for this species as a result of residual impacts due to MOD 10 is addressed in Section 10.1.1 of the BDAR.

Details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts

The BDAR specifically addresses section 10 of the BAM and provides information on the application of the no net loss standard and MOD 10 biodiversity offset obligations.

Details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites

Section 11 of the BDAR outlines the biodiversity credit requirements for MOD 10. The offset obligations will be met through implementing a combination of the following offset delivery options, being:

- the purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register
- establishing a biodiversity stewardship site(s) on lands with like for like biodiversity values to those impacted by MOD 10
- through making a payment into the Biodiversity Conservation Fund.

C3.3.3 Brown Treecreeper (south-eastern)

Status

The eastern subspecies of the Brown Treecreeper (south-eastern) (*Climacteris picumnus victoriae*) is listed as Vulnerable under the EPBC Act.

Description

Brown Treecreeper (south-eastern), is Australia's largest treecreeper. The species is grey-brown with black streaking on the lower breast and belly, and black bars on the undertail. Pale buff bands across the flight feathers are obvious in flight. The face is pale, with a dark line through the eye, and a dark crown (Higgins and Peter, 2002). Sexes differ slightly in all plumages, with small patches of black and white streaking on the centre of the uppermost breast on males, while the females exhibit rufous and white streaking. Juveniles differ from adults mainly by the pattern of the under-body and by their pale bill and gape. Subspecies victoriae is distinguished from subspecies picumnus by colour differences on the face, body and tail markings. The two subspecies grade into each other through central New South Wales (Higgins and Peter, 2002). Brown treecreepers (south-eastern) occupy dry open eucalypt forests and woodlands. The subspecies mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species. They also occur in mallee, forests and woodlands subject to periodic inundation, e.g., river red gum (*Eucalyptus camaldulensis*) woodlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses in the upper Murray River (Office of Environment & Heritage, 2024). The subspecies is not usually found in woodlands with a dense shrub layer, and it is absent from heavily degraded woodlands and steep rocky hills. Optimal habitat for brown treecreeper (south-eastern) must experience some kind of ongoing disturbance regime (historically Indigenous burning practices) to keep the ground layer from becoming too dense and uniform (Commonwealth Department of Climate Change Energy the Environment and Water, 2023b).

The subspecies forages both on the ground and in mature live and dead trees and are terrestrial and arboreal in about equal proportions. The subspecies is described as sedentary, with birds occupying permanent territories. They are usually observed in pairs or small family groups of up to five birds. Brown Treecreepers (south-eastern) nest and roost in naturally occurring tree cavities in a variety of eucalypt species. Breeding takes place from July to February across its range (Office of Environment & Heritage, 2024).

Brown treecreepers (south-eastern) are endemic to south-eastern Australia from the Grampians in western Victoria, through central New South Wales to the Bunya Mountains in Queensland, and from the coast to the inland slopes of Great Dividing Range. In New South Wales the western boundary of the range runs approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell and along this line the subspecies intergrades with the arid zone

subspecies of Brown Treecreeper *C. p. picumnus*. The subspecies is less commonly found on coastal plains and ranges (Office of Environment & Heritage, 2024).

Relevant Commonwealth guidelines, policy statements including listing advice, conservation advice and recovery plan

A summary of the relevant Commonwealth guidelines and policy statements available for this species is as follows:

- approved conservation advice: Conservation Advice for *Climacteris picumnus victoriae* (brown treecreeper (south-eastern))
- no relevant listing advice is available for this species. Listing assessment information for this species may be available in the approved Conservation Advice
- there is no adopted or made Recovery Plan for this species
- no threat abatement plan has been identified as being relevant for this species.

Specific impacts

This subspecies of Brown Treecreeper was not recorded during field surveys within the Proposed Action Boundary despite its occurrence in other areas of the Leard State Forest. Brown Treecreepers are reticent to use habitat forms as occur where the Proposed Action is located, because these upslope woodlands are generally characterised by a dense understory shrub layer. While the open grassy habitats this species prefers are sometimes characterised by shrub occurrences, preferred habitats have shrub layers at lower densities which allow this species to forage on the ground and over fallen timber with the security of being able to monitor surrounding habitats for the presence of predators. These habitat characteristics are denied the species within habitats associated with the Proposed Action Boundary and is the key reason that these habitats were not found to contain Brown Treecreepers, despite upper strata suitability.

Locally, the Brown Treecreeper prefers lowland grassy woodland habitats dominated by *E. albens* but more widely throughout its range it generally inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species present, but not representing a dense cover. The species as a whole is also found in mallee and River Red Gum (*E. camaldulensis*) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi, and grasses, although some of those habitat types are beyond the range of the threatened eastern subspecies.

The Proposed Action will result in removal of 84.48 ha of marginal habitat in the form of PCT 531, PCT 462, PCT 588, PCT 592, and PCT 594, which are listed in BioNet as suitable for the species.

While the Proposed Action Boundary is assessed as “potential’ habitat for the Brown Treecreeper, the non-preferred high understory shrub densities and the species’ absence in those habitats during considerable field investigations are strong evidence that the Proposed Action Boundary does not contain habitats that are preferred by local populations of this species.

EPBC Act significant impact assessment

The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013b). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity, and/or
- at or near the limit of the species range.

Is this part of an important population?

In accordance with the Significant Impact Guidelines, the presence of an important population must be identified prior to addressing the significance impact criteria. An important population is defined in the guidelines as a population that is necessary for a species' long-term survival and recovery (Department of the Environment, 2013a). Under the EPBC Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity
- at or near the limit of the species range.

No important populations are currently listed for Brown Treecreeper (south-eastern) (Commonwealth Department of Climate Change Energy the Environment and Water, 2023b). Despite the occurrence of Brown Treecreeper (south-eastern) within the Leard State Forest, there are no records for this species in the Proposed Action Boundary despite significant survey effort. Locally, the Brown Treecreeper (south-eastern) prefers lowland grassy woodland habitats dominated by *E. albens*, usually with an open grassy understorey. These habitat characteristics are denied the species within habitats associated with the Proposed Action Boundary and is the key reason that these habitats were not found to contain Brown Treecreepers, despite upper strata suitability.

While the Proposed Action Boundary is assessed as "potential' habitat for the Brown Treecreeper, the non-preferred high understory shrub densities and the species' absence in those habitats during considerable field investigations are strong evidence that the Proposed Action Boundary does not contain habitats that are preferred by local populations of this species.

Brown Treecreeper individuals within the Proposed Action Boundary are unlikely to be key source populations for breeding or dispersal or be necessary for maintaining genetic diversity as the habitat is not preferred by local populations, and individuals within the Proposed Action Boundary are not at the limit of the threatened subspecies range. For these reasons, individuals within the Proposed Action Boundary cannot be identified as an important population.

An action is likely to have a significant impact on a Vulnerable species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of an important population of a species

Not applicable as individuals that might occur within the Proposed Action Boundary are not part of an important population.

Reduce the area of occupancy of an important population of the species

Not applicable as individuals that might occur within the Proposed Action Boundary are not part of an important population.

Fragment an existing important population into two or more populations

Not applicable as individuals that might occur within the Proposed Action Boundary are not part of an important population.

Adversely affect habitat critical to the survival of a species

No critical habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat. The approved Conservation Advice for *Climacteris picumnus victoriae* (brown treecreeper (south-eastern)) (Commonwealth Department of Climate Change Energy the Environment and Water, 2023b) considers habitat critical to the species as relatively undisturbed grassy woodland with native understorey and an open habitat structure at ground level so that birds are able to feed on the ground and maintain vigilance against predators. Such habitat did not occur in the Proposed Action Boundary and the species has not been recorded therein. Accordingly, the Proposed Action will not affect habitat critical to the survival of the Brown Treecreeper (south-eastern).

Disrupt the breeding cycle of an important population

Not applicable as individuals that might occur within the Proposed Action Boundary, are not part of an important population.

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

The Proposed Action will likely affect up to 84.48 ha of potential habitat not preferred by the species. Due to the lack of preferred habitat because of the dominance of habitat containing dense understory shrub strata, it is unlikely that the Proposed Action would have a direct impact on the species.

Result in invasive species that are harmful to an Endangered species becoming established in the Endangered species´ habitat

It is not likely that invasive species (such as introduced predators) that are potentially harmful to the Brown Treecreeper (south-eastern) would become further established as a result of the Proposed Action.

Introduce disease that may cause the species to decline

There are no known diseases causing potential species decline to Brown Treecreeper (south-eastern). It is unlikely that disease would be increased by the Proposed Action.

Interfere with the recovery of the species

There is currently no recovery plan in place for Brown Treecreeper (south-eastern). The approved conservation advice for the species outlines a number of conservation, research and recovery actions for the species with the primary conservation objective that 'stable or increasing populations are observed across the range' (Commonwealth Department of Climate Change Energy the Environment and Water, 2023b).

The Proposed Action will remove 84.48 ha of marginal habitat for the Brown Treecreeper, that is generally avoided by the species due to understorey structural deficiencies. The Proposed Action Boundary occurs within the Leard State Forest which is continuous with the Leard State Conservation Area to the west, representing more than 3,000 ha of similar and higher quality habitat for this species. While the Proposed Action will represent an incremental loss of a marginal habitat type, it will not represent a significant impact on the recovery of this species, considering the vegetation removal will not reduce connectivity for the species on a local level.

Conclusion

The relatively high density of understory shrub strata across the Proposed Action Boundary, generally prevents the use of these habitats by local Brown Treecreeper (south-eastern) populations as evidenced by the lack of records during considerable ecological survey effort on many survey visits covering a wide range of different fauna guilds, including both targeted and incidental bird surveys throughout the survey periods. The extent of native vegetation and the removal of marginal habitat associated with the Proposed Action is assessed as relatively small (84.48 ha) in terms of available habitat for the species within Leard State Forest and adjoining conservation lands (>3,000 ha). The Proposed Action is not considered to fragment any locally occurring populations, affect habitat critical to their survival, disrupt their breeding cycles, or interfere with the recovery of these species. Therefore, the Proposed Action is assessed as representing an incremental loss of marginal local habitat, which it is not considered likely to affect the long-term viability of the species in the locality.

NSW Assessment Bilateral requirements

For each of the EPBC Act listed threatened species and migratory species likely to be impacted by the action the EIS must provide a separate:

Description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plan

A description of habitat for this species, important populations, habitat critical for survival and relevant Commonwealth documents are provided in the sections above, with a map showing the modelled distribution of the species provided in Figure C.4.

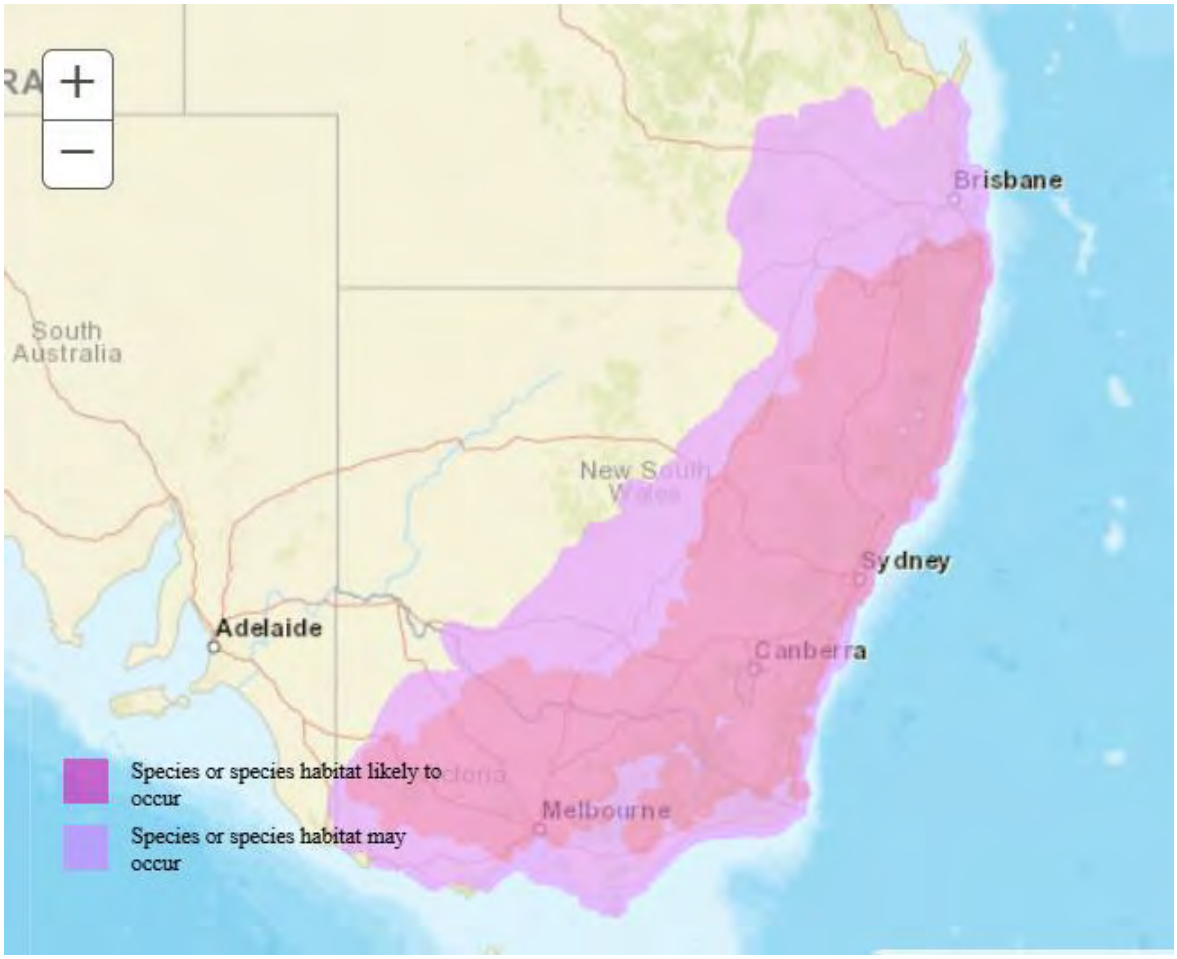


Figure C.4 Current distribution map for Brown Treecreeper (south-eastern) (Commonwealth Department of Climate Change Energy the Environment and Water, 2024c)

Details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements

Prior to survey, habitat constraints and microhabitats for candidate threatened fauna (species credit) species as listed within the NSW Threatened Biodiversity Data Collection was undertaken. In addition, a review of previous ecological survey and assessment and monitoring of the Leard State Forest, Vegetation Corridor, and subject land was undertaken.

Field survey techniques were used to undertake targeted survey in general accordance with the *NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (Department of

Environment and Conservation, 2004) and *Survey guidelines for Australia's threatened birds (Department of the Environment Water Heritage and the Arts, 2010c)* including:

- 39 20-minute diurnal bird surveys between August 2023 and January 2024
- 45 person hours of parallel bird transects in August 2023
- 56 person hours of parallel bird transects in October 2023
- five habitat assessments.

Further details of these surveys are provided in Section 2.4 and Table 5.9 of the BDAR.

Description of the specific impacts and its regard to the full national extent of the species or community's range

The Proposed Action will remove 84.48 ha of marginal habitat for the Brown Treecreeper (south-eastern) that is generally avoided by the species due to understorey structural deficiencies. As an ecosystem credit species, the Brown Treecreeper (south-eastern) is assumed present in all associated PCTs, including PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594, and as such, contributes to the offset requirements for these PCTs. Figure C.4 illustrates the current known generalised distribution.

Description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action

The proposed avoidance and mitigation measures are outlined in Section 7 and Section 8.4 of the BDAR. Regarding specific measures for this species, the following relevant mitigation measures are recommended for any related residual impacts:

- limit annual vegetation disturbance to the minimum necessary for planned mining operations
- timing of clearing works to avoid critical life cycle events (i.e. breeding)
- demarcation of clearing boundaries using continuous high visibility flagging (or similar)
- pre-clearing surveys
- two-staged clearing process
- establishment of no-go zones to protect adjacent potential habitat during construction and operation.

Identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account

The residual direct impact to Brown Treecreeper (south-eastern) includes 84.48 ha of potential habitat not preferred by the species through associated PCTs, including PCT 531, PCT 462, PCT 588, PCT 592, and PCT 594. The residual impact has been captured as part of ecosystem credits in Section 11.1 of the BDAR.

A description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established

Details of offset requirements and obligations for this species as a result of residual impacts due to MOD 10 is addressed in Section 10.1.1 of the BDAR.

Details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts

The BDAR specifically addresses section 10 of the BAM and provides information on the application of the no net loss standard and MOD 10 biodiversity offset obligations.

Details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites

Section 11 of the BDAR outlines the biodiversity credit requirements for MOD 10. The offset obligations will be met through implementing a combination of the following offset delivery options, being:

- the purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register
- establishing a biodiversity stewardship site(s) on lands with like for like biodiversity values to those impacted by MOD 10
- through making a payment into the Biodiversity Conservation Fund.

C3.3.4 Painted Honeyeater

Status

The Painted Honeyeater (*Grantiella picta*) is listed as Vulnerable under the EPBC Act.

Description

The Painted Honeyeater is sparsely distributed from south-eastern Australia to north-western Queensland and eastern Northern Territory. The greatest concentrations and almost all records of breeding come from south of 26ºS, on inland slopes of the Great Dividing Range between the Grampians, Victoria and Roma, Queensland. Fruiting mistletoe primarily influences the Painted Honeyeater's seasonal north-south movements, with its breeding season closely matched. After breeding, many birds move into semi-arid regions such as north-eastern South Australia, central and western Queensland, and central Northern Territory. Breeding occurs from October to March when mistletoe fruits are most available (Threatened Species Scientific Committee, 2015c).

The species is a mistletoe specialist, and inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands of Black Box and River Red Gum, Box-ironbark-yellow Gum woodlands, Acacia-dominated woodlands, Paperbarks, Casuarinas, Callitris, and trees on farmland or gardens. The species prefers woodlands which contain a higher number of mature trees, as these host more mistletoes, and is more common in wider blocks of remnant woodland than in narrower strips (Threatened Species Scientific Committee, 2015c). Threats for this species include:

- habitat loss due to clearing
- grazing by livestock, macropods and rabbits, limiting new tree recruitment
- competition with the aggressive Noisy Miner (*Manorina melanocephala*), predation by invasive species such as Black Rats (*Rattus rattus*), and nest predation by over abundant Pied Currawongs (*Strepera graculina*), pied and grey butcherbirds (*Cracticus nigrogularis* and *Cracticus torquatus*), and crows and ravens (Corvidae) (Threatened Species Scientific Committee, 2015c).

Strongholds for the species and breeding areas occur on the inland slopes of the Great Dividing Range in NSW, Victoria and Southern Queensland (Threatened Species Scientific Committee, 2015c).

Relevant Commonwealth guidelines, policy statements including listing advice, conservation advice and recovery plan

A summary of the relevant Commonwealth guidelines and policy statements available for this species is as follows:

- Conservation Advice *Grantiella picta* painted honeyeater (Department of the Environment 2015)
- listing assessment information for this species may be available in the approved Conservation Advice.
- adopted/made Recovery Plan: *National Recovery Plan for the Painted Honeyeater* (*Grantiella picta*) (Commonwealth of Australia, 2021)
- no Threat Abatement Plan has been identified as being relevant for this species.

Relevant survey guidelines for this species include:

- Survey Guidelines for Australia's Threatened Birds (Department of the Environment Water Heritage and the Arts, 2010c).

Specific impacts

This species was not recorded during field surveys within the Proposed Action Boundary; however, potential habitat was recorded therein in form of mistletoe occurrence and there are records for this species locally. The species is regularly recorded in association with *Acacia pendula* immediately south of the Leard State Forest and in the wider locality and there is an old record in mistletoe from Pilliga Box dominated habitats in the south of the forest prior to the commencement of mining operations. The Painted Honeyeater's primary mistletoe (*Amyema* genus) food source was recorded in Proposed Action Boundary.

The Proposed Action will result in removal of 84.48 ha of marginal habitat in the form of PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594, which are listed in BioNet as suitable for the species.

EPBC Act significant impact assessment

The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013b). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity, and/or
- at or near the limit of the species range.

Is this part of an important population?

The Painted Honeyeater is sparsely distributed from south-eastern Australia to north-western Queensland and eastern Northern Territory. The greatest concentrations and almost all records of breeding come from south of 26ºS, on inland slopes of the Great Dividing Range between the Grampians, Victoria and Roma, Queensland. Fruiting mistletoe primarily influences the Painted Honeyeater's seasonal north-south movements, with its breeding season closely matched. After breeding, many birds move into semi-arid regions such as north-eastern South Australia, central and western Queensland, and central Northern Territory. Breeding occurs from October to March when mistletoe fruits are most available (Threatened Species Scientific Committee, 2015c).

The species is a mistletoe specialist, and inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands of Black Box and River Red Gum, box-ironbark-yellow gum woodlands, Acacia-dominated woodlands, Paperbarks, Casuarinas, Callitris, and trees in farmland or gardens. The species prefers woodlands which contain a higher number of mature trees, as these host more mistletoes, and is more common in wider blocks of remnant woodland than in narrower strips (Threatened Species Scientific Committee, 2015c).

Its regional range extends as far east as the Central and Upper Hunter Valley and the intervening woodlands throughout the Liverpool Plains where mistletoe host species occur. Local observations of this species area dominated by occurrences at *Amyema quandang* (Grey Mistletoe) which habitually parasitises *Acacia* sp. notably *Acacia pendula* (Weeping Myall) in the Boggabri and Liverpool Plains region. The species has also been observed to use *Amyema miquelii* (Box Mistletoe) in Leard State Forest (WSP ecologist pers. obs. 2006) and where the mistletoes occurred in abundance within Boggabri Coal Mine's rehabilitation area.

The species has been conspicuously absent from Leard State Forest during the last 12 years and the dominant trees within the Proposed Action Boundary (*E. crebra*) do not carry dense occurrences of mistletoe.

Due to the cleared nature of the floodplain landscapes in which this species occurs locally, notwithstanding efforts to rehabilitate areas in the region and land holders endeavouring to preserve important habitat, locally occurring Painted Honeyeaters are highly dependent on remaining habitats remnants and are therefore likely to be deemed as an important population.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of an important population of a species

Habitats within the Proposed Action Boundary are unlikely to be used by this species regularly, due to the paucity of records for this species within the Leard State Forest over the last 12 years. Therefore, the Proposed Action is considered unlikely to lead to a long-term decrease in the size of an important population of Painted Honeyeater.

Reduce the area of occupancy of an important population of the species

Habitats within the Proposed Action Boundary are unlikely to be used by this species regularly, due to the paucity of records for this species within the Leard State Forest over the last 12 years. Therefore, the Proposed Action is considered unlikely to significantly decrease the area of occupancy of an important population of Painted Honeyeater.

Fragment an existing important population into two or more populations

The Proposed Action is considered unlikely to fragment an existing important population into two or more populations of Painted Honeyeater as connectivity within the Leard State Forest will be preserved by a corridor of vegetation set aside for connectivity between eastern and western sections of the forest.

Adversely affect habitat critical to the survival of a species

No critical habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat. Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary proposed development, or
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment, 2013b).

The *National Recovery Plan for the Painted Honeyeater* (*Grantiella picta*) (Commonwealth of Australia, 2021) details habitat critical to the survival of the Painted Honeyeater as:

- Breeding habitat – known or likely breeding habitat in Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) woodlands, box-gum woodlands and box ironbark forests on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland

- Foraging habitat – all preferred foraging species within known and likely foraging habitat particularly mistletoes of the genus *Amyema* growing on forest and woodland eucalypt and acacias.

The relatively small area of potential habitat likely to be affected by the Proposed Action (84.48 ha) represents a relatively small component of locally occurring resources that would be accessible to this species. The area in which the Proposed Action is located is not considered to be important to the Painted Honeyeater due to the lack of records for this species in the Leard State Forest over the last 12 years and the dominant trees within the Proposed Action Boundary (*E. crebra*) do not carry dense occurrences of mistletoe. Therefore, the removal of about 84.48 ha of potential habitat would not be considered critical to the survival of this species.

Disrupt the breeding cycle of an important population

The area in which the Proposed Action is located is not considered to be important to the breeding cycle of the Painted Honeyeater due to the lack of records for this species in the Leard State Forest over the last 12 years.

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

The Proposed Action would remove approximately 84.48 ha of potential habitat for this species. It is not expected that the Proposed Action will significantly modify, destroy, remove, isolate or decrease the availability or quality of habitat for the Painted Honeyeater to cause the species to decline. Although vegetation clearing will represent a small loss within the area, it is not considered likely that the action would result in disturbance to the extent that the species would decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat

The local area currently exhibits disturbance regimes associated with agriculture, grazing and mining. These disturbances include vegetation clearing and habitat removal, artificial noise/light regimes and some weed invasion. It is not likely that invasive species (such as introduced predators) that are potentially harmful to the Painted Honeyeater would become further established as a result of the Proposed Action.

Introduce disease that may cause the species to decline

There are no known diseases causing potential species decline to the Painted Honeyeater, or diseases to its preferred food source, mistletoe.

Will the action interfere with the recovery of the species?

The Proposed Action is contrary to the recovery plan vision, objectives and strategies to sustain a positive population trend (compared to 2020 baseline counts) in the number of mature individuals of the Painted Honeyeater (Commonwealth of Australia, 2021), contributing to the degradation and removal of habitat (i.e., mature trees containing mistletoe). Nevertheless, it is considered unlikely that the amount of potential clearing would interfere substantially with the recovery of the species due to the abundance of similar, and likely better-quality habitat in the locality and greater region. Therefore, the Proposed Action is not likely to interfere with the recovery of this species.

Conclusion

Although the Painted Honeyeater was not recorded during field surveys, there is potential foraging resources for this species in the Proposed Action Boundary. While the Proposed Action would remove up to 84.48 ha and this would add to the remnant woodland already removed as part of the wider Leard Forest Mining Precinct, it is considered that the Proposed Action would not reduce the area of occupancy of this species given the lack of records in the forest and higher-quality habitat in the locality and greater region. As core populations, breeding areas, and the species stronghold do not occur within the Proposed Action Boundary or surrounding forest, as evidenced by the absence of the species over a long period, it is considered unlikely that the Proposed Action would have a significant impact on the Painted Honeyeater.

NSW Assessment Bilateral requirements

For each of the EPBC Act listed threatened species and migratory species likely to be impacted by the action the EIS must provide a separate:

Description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plan

A description of habitat for this species, important populations, habitat critical for survival and relevant Commonwealth documents are provided in the sections above, with a map showing the modelled distribution of the species provided in Figure C.5.

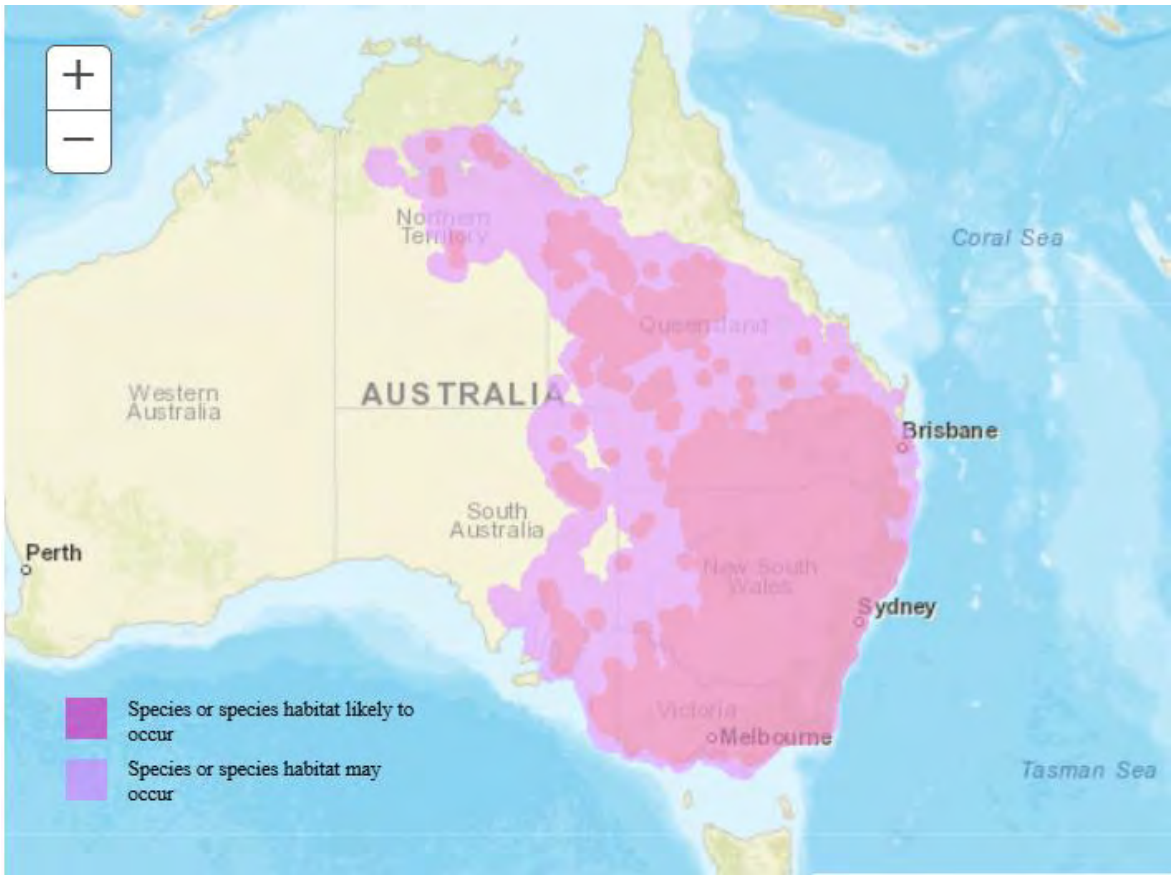


Figure C.5 Current distribution map for Painted Honeyeater
(Commonwealth Department of Climate Change Energy the Environment and Water, 2024c)

Details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements

Prior to survey, habitat constraints and microhabitats for candidate threatened fauna (species credit) species as listed within the NSW Threatened Biodiversity Data Collection was undertaken. In addition, a review of previous ecological survey and assessment and monitoring of the Leard State Forest, Vegetation Corridor, and subject land was undertaken.

Field survey techniques were used to undertake targeted survey in general accordance with the *NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (Department of Environment and Conservation, 2004) and *Survey guidelines for Australia's threatened birds (Department of the Environment Water Heritage and the Arts, 2010c)* including:

- 39 20-minute diurnal bird surveys between August 2023 and January 2024
- 45 person hours of parallel bird transects in August 2023
- 56 person hours of parallel bird transects in October 2023
- five habitat assessments.

Further details of these surveys are provided in Section 2.4 and Table 5.9 of the BDAR.

Description of the specific impacts and its regard to the full national extent of the species or community's range

The Proposed Action will remove 84.48 ha of marginal habitat for the Painted Honeyeater. As an ecosystem credit species, the Painted Honeyeater is assumed present in all associated PCTs, including PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594, and as such, contributes to the offset requirements for these PCTs. Figure C.5 illustrates the current known generalised distribution.

Description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action

The proposed avoidance and mitigation measures are outlined in Section 7 and Section 8.4 of the BDAR. Regarding specific measures for this species, the following relevant mitigation measures are recommended for any related residual impacts:

- limit annual vegetation disturbance to the minimum necessary for planned mining operations
- timing of clearing works to avoid critical life cycle events (i.e. breeding)
- demarcation of clearing boundaries using continuous high visibility flagging (or similar)
- pre-clearing surveys
- establishment of no-go zones to protect adjacent potential habitat during construction and operation.

Identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account

The residual direct impact to Painted Honeyeater includes 84.48 ha of potential habitat through associated PCTs, including PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594. Ecosystem credit offsets will be provided for all residual impacts to these vegetation types as detailed in Section 10.1.1 and Section 11.1 of the BDAR.

A description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established

Details of offset requirements and obligations for this species as a result of residual impacts due the Proposed Action is addressed in Section 10.1.1 of the BDAR.

Details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts

The BDAR specifically addresses section 10 of the BAM and provides information on the application of the no net loss standard and the Proposed Action biodiversity offset obligations.

Details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites

Section 11 of the BDAR outlines the biodiversity credit requirements for MOD 10. The offset obligations will be met through implementing a combination of the following offset delivery options, being:

- the purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register
- establishing a biodiversity stewardship site(s) on lands with like for like biodiversity values to those impacted by MOD 10
- through making a payment into the Biodiversity Conservation Fund.

C3.3.5 White-throated Needletail

Status

The White-throated Needletail (*Hirundapus caudacutus)* is listed as Vulnerable under the EPBC Act.

Description

White-throated Needletails only occur in Australia between late spring and early autumn, and are most likely to occur in summer, when they sometimes form large flocks, appearing as a swirling cloud of birds. White-throated Needletails often occur in large numbers over eastern and northern Australia. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. The White-throated Needletail feeds on flying insects, such as termites, ants, beetles and flies. They catch the insects in flight in their wide gaping beaks. Birds usually feed in rising thermal currents associated with storm fronts and bushfires.

Relevant Commonwealth guidelines, policy statements including listing advice, conservation advice and recovery plan

A summary of the relevant Commonwealth guidelines and policy statements available for this species is as follows:

- Conservation Advice *Hirundapus caudacutus* White-throated Needletail (Threatened Species Scientific Committee, 2019b)
- listing assessment information for this species may be available in the approved Conservation Advice.
- there is no adopted or made Recovery Plan for this species, as the approved Conservation Advice for the species provides sufficient direction to implement priority actions, mitigate against key threats and enable recovery.
- no Threat Abatement Plan has been identified as being relevant for this species.

Relevant survey guidelines for this species include:

- Survey Guidelines for Australia's Threatened Birds (Department of the Environment Water Heritage and the Arts, 2010c)
- Species Profile and Threats Database – *Hirundapus caudacutus* – White-throated Needletail (Commonwealth Department of Climate Change Energy the Environment and Water, 2024c).

Specific impacts

This species has been previously recorded in aerial habitats over the Leard State Forest. The Proposed Action Boundary provides seasonal aerial foraging habitat for this species. The Proposed Action will result in the removal of approximately 84.48 ha of woodland habitat that may be rarely used by the species as a promoter of aerial foraging resources as part of a far larger home range.

EPBC Act significant impact assessment

The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013b). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity
- at or near the limit of the species range.

Is this part of an important population?

The White-throated Needletail is a migratory species and occurs in Australia only between late spring and early autumn but are most commonly encountered in summer. This species is a non-breeding migrant with breeding taking place in Northern Asia (Threatened Species Scientific Committee, 2019a). The White-throated Needletail feeds on flying insects, such as termites, ants, beetles and flies. As with other aerial birds, such as swallows and martins, they catch insects in flight with wide gaping beaks. They have been recorded roosting in forests and woodlands, within dense foliage in the canopy or in hollows, but such observations are very rare (Higgins, 1999). Ridge top locations, such as those where the Proposed Action is located are often used by aerial foragers, due to the deflection of wind aiding keeping aloft and supplying foraging opportunities and Needletails use such areas, convective updraughts and the edges of weather fronts as places that concentrate their insect prey (Higgins, 1999). This species is not at or near the limit of its range as it occurs over eastern and northern Australia and in Northern Asia (Threatened Species Scientific Committee, 2019a).

White-throated Needletail is an aerial species, which occurs over a wide range of different habitat types including but by no means limited to woodlands and forests, heathlands and grasslands, estuaries, swamps and oceans, and offshore islands (Higgins, 1999). While the species occurs over most types of habitats spanning every elevation above the ground to forage, they are perhaps most often recorded over wooded areas including open forests to rainforest.

As the Proposed Action Boundary does not contain key resources for breeding or dispersal, does not occur at the limit of the species distribution range and is unlikely to be necessary for maintaining genetic diversity populations which may occur within Australia, it is not considered to form part of an 'important population'.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of an important population of a species

Not applicable. White-throated Needletail occurring in the Proposed Action Boundary is not part of an important population.

Reduce the area of occupancy of an important population

Not applicable. White-throated Needletail occurring in the Proposed Action Boundary is not part of an important population.

Fragment an existing important population into two or more populations

Not applicable. White-throated Needletail occurring in the Proposed Action Boundary is not part of an important population.

Adversely affect habitat critical to the survival of a species

No critical habitat is listed for this species under the EPBC Act. Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary proposed development, or
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment, 2013b).

The Proposed Action will remove a small area 84.48 ha of habitat over which this species may occasionally forage. The White-throated Needletail is a migratory species and breeds in northern Asia. This species forages on the wing and the vegetation within the Proposed Action Boundary is likely to increase aerial foraging opportunities for this species. However, this species uses widely separate habitats across eastern Australia and the Proposed Action represents only a very small portion of foraging resources accessible to this species when present in Australian aerial habitats.

Therefore, the Proposed Action Boundary would not meet the above criteria and is not critical to the survival of the White-throated Needletail.

Disrupt the breeding cycle of an important population

Not applicable. White-throated Needletail does not breed within Australia and therefore is not part of an important population.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Proposed Action will impact approximately 84.48 ha of potential foraging habitat for the White-throated Needletail.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

It is not likely that invasive species (such as introduced predators) that are harmful to the White-throated Needletail would become further established as a result of the Proposed Action.

Introduce disease that may cause the species to decline

No. There are no known diseases that are likely to increase in the area as a result of the Proposed Action.

Interfere substantially with the recovery of the species

The key limiting habitat factors for White-throated Needletails do not occur within Australia, reductions in its population numbers are affected in its Asian breeding areas. As this species does not breed in Australia, forages on the wing and only very intermittently occurs over Leard State Forest, the Proposed Action is not likely to interfere with the recovery of this species.

Conclusion

The Proposed Action Boundary represents a very small influence on needletail aerial foraging habitat opportunities locally, no breeding occurs within Australian habitats, and the Proposed Action Boundary does not contain important roosting habitat. The White-throated Needletail is likely to forage over the Proposed Action Boundary for aerial foraging on an intermittent basis and is not likely to have a significant impact upon available resources for this species in the vicinity of the Proposed Action or its wider locality. Therefore, the habitat to be impacted is not considered important to the long-term survival of the White-throated Needletail.

NSW Assessment Bilateral requirements

For each of the EPBC Act listed threatened species and migratory species likely to be impacted by the action the EIS must provide a separate:

Description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plan

A description of habitat for this species, important populations, habitat critical for survival and relevant Commonwealth documents are provided in the sections above, with a map showing the modelled distribution of the species provided in Figure C.6.



Figure C.6 Current distribution map for White-throated Needletail (Commonwealth Department of Climate Change Energy the Environment and Water, 2024c)

Details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements

Prior to survey, habitat constraints and microhabitats for candidate threatened fauna (species credit) species as listed within the NSW Threatened Biodiversity Data Collection was undertaken. In addition, a review of previous ecological survey and assessment and monitoring of the Leard State Forest, Vegetation Corridor, and subject land was undertaken.

Field survey techniques were used to undertake targeted survey in general accordance with the *NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (Department of Environment and Conservation, 2004) and *Survey guidelines for Australia's threatened birds (Department of the Environment Water Heritage and the Arts, 2010c)* including:

- 16 20-minute diurnal bird surveys between October 2023 and January 2024
- 56 person hours of parallel bird transects in October 2023
- five habitat assessments.

Further details of these surveys are provided in Section 2.4 and Table 5.9 of the BDAR.

Description of the specific impacts and its regard to the full national extent of the species or community's range

The species is an ecosystem credit species, and as such it is predicted in all PCTs for the Proposed Action. Figure C.6 shows the current known generalised distribution from the Department's Species Profile and Threats Database (Commonwealth Department of Climate Change Energy the Environment and Water, 2024c), which is an indicative distribution map of the present distribution of the species based on best available knowledge. The Proposed Action Boundary is not at the limit of the known distribution of this species. The Proposed Action will remove 84.48 ha of habitat, above which, this species may forage for insects aerially. As an ecosystem credit species, the White-throated Needletail is assumed present in all associated PCTs, including PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594, and as such, contributes to the offset requirements for these PCTs.

Description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action

The proposed avoidance and mitigation measures are outlined in Section 7 and Section 8.4 of the BDAR. Regarding specific measures for this species, the following relevant mitigation measures are recommended for any related residual impacts:

- limit annual vegetation disturbance to the minimum necessary for planned mining operations
- demarcation of clearing boundaries using continuous high visibility flagging (or similar)
- pre-clearing surveys
- establishment of no-go zones to protect adjacent potential habitat during construction and operation.

Identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account

The residual direct impact to White-throated Needletail includes 84.48 ha of foraging habitat through associated PCTs, including PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594. Ecosystem credit offsets will be provided for all residual impacts to these vegetation types as detailed in Section 10.1.1 and Section 11.1 of the BDAR.

A description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established

Details of offset requirements and obligations for this species as a result of residual impacts due the Proposed Action is addressed in Section 10.1.1 of the BDAR.

Details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts

The BDAR specifically addresses section 10 of the BAM and provides information on the application of the no net loss standard and the Proposed Action biodiversity offset obligations.

Details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites

Section 11 of the BDAR outlines the biodiversity credit requirements for MOD 10. The offset obligations will be met through implementing a combination of the following offset delivery options, being:

- the purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register
- establishing a biodiversity stewardship site(s) on lands with like for like biodiversity values to those impacted by MOD 10
- through making a payment into the Biodiversity Conservation Fund.

C3.3.6 Swift Parrot

Status

The Swift Parrot (*Lathamus discolor*) is listed as Critically Endangered under the EPBC Act.

Description

The Swift Parrot breeds in Tasmania during summer and migrates to mainland Australia (in autumn) for winter. During winter the species disperses widely across forests and woodlands, foraging on nectar and lerps in eucalypt species, mainly in Victoria and New South Wales. Small numbers of Swift Parrots are also recorded in the Australian Capital Territory, south-eastern South Australia and southern Queensland (DCCEEW, 2024a).

On the mainland during the winter months Swift Parrots are widely nomadic in response to the varying distribution of blossom (Higgins, 1999). Swift Parrot movements locally vary from year to year in response to resources within their range and the presence of good resources locally is not an indicator that they will necessarily be present at a given location. Although blossom is used by Swift Parrots, they also frequently take lerps and may be found using lerp even when blossom is present to avoid conflict with large honeyeaters, such as Noisy Friarbirds and Red Wattlebirds (Saunders, 2011). The distribution of blossom and lerp varies considerably season to season in response to climatic variations and tree species cyclic blossoming intervals. Due to variations in the distribution of blossom from year to year their distribution may shift from the NSW western slopes to the coast or in the tablelands. Therefore, whilst they can occur throughout much of NSW, Victoria and south-east Queensland they are likely only to reside in areas where blossom and lerp resources are plentiful (i.e. may occur in discrete areas where localised resources occur such as winter flowering Eucalypts). In the Boggabri locality, White Box (*Eucalyptus albens*) and Yellow Box (*E. melliodora*) are important nectar-producing trees for the Swift Parrot and other blossom nomads.

WSP ecologists have observed Swift Parrots to be present in sections of the Leard State Forest that contain higher densities of White Box on at least five occasions over the last 12 years, with most of these records occurring in late July and August. In all observations of Swift Parrot in the Leard State Forest, the birds were associated with stands of White Box exclusively, in almost all cases, when the trees were producing blossom. White Box across the locality produces at least some blossom in most seasons, but only intermittently flowers very strongly and Swift Parrots, as well as inflated numbers of other nomadic nectarivorous birds, are attracted to such blossoming events.

Threats for this species include:

- predation by sugar gliders
- loss of habitat through clearing for agriculture, and urban and industrial development
- collision mortality.

Relevant Commonwealth guidelines, policy statements including listing advice, conservation advice and recovery plan

A summary of the relevant Commonwealth guidelines and policy statements available for this species is as follows:

- the approved Conservation Advice *Lathmus discolor* Swift Parrot (Threatened Species Scientific Committee, 2016)
- listing assessment information may be available in the approved Conservation Advice for this species
- The National Recovery Plan for the Swift Parrot (*Lathmus discolor*) (DCCEEW, 2024a).

Relevant adopted/made threat abatement plans include:

- threat abatement plan for predation by feral cats (Commonwealth of Australia, 2015).

Relevant survey guidelines for this species include:

Survey Guidelines for Australia's Threatened Birds (Department of the Environment, 2010).

Specific impacts

This species was not recorded during field surveys; however, woodland habitat was recorded in the Proposed Action Boundary and there are records for this species locally. The Proposed Action will result in removal of 84.48 ha of potential marginal habitat in the form of PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594, which are listed in BioNet as suitable for the species.

EPBC Act significant impact assessment

The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013b).

An action is likely to have a significant impact on a Critically Endangered or Endangered species if there is a real chance or possibility that it will result in one or more of the following:

Lead to a long-term decrease in the size of a population of a species

Approximately 84.48 ha of potential foraging habitat for the Swift Parrot would be affected by the Proposed Action. While there are few records in databases for the Swift Parrot being observed in Leard State Forest, WSP ecologists have observed the species to be present in sections of the forest containing higher densities of *E. albens* (White Box) on at least five occasions over the last 12 years. In all observations of Swift Parrots in the Leard State Forest, the birds were associated with stands of White-Box exclusively, in almost all cases, when the trees were producing blossom. White Box across the locality produces at least some blossom in most seasons, but only intermittently flowers very strongly and Swift Parrots, as well as inflated numbers of other nomadic (those species that are not resident locally) nectarivorous birds, are attracted to such blossoming events.

The area to be impacted is dominated by *E. crebra* (Narrow-leaved Ironbark). While habitat in the Proposed Action Boundary has the potential to be used by Swift Parrot, during regional movements and perhaps foraging opportunities (see below), its value to the species is likely to be limited, due to its lack of the preferred local foraging resources for the species; namely, locally important nectar-producing trees, such as *E. albens* (White Box) and *E. melliodora* (Yellow Box).

The dominant tree species throughout the Proposed Action Boundary is *E. crebra* (Narrow-leaved Ironbark). WSP ecologists have observed in other locations (the Central and Lower Hunter Valley) that lerps present on the leaves of *E. crebra*, and sometimes *E. tereticornis*, and *E. punctata*, are an important resource for Swift Parrots, and in some areas, the birds use lerp regularly and often almost exclusively. Nevertheless, the species also appear to exclusively use blossom resources at other locations in preference to lerp, such as when large aggregations occur intermittently at Chain Valley Bay in southern Lake Macquarie. In the Leard State Forest the Swift Parrot has only been observed to use White Box blossom, and on one occasion a single bird, at one of the Biodiversity Offset Areas, attending an *E. melliodora* (Yellow Box) blossoming event. While Swift Parrots have not been observed to use lerp as resource in the forest and have not been observed using stands of *E. crebra*, their use of such resources across the remainder of the forest, on at least an intermittent basis, cannot be entirely discounted.

Within the Proposed Action Boundary there are no *E. melliodora* individuals present and *E. albens* is very sparse, being limited to a few very small groupings of individual trees. Throughout its western slopes range the Swift Parrot is not defined by *E. crebra* forests, although it occurs in Box/Ironbark community types and does occur in *E. crebra* forests when there are nectar producing tree species present, such as *E. albens* (White Box) and *E. melliodora* (Yellow Box). In over 12 years of surveys targeting both Regent Honeyeaters and Swift Parrots, during winter periods when White Box blossoms, no Swift Parrots have been observed to use *E. crebra*. Within the Biodiversity Offset Areas, *E. crebra* often exclusively dominates, particularly in upland areas such as the Nandewar Range to the east. Swift Parrots have not been observed to use such areas. While the results of those surveys encompass annual flowering events when blossom is scarce, they also encompass periods when *E. albens* flowers very strongly in the Leard State Forest and the surrounding region. During such periods, inflated guilds of nectarivorous birds, which require inter-regional movements to attend the blossom are present, and it is generally during those periods when Swift Parrots are present.

The Proposed Action Boundary does not include areas that periodically attract an inflation of nectarivorous birds due to high blossom densities, to the contrary, its capability to support nectarivorous birds is limited to birds that are locally resident in low but stable numbers. Therefore, it is considered very likely that the paucity of preferable local foraging habitat within the Proposed Action Boundary may limit the presence of Swift Parrots within it.

Nevertheless, the removal of 84.48 ha of woodland habitat further reduces the extent of high-quality local forest vegetation, which may be used by this species and together with considerable losses of suitable and higher quality habitats elsewhere in the forest, the Proposed Action Boundary is assessed as an additional incremental loss of potential habitat for the species.

Reduce the area of occupancy of the species

The Proposed Action is likely to affect approximately 84.48 ha of habitat for the Swift Parrot, including habitats that support potential foraging opportunities.

Therefore, the removal of approximately 84.48 ha of potential habitat is considered be an additional loss of relatively high-quality woodland habitat that will incrementally reduce the area of occupancy for the Swift Parrot during seasons when individuals of this species may be reliant on local resources.

Fragment an existing population into two or more populations

Habitat connectivity is not likely to be affected by the Proposed Action, given that this species is highly mobile and nomadic, the Proposed Action Boundary would not present a significant barrier to these species. It is not considered likely that habitat would become further isolated or fragmented significantly beyond that currently existing in the Proposed Action Boundary due to the retention of the Leard State Forest Vegetation Corridor linking eastern and western sections of Leard State Forest.

Adversely affect habitat critical to the survival of a species

No critical habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat. According to the National Recovery Plan for the Swift Parrot (*Lathmus discolor*) (DCCEEW, 2024a), all preferred foraging species within known and likely foraging habitat on the mainland are critical to the survival of the Swift Parrot. This includes Yellow Gum (*E. leucoxylon*); Red Ironbark (*E. tricarpa*); Mugga Ironbark (*E. sideroxylon*); Grey Box (*E. macrocarpa*); White Box (*E. albens*); Yellow Box (*E. melliodora*); Swamp Mahogany (*E. robusta*); Forest Red Gum (*E. tereticornis*); Blackbutt (*E. pilularis*); and Spotted Gum (*Corymbia maculata*).

While habitat in the Proposed Action Boundary has the potential to be used by Swift Parrot, during regional movements and perhaps foraging opportunities, its value to the species is likely to be limited, due to its lack of the preferred local foraging resources for the species; namely, locally important nectar-producing trees, such as *E. albens* (White Box) and *E. melliodora* (Yellow Box).Within the Proposed Action Boundary there are no *E. melliodora* individuals present and *E. albens* is very sparse, being limited to a few very small groupings of individual trees. Throughout its western slopes range the Swift Parrot is not defined by *E. crebra* forests, although it occurs in Box/Ironbark community types and does occur in *E. crebra* forests when there are nectar producing tree species present, such as *E. albens* (White Box) and *E. melliodora* (Yellow Box). In over 12 years of surveys targeting both Regent Honeyeaters and Swift Parrots, during winter periods when White Box blossoms, no Swift Parrots have been observed to use *E. crebra*.

Swift Parrot has important habitat maps, as identified in NSW BioNet which identify land that is considered important to support critical life stages of the species (i.e. key areas that migratory species forage/over-winter in, or sites where multiple records have been located over multiple years) (Department of Planning Industry and Environment, 2021). While important foraging habitat is mapped within the Leard State Forest, no mapped habitat overlaps with the Proposed Action Boundary. As the species has not been recorded in the Proposed Action Boundary and the Proposed Action Boundary is not identified as an area of important habitat and contains a few small groupings of individual White Box tress, it is unlikely to be critical habitat for this species.

Disrupt the breeding cycle of a population

Swift Parrots breed in Tasmania during spring and summer, migrating to south-eastern Australia during autumn and winter (Department of Planning and Environment, 2023c). While Swift Parrots are dependent on flowering resources across a wide range of habitats (woodlands and forests) within their NSW wintering grounds, the removal of approximately 84.48 ha of potential foraging habitat is unlikely to disrupt their movements to Tasmanian breeding grounds. As such the Proposed Action is unlikely to affect their breeding cycle.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Proposed Action will disturb approximately 84.48 ha of native vegetation considered to contain potential foraging habitat for this nomadic nectarivore. The removal of approximately 84.48 ha of potential habitat is an additional loss, decreasing the amount of suitable foraging habitat available locally. Considering the mobile nature of this species, this action is unlikely to isolate habitat for the species significantly. While Swift Parrot numbers are relatively low, and local resources appear abundant, the species experiences strong competition for resources with more common nectarivorous birds, so the loss of additional habitat must be viewed as an incremental loss of potential habitat locally. Nevertheless, as the habitat appears to be of less importance to the species locally, it is unlikely that the Proposed Action will modify, destroy, remove or isolate habitat for this species to the extent that is likely to cause the species to decline.

Result in invasive species that are harmful to an Endangered species becoming established in the Endangered species´ habitat

It is not likely that invasive species (such as introduced predators) that are potentially harmful to the Swift Parrot would become further established as a result of the Proposed Action.

Introduce disease that may cause the species to decline

No. It is unlikely that disease would be increased by the Proposed Action.

Interfere with the recovery of the species

The National Recovery Plan for the Swift Parrot (*Lathamus discolor*) (DCCEEW, 2024a) outlined the following recovery actions:

- by 2032, maintain or improve the extent, condition and connectivity of habitat of the Swift Parrot
- by 2032, anthropogenic threats to Swift Parrot are demonstrably reduced
- by 2032, measure and sustain a positive population trend.

The Proposed Action would be in conflict with the first and second recovery objectives.

Conclusion

The removal of 84.48 ha of vegetation represents the incremental loss of habitats containing potential foraging resources for the Swift Parrot, which could be utilised by this species intermittently during periods of seasonal blossom variation. However, considering the apparent preferences for box woodland blossom resources locally, and the continuing abundance of those high-quality foraging resources in surrounding landscape where the species is observed to occur when present locally, the foraging habitat to be removed is considered relatively small in terms of more preferred habitats available locally to this species. Considering the mobility of this species, the Proposed Action will not fragment or isolate any locally occurring population. In addition, the species does not breed in NSW and therefore no breeding habitat would be impacted due to the proposed development.

The Proposed Action, therefore, is considered to represent an incremental loss of available local habitat. Given the impact to Swift Parrot habitat in Leard State Forest as a consequence of current mining operations in the Leard Forest Mining Precinct, the incremental loss of potential habitat depleted by cumulative impacts locally is likely to modify, destroy or remove habitat for the species. Consequently, the Proposed Action is considered to have a significant impact on the Swift Parrot.

NSW Assessment Bilateral requirements

For each of the EPBC Act listed threatened species and migratory species likely to be impacted by the action the EIS must provide a separate:

Description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plan

A description of habitat for this species, important populations, habitat critical for survival and relevant Commonwealth documents are provided above, with a map showing the modelled distribution of the species provided in Figure C.7.

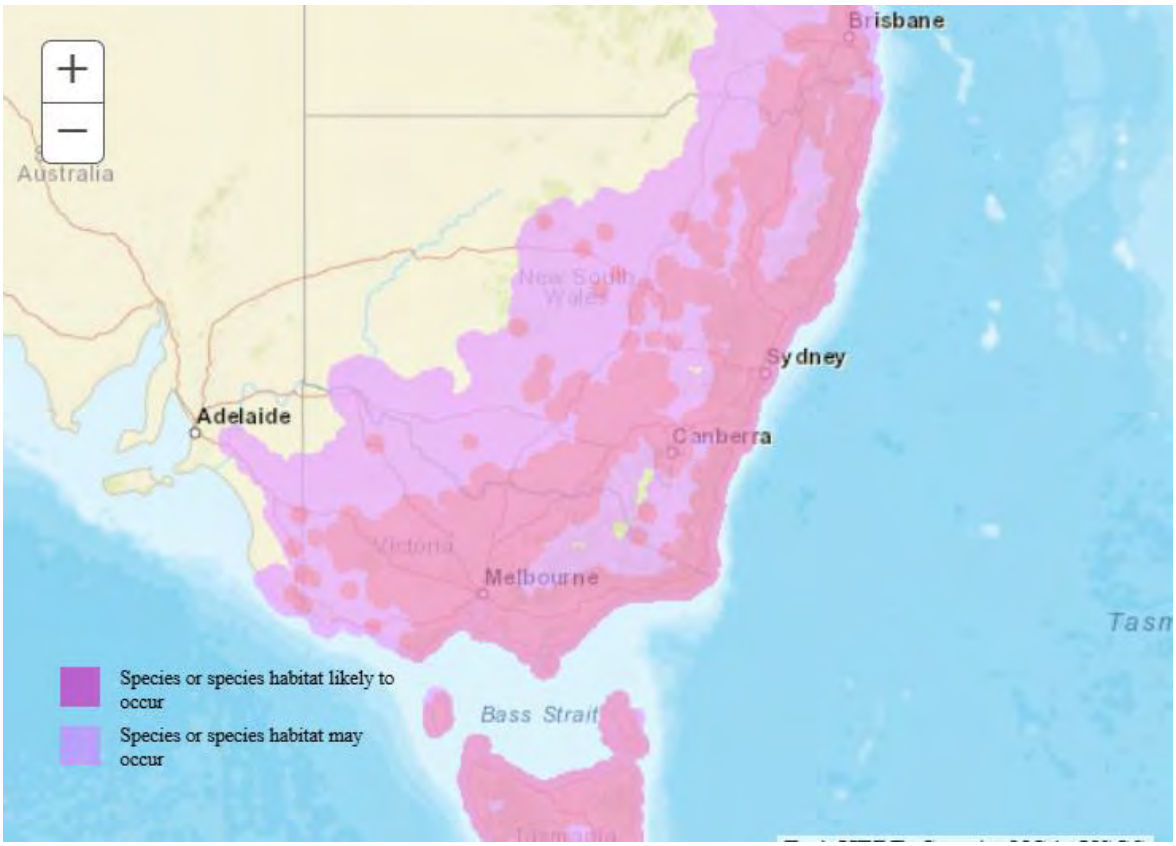


Figure C.7 Current distribution map for Swift Parrot
(Commonwealth Department of Climate Change Energy the Environment and Water, 2024c)

Details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements

Prior to survey, habitat constraints and microhabitats for candidate threatened fauna (species credit) species as listed within the NSW Threatened Biodiversity Data Collection was undertaken. In addition, a review of previous ecological survey and assessment and monitoring of the Leard State Forest, Vegetation Corridor, and subject land was undertaken.

Field survey techniques were used to undertake targeted seasonal surveys in general accordance with the NSW TBDC and *Survey guidelines for Australia's threatened birds (Department of the Environment, 2010)* including:

- 45 person hours of parallel bird transects in August 2023
- 26 diurnal bird surveys in August 2023.

Further details of these surveys are provided in Section 2.4 and Table 5.9 of the BDAR.

Description of the specific impacts and its regard to the full national extent of the species or community's range

The Proposed Action will result in the direct removal of 84.48 ha of potential marginal foraging habitat in the form of PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594.

While the habitats within the Proposed Action Boundary were not assessed as being highly significant for the Swift Parrot, due to their upslope topographical location, less than fertile soil profiles and lack of important blossom producing tree species, Swift Parrots are a forest and woodland species requiring continuous wooded habitats to navigate through the landscape between widely separated blossoming events.

The removal of 84.48 ha of vegetation represents the incremental loss of habitats containing potential foraging resources for the Swift Parrot, which could be utilised by this species intermittently during periods of seasonal blossom variation. However, considering the apparent preferences for box woodland blossom resources locally, and the continuing abundance of those high-quality foraging resources in surrounding landscape where the species is observed to occur when present locally, the foraging habitat to be removed is considered relatively small in terms of more preferred habitats available locally to this species. Figure C.7 illustrates the current known generalised distribution.

Description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action

The proposed avoidance and mitigation measures are outlined in Section 7 and Section 8.4 of the BDAR. Regarding specific measures for this species, the following relevant mitigation measures are recommended for any related residual impacts:

- limit annual vegetation disturbance to the minimum necessary for planned mining operations
- timing of clearing works to avoid critical life cycle event
- demarcation of clearing boundaries using continuous high visibility flagging (or similar)
- pre-clearing surveys
- establishment of no-go zones to protect adjacent potential habitat during construction and operation.

Identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account

The residual direct impact to Swift Parrot includes 84.48 ha of box/ironbark habitat through associated PCTs, including PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594.

WSP ecologists have observed the species to be present in sections of the Leard State Forest that contained higher densities of *E. albens* (White Box) on at least five occasions over the last 12 years. In all observations of Swift Parrots in the Leard State Forest, the birds were associated with stands of White-Box exclusively, in almost all cases, when the trees were producing blossom. White Box across the locality produces at least some blossom in most seasons, but only intermittently flowers very strongly and Swift Parrots, as well as inflated numbers of other nomadic (those species that are not resident locally) nectarivorous birds, are attracted to such blossoming events.

The Proposed Action Boundary is dominated by *E. crebra* (Narrow-leaved Ironbark). While habitat in the Proposed Action Boundary has the potential to be used by Swift Parrot, during regional movements and perhaps foraging opportunities (for lerp), its value to the species is likely to be limited, due to its lack of the preferred local foraging resources for the species; namely, locally important nectar-producing trees, such as *E. albens* (White Box) and *E. melliodora* (Yellow Box).

In over 12 years of surveys targeting both Regent Honeyeaters and Swift Parrots, during winter periods when White Box blossoms, no Swift Parrots have been observed to use *E. crebra*. The Proposed Action Boundary does not include areas that periodically attract an inflation of nectarivorous birds due to high blossom densities, to the contrary, its capability to support nectarivorous birds is limited to birds that are locally resident in low but stable numbers. Therefore, it is considered very likely that the paucity of preferable local foraging habitat within the Proposed Action Boundary may limit the presence of Swift Parrots within it.

Nevertheless, the removal of 84.48 ha of woodland habitat further reduces the extent of high-quality local forest vegetation, which may be used by this species and together with considerable losses of suitable and higher quality habitats elsewhere in the Leard State Forest, the Proposed Action Boundary is assessed as an additional incremental loss of potential habitat for the species.

A description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established

Details of offset requirements and obligations for this species as a result of residual impacts due to MOD 10 is addressed in Section 10.1.1 of the BDAR.

Details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts

The BDAR specifically addresses section 10 of the BAM and provides information on the application of the no net loss standard and MOD 10 biodiversity offset obligations.

Details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites

Section 11 of the BDAR outlines the biodiversity credit requirements for MOD 10. The offset obligations will be met through implementing a combination of the following offset delivery options, being:

- the purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register
- establishing a biodiversity stewardship site(s) on lands with like for like biodiversity values to those impacted by MOD 10
- through making a payment into the Biodiversity Conservation Fund.

C3.3.7 Hooded Robin (south-eastern)

Status

The Hooded Robin (south-eastern) (*Melanodryas cucullata cucullata)* is listed as Endangered under the EPBC Act.

Description

The Hooded Robin is a relatively large Australian robin, reaching up to 17 cm in length. The colouration of the male lends the species its name, with it having a bold black hood extending down a white breast. Its back is black with a distinct white wing-bar and shoulder. Its tail is black and has prominent white side-panels. The females and juveniles have a duller colouration. The upperparts are brownish-grey, but they have same black and white wings (Commonwealth Department of Climate Change Energy the Environment and Water, 2023c).

The subspecies' population has declined by half over the last decade, and there are currently estimated to be approximately 68,000 mature individuals in the wild. This number, however, has a low reliability. This subspecies extent of occurrence is approximately 1,200,000 km^2, in which it occupies an estimate 30,000 km^2. They occur in south-eastern Australia, ranging from south-east Queensland to Yorke Peninsula, South Australia. They prefer dry eucalypt and acacia woodlands and shrublands with an open understorey, some grassy areas and a complex ground layer. They can occur in patches as small as 2.9 ha, but they generally prefer patches of at least 10 ha (Commonwealth Department of Climate Change Energy the Environment and Water, 2023c).

Threats to the subspecies include:

- increased predation from introduced mammals (cats and foxes)
- invasive weeds
- competition with noisy miners (*Manorina melanocephala*)
- over-grazing by domestic stock, rabbits, and overabundant kangaroos
- habitat loss and fragmentation.

Relevant Commonwealth guidelines, policy statements including listing advice, conservation advice and recovery plan

A summary of the relevant Commonwealth guidelines and policy statements available for this species is as follows:

- the approved Conservation Advice for *Melanodryas cucullata cucullata* (Hooded Robin (south-eastern)) (Commonwealth Department of Climate Change Energy the Environment and Water, 2023c)
- listing assessment information may be available in the approved Conservation Advice
- there is no adopted or made Recovery Plan for this species
- no threat abatement plans have been identified as being relevant for this species.

Specific impacts

This subspecies of Hooded Robin was not recorded during field surveys within the Proposed Action Boundary and there are no records for this species in other areas of Leard State Forest. The south-eastern ssp. of the Hooded Robin does not use shrubby habitat forms as occur where the Proposed Action is located, it is found in very open grassy woodland habitats that occur outside of such forested habitats. The upslope woodlands in which the Proposed Action is located are generally characterised by a dense understory shrub layer. While the very open grassy habitats this species prefers are sometimes characterised by shrub occurrences, preferred habitats have shrub layers at lower densities that allow this species to forage on the ground for invertebrates, such as grasshoppers, which prefer open habitats. Like a number of other woodland birds, Hooded Robins also prefer the security present in open habitats that enables them to monitor their surroundings for the presence of predators. These habitat characteristics are denied the species within habitats associated with the Proposed Action Boundary and is the key reason that these habitats and indeed the wider forest, including more grassy examples, do not support Hooded Robins.

The Proposed Action will result in removal of 84.48 ha of marginal habitat in the form of PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594, which are listed in BioNet as suitable for the species.

While the Proposed Action Boundary is assessed as “potential’ habitat for the South-eastern Hooded Robin, the non-preferred high understory shrub densities, and the species’ absence in those habitats during considerable field investigations, are strong evidence that the Proposed Action Boundary does not contain habitats that are preferred by local populations of this species.

EPBC Act significant impact assessment

The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013b).

An action is likely to have a significant impact on a Critically Endangered or 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 of a species

This subspecies of Hooded Robin was not recorded during field surveys within the Proposed Action Boundary and there are no records for this species in other areas of Leard State Forest. The south-eastern ssp. of the Hooded Robin does not use shrubby habitat forms as occur where the Proposed Action is located, it is found in very open grassy woodland habitats that occur outside of such forested habitats. The upslope woodlands in which the Proposed Action is located are

generally characterised by a dense understory shrub layer. While the very open grassy habitats this species prefers are sometimes characterised by shrub occurrences, preferred habitats have shrub layers at lower densities which allow this species to forage on the ground for invertebrates, such as grasshoppers, which prefer open habitats. Like a number of other woodland birds, Hooded Robins also prefer the security present in open habitats that enables them to monitor their surroundings for the presence of predators. These habitat characteristics limit the species occupation of habitats associated with the Proposed Action Boundary and is the key reason that these habitats and indeed the wider forest, including more grassy examples, do not support Hooded Robins.

While the Proposed Action Boundary is assessed as "potential' habitat for the South-eastern Hooded Robin, impacting approximately 84.48 ha, the non-preferred high understory shrub densities, and the species' absence in those habitats during considerable field investigations, are strong evidence that the Proposed Action Boundary does not contain habitats that are preferred by local populations of this species. Accordingly, the Proposed Action is not likely to lead to a long-term decrease in the size of a population of the species.

Reduce the area of occupancy of the species

The Proposed Action is likely to affect approximately 84.48 ha of habitat that is considered unlikely to be important for the Hooded Robin (south-eastern) due to a lack of records in areas of much higher quality elsewhere in Leard State Forest. Although the Proposed Action will result in the loss of forested habitat, the loss of habitat does not include habitat attributes that are most important for the species locally.

Therefore, the Proposed Action is considered unlikely to significantly reduce the area of occupancy for the Hooded Robin (south-eastern) in the locality.

Fragment an existing population into two or more populations

The Leard State Forest Vegetation Corridor is a 500 m strip of remnant native vegetation reserved in perpetuity that links the eastern section of the Leard State Forest to the western sections of the forest and the Conservation Area beyond. The Proposed Action will not compromise the link between eastern and western sections of the forest such that it would fragment an existing population into two or more populations.

Adversely affect habitat critical to the survival of a species

No critical habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat. As outlined in the species' Conservation Advice (Commonwealth Department of Climate Change Energy the Environment and Water, 2023c), habitat critical to the survival of the Hooded Robin (south-eastern) includes:

- dry eucalypt and acacia woodlands and shrubland remnants with an open understorey, some grassy areas and a complex ground layer, often in or near clearing or open areas
- structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses
- standing dead or live trees and tree stumps are also essential for nesting, roosting and foraging
- moderately deep to deep soils, rocks and fallen timber which provide essential foraging habitat.

Potential impacts associated with the Proposed Action includes the removal of up to 84.48 ha of vegetation, which is not used by this species. The Proposed Action is therefore unlikely to affect habitat of critical importance to this species.

Disrupt the breeding cycle of a population

This subspecies of Hooded Robin was not recorded during field surveys within the Proposed Action Boundary and there are no records for this species in other areas of Leard State Forest. The south-eastern ssp. of the Hooded Robin does not use shrubby habitat forms as occur where the Proposed Action is located. The upslope woodlands in which the Proposed Action is located are generally characterised by a dense understory shrub layer. These habitat characteristics limit the species occupation of habitats associated with the Proposed Action Boundary and is the key reason that these habitats and indeed the wider forest, including more grassy examples, do not support Hooded Robins. Therefore, the proposed removal of about 84.48 ha of potential woodland habitat is unlikely to disrupt the breeding cycle of a population of the South-eastern Hooded Robin.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Potential impacts associated with the Proposed Action includes the removal of up to 84.48 ha of vegetation, which is not used by this species. The Proposed Action is therefore unlikely to cause the species 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

It is not likely that invasive species (such as introduced predators) that are potentially harmful to the Hooded Robin (south-eastern) would become further established as a result of the Proposed Action.

Introduce disease that may cause the species to decline

There are no knows diseases causing potential species decline to the Hooded Robin and the Proposed Action does not contain suitable habitat for this species.

Interfere with the recovery of the species?

A national recovery plan has not been developed for the Hooded Robin (south-eastern) and the Proposed Action Boundary does not contain habitat that is suitable for this species.

Conclusion

The Proposed Action will not have a significant impact on the south-eastern subspecies of the Hooded Robin, as the removal of 84.48 ha of vegetation will not represent the loss of habitat that is used by this species, due to the relatively dense canopy strata and high densities of shrubs in the understory strata. No records for this species are known from within the wider Leard State Forest, although this species has been observed in open habitats around the forest's periphery. While Hooded Robins have been observed on many occasions locally, all records occur outside of forested habitats containing high densities of shrubs in the understory as occur within the Proposed Action Boundary and woodland habitats surrounding it. Therefore, the Proposed Action will not impact upon Hooded Robins in the wider locality of the Proposed Action.

NSW Assessment Bilateral requirements

For each of the EPBC Act listed threatened species and migratory species likely to be impacted by the action the EIS must provide a separate:

Description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plan

A description of habitat for this species, important populations, habitat critical for survival and relevant Commonwealth documents are provided above, with a map showing the modelled distribution of the species provided in Figure C.8.

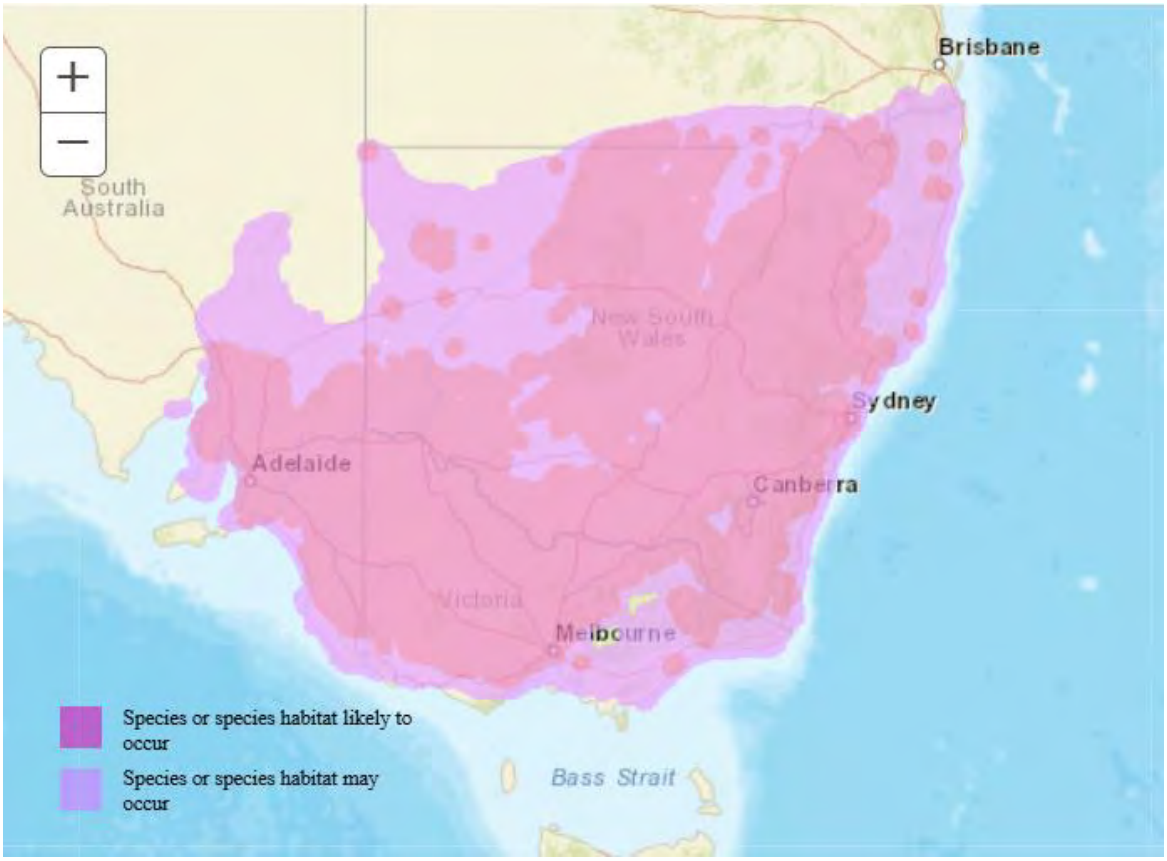


Figure C.8 Current distribution map for Hooded Robin (south-eastern) (Commonwealth Department of Climate Change Energy the Environment and Water, 2024c)

Details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements

Prior to survey, habitat constraints and microhabitats for threatened fauna species as listed within the NSW Threatened Biodiversity Data Collection was undertaken. In addition, a review of previous ecological survey and assessment and monitoring of the Leard State Forest, Vegetation Corridor, and subject land was undertaken.

Threatened bird surveys completed within the Proposed Action Boundary were carried out in general accordance with the *NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (Department of Environment and Conservation, 2004)* and *Survey guidelines for Australia's threatened birds (Department of the Environment, 2010)* including:

- 39 20-minute diurnal bird surveys between August 2023 and January 2024
- 45 person hours of parallel bird transects in August 2023
- 56 person hours of parallel bird transects in October 2023
- five habitat assessments.

Further details of these surveys are provided in Section 2.4 and Table 5.9 of the BDAR.

Description of the specific impacts and its regard to the full national extent of the species or community's range

While the Proposed Action Boundary is assessed as "potential' habitat for the Hooded Robin (south-eastern), impacting approximately 84.48 ha, the non-preferred high understory shrub densities, and the species' absence in those habitats during considerable field investigations, are strong evidence that the Proposed Action Boundary does not contain habitats that are preferred by local populations of this species.

This subspecies of Hooded Robin was not recorded during field surveys within the Proposed Action Boundary and there are no records for this species in other areas of Leard State Forest. The south-eastern ssp. of the Hooded Robin does not use shrubby habitat forms as occur where the Proposed Action is located, it is found in very open grassy woodland habitats that occur outside of such forested habitats. The upslope woodlands in which the Proposed Action is located are generally characterised by a dense understory shrub layer. While the very open grassy habitats this species prefers are sometimes characterised by shrub occurrences, preferred habitats have shrub layers at lower densities which allow this species to forage on the ground for invertebrates, such as grasshoppers, which prefer open habitats. Like a number of other woodland birds, Hooded Robins also prefer the security present in open habitats that enables them to monitor their surroundings for the presence of predators. These habitat characteristics limit the species occupation of habitats associated with the Proposed Action Boundary and is the key reason that these habitats and indeed the wider forest, including more grassy examples, do not support Hooded Robins. Figure C.8 illustrates the current known generalised distribution.

Description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action

The proposed avoidance and mitigation measures are outlined in Section 7 and Section 8.4 of the BDAR. Regarding specific measures for this species, the following relevant mitigation measures are recommended for any related residual impacts:

- limit annual vegetation disturbance to the minimum necessary for planned mining operations
- timing of clearing works to avoid critical life cycle event
- demarcation of clearing boundaries using continuous high visibility flagging (or similar)
- pre-clearing surveys
- establishment of no-go zones to protect adjacent potential habitat during construction and operation.

Identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account

The residual direct impact to Hooded Robin (south-eastern) includes 84.48 ha of box/ironbark habitat through associated PCTs, including PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594. While the Proposed Action Boundary is assessed as “potential’ habitat for the Hooded Robin (south-eastern), the non-preferred high understory shrub densities, and the species’ absence in those habitats during considerable field investigations, are strong evidence that the Proposed Action Boundary does not contain habitats that are preferred by local populations of this species. However, as an ecosystem credit species, the Hooded Robin (south-eastern) is assumed present in all associated PCTs, and as such, contributes to the offset requirements for these PCTs.

A description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established

Details of offset requirements and obligations for this species as a result of residual impacts due to MOD 10 is addressed in Section 10.1.1 of the BDAR.

Details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts

The BDAR specifically addresses section 10 of the BAM and provides information on the application of the no net loss standard and MOD 10 biodiversity offset obligations.

Details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites

Section 11 of the BDAR outlines the biodiversity credit requirements for MOD 10. The offset obligations will be met through implementing a combination of the following offset delivery options, being:

- the purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register
- establishing a biodiversity stewardship site(s) on lands with like for like biodiversity values to those impacted by MOD 10
- through making a payment into the Biodiversity Conservation Fund.

C3.3.8 Diamond Firetail

Status

The Diamond Firetail (*Stagonopleura guttata)* is listed as Vulnerable under the EPBC Act.

Description

The Diamond Firetail is a large finch with a bright red bill, and red eyes and rump. The white throat and lower breast are separated by a broad black breast-band that extends into the strongly white-spotted, black flanks. It has a grey back and head, and ashy-brown wings. The female is similar to the male (Commonwealth Department of Climate Change Energy the Environment and Water, 2023d). Diamond Firetails occur on the south-east mainland of Australia from central Queensland to Eyre Peninsula, South Australia, and about 300 km inland from the sea. 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 (Office of Environment & Heritage, 2024). They have disappeared from many of the more settled parts of New South Wales, Australian Capital Territory and Victoria.

Diamond Firetails occur in eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats, including farmland and grassland with scattered trees. They prefer areas with relatively low tree density, few large logs, little litter cover and high grass cover. The species appears to be sedentary, though some populations move locally. Birds roost in dense shrubs or in smaller nests built especially for roosting. Diamond firetails feed predominantly at ground level, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects.

Relevant Commonwealth guidelines, policy statements including listing advice, conservation advice and recovery plan

A summary of the relevant Commonwealth guidelines and policy statements available for this species is as follows:

- Conservation Advice for *Stagonopleura guttata* (Diamond Firetail) (Commonwealth Department of Climate Change Energy the Environment and Water, 2023d)
- listing assessment information for this species may be available in the approved Conservation Advice
- there is no adopted or made Recovery Plan for this species
- no Threat Abatement Plan has been identified as being relevant for this species.

Specific impacts

While this species has not been recorded during field surveys within the Proposed Action Boundary, it has been observed previously in habitat adjacent to the site, and the species is known to occur elsewhere within Leard State Forest and within wider locality. While much of the Proposed Action Boundary is characterised by dense understories of shrubs, there are a number of areas where grassy dominated ground covers prevail, which offer opportunities for this woodland species.

The Proposed Action will remove up to 84.48 ha of potential habitat in the form of PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594, which are listed in BioNet as suitable for the species.

EPBC Act significant impact assessment

The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013b). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity, and/or
- at or near the limit of the species range.

Is an important population likely to be present?

This species has not been recorded within the Proposed Action Boundary, but the species has been observed in similar adjacent habitats, elsewhere in Leard State Forest and within the wider locality. This species, if occurring in the Proposed Action Boundary, would not be at the limit of their known range; nor would any population there be likely to be a key source population or necessary for maintaining genetic diversity. While potential breeding habitat occurred within the Proposed Action Boundary, such habitats are abundant across Leard State Forest. Therefore, it is considered that any population of the species that may be present is unlikely to be an 'important population'.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of an important population of a species

Not applicable as an 'important population' is unlikely to exist in the Proposed Action Boundary.

Reduce the area of occupancy of an important population

Not applicable as an 'important population' is unlikely to exist in the Proposed Action Boundary.

Fragment an existing important population into two or more populations

Not applicable as an 'important population' is unlikely to exist in the Proposed Action Boundary.

Adversely affect habitat critical to the survival of a species

No critical habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat. As outlined in the species' Conservation Advice (Commonwealth Department of Climate Change Energy the Environment and Water, 2023d), habitat critical to the survival of the Diamond Firetail includes:

- eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats
- low tree density, few large logs, and little litter cover but high grass cover for foraging, roosting and breeding
- drooping she-oak (*Allocasuarina verticillata*) within the Mt Lofty Ranges.

Given the nature of the works and the Proposed Action Boundary is typical of habitat in adjacent woodland, it is unlikely that these are important to the long-term survival of the species in the locality. The Proposed Action is therefore unlikely affect habitat of critical importance to this species.

Disrupt the breeding cycle of an important population

Not applicable as an 'important population' is unlikely to exist in the Proposed Action Boundary.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Proposed Action may remove up to 84.48 ha of potential habitat. Although the Proposed Action will represent an incremental loss of habitats depleted by cumulative impacts locally, similar habitats to those in the Proposed Action Boundary occur widely in adjacent woodland, and the habitat losses are unlikely to threaten the long-term survival of the species in the locality. The Proposed Action is therefore unlikely to cause the species to significantly decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat

Invasion of predator species are unlikely to increase as a result of the Proposed Action given the existing nature of the Proposed Action Boundary. Given the small amounts of potentially suitable habitat for this species represented in the Proposed Action Boundary, it is unlikely to change significantly as a result of the Proposed Action.

Introduce disease that may cause the species to decline

There are no known diseases causing potential species decline to Diamond Firetail.

Will the action interfere with the recovery of the species?

A national recovery plan has not been developed for the Diamond Firetail.

Conclusion

The Proposed Action is considered unlikely to have a significant impact on the species. The removal of 84.48 ha of vegetation, which contains foraging and breeding resources, are widespread within the adjacent forest. The habitat affected is a very small proportion of potential habitat for the species in the locality. Considering the retention of corridor links, the proposed development will not fragment or isolate any locally occurring population. In addition, although small amounts of foraging habitat with adjacent breeding opportunities occur in the proposed development footprint there is an abundance of such habitats in forests surrounding the Proposed Action Boundary. Therefore, it is unlikely that this species would be significantly affected by the Proposed Action.

NSW Assessment Bilateral requirements

For each of the EPBC Act listed threatened species and migratory species likely to be impacted by the action the EIS must provide a separate:

Description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plan

A description of habitat for this species, important populations, habitat critical for survival and relevant Commonwealth documents are provided above, with a map showing the modelled distribution of the species provided in Figure C.9.

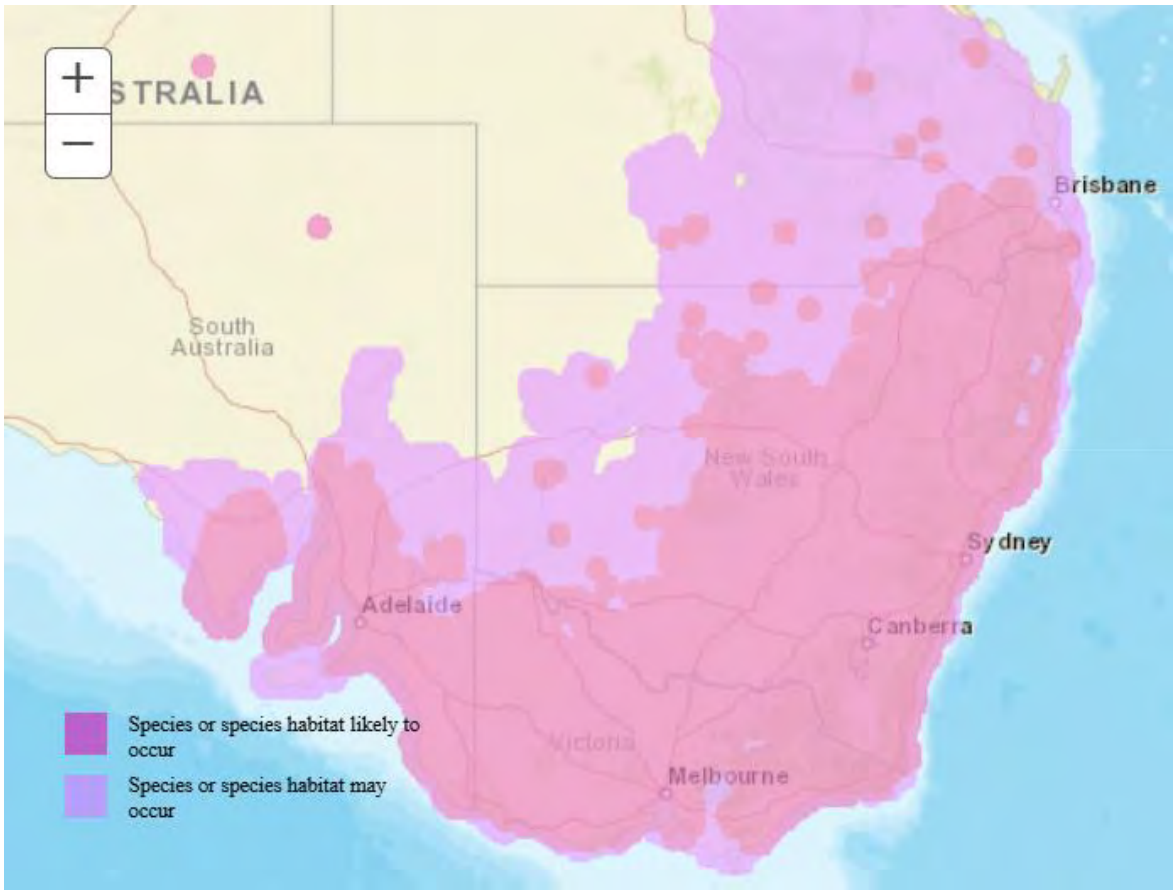


Figure C.9 Current distribution map for Diamond Firetail
(Commonwealth Department of Climate Change Energy the Environment and Water, 2024c)

Details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements

Prior to survey, habitat constraints and microhabitats for threatened fauna species as listed within the NSW Threatened Biodiversity Data Collection was undertaken. In addition, a review of previous ecological survey and assessment and monitoring of the Leard State Forest, Vegetation Corridor, and subject land was undertaken.

Threatened bird surveys completed within the Proposed Action Boundary were carried out in general accordance with the *NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (Department of Environment and Conservation, 2004)* and *Survey guidelines for Australia's threatened birds (Department of the Environment, 2010)* including:

- 39 20-minute diurnal bird surveys between August 2023 and January 2024
- 45 person hours of parallel bird transects in August 2023
- 56 person hours of parallel bird transects in October 2023
- five habitat assessments.

Further details of these surveys are provided in Section 2.4 and Table 5.9 of the BDAR.

Description of the specific impacts and its regard to the full national extent of the species or community's range

While this species has not been recorded during field surveys within the Proposed Action Boundary, it has been observed previously in habitat adjacent to the site, and the species is known to occur elsewhere within Leard State Forest and within wider locality. While much of the Proposed Action Boundary is characterised by dense understories of shrubs, there are a number of areas where grassy dominated ground covers prevail, which offer opportunities for this woodland species.

The Proposed Action will remove up to 84.48 ha of potential habitat in the form of PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594, which are listed in BioNet as suitable for the species. Figure C.9 illustrates the current known generalised distribution. The Proposed Action is not at the limit of the known distribution.

Description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action

The proposed avoidance and mitigation measures are outlined in Section 7 and Section 8.4 of the BDAR. Regarding specific measures for this species, the following relevant mitigation measures are recommended for any related residual impacts:

- limit annual vegetation disturbance to the minimum necessary for planned mining operations
- timing of clearing works to avoid critical life cycle event
- demarcation of clearing boundaries using continuous high visibility flagging (or similar)
- pre-clearing surveys
- establishment of no-go zones to protect adjacent potential habitat during construction and operation.

Identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account

The residual direct impact to Diamond Firetail includes 84.48 ha of box/ironbark habitat through associated PCTs, including PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594. However, as an ecosystem credit species, the Diamond Firetail is assumed present in all associated PCTs, and as such, contributes to the offset requirements for these PCTs.

A description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established

Details of offset requirements and obligations for this species as a result of residual impacts due to MOD 10 is addressed in Section 10.1.1 of the BDAR.

Details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts

The BDAR specifically addresses section 10 of the BAM and provides information on the application of the no net loss standard and MOD 10 biodiversity offset obligations.

Details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites

Section 11 of the BDAR outlines the biodiversity credit requirements for MOD 10. The offset obligations will be met through implementing a combination of the following offset delivery options, being:

- the purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register
- establishing a biodiversity stewardship site(s) on lands with like for like biodiversity values to those impacted by MOD 10
- through making a payment into the Biodiversity Conservation Fund.

C3.3.9 Spotted-tailed Quoll

Status

The Spotted-tailed Quoll (southeastern mainland population) (*Dasyurus maculatus maculatus)* is listed as Endangered under the EPBC Act.

Description

The Spotted-tailed Quoll (southeastern mainland population) is a nocturnal carnivorous marsupial that occurs from southern Queensland to south-western Victoria. This species typically feeds on a wide variety of prey including small mammals (<5 kg), birds, reptiles, fish, amphibian and invertebrates (Threatened Species Conservation Advice, 2020). They occur as solitary animals in low density with home ranges of up to a few thousand ha for males and several hundred ha for females (Threatened Species Conservation Advice, 2020). Spotted-tailed Quoll's inhabitant a wide range of vegetation types including closed forests, tall eucalypt forest, open woodlands, open forests, drier rain shadow woodlands and coastal heathlands. Since European settlement, habitat reduction and fragmentation for the Spotted-tailed Quoll has led to an estimated 50-90% reduction in population for mainland Australia and 25-50% reduction for populations in NSW (Threatened Species Conservation Advice, 2020).

Relevant Commonwealth guidelines, policy statements including listing advice, conservation advice and recovery plan

A summary of the relevant Commonwealth guidelines and policy statements available for this species is as follows:

- Conservation Advice *Dasyurus maculatus maculatus* (southeastern mainland population) Spotted-tailed Quoll (Threatened Species Conservation Advice, 2020)
- listing assessment information for this species may be available in the approved Conservation Advice
- National Recovery Plan for the Spotted-tailed Quoll *Dasyurus maculatus* (Department of Environment Land Water and Planning, 2016).

Relevant adopted/made threat abatement plans include:

- threat abatement plan for predation by feral cats (Department of the Environment and Heritage, 2006).
- threat abatement plan for predation by the European red fox (Department of the Environment Water Heritage and the Arts, 2008).

Relevant survey guidelines for this species include:

- Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed under the *Environment Protection and Biodiversity Conservation Act* 1999 (Department of Sustainability Environment Water Population and Communities, 2011).

Specific impacts

There is a small number of historic records within the locality for this species. The Spotted-tailed Quoll was previously widely distributed from south-east Queensland, eastern NSW, Victoria, south-east South Australia and Tasmania. In Queensland, the Spotted-tailed Quoll occurs in south-east Queensland along the coast and ranges from Gladstone to the border and inland to Monto and Stanthorpe. Occurrences from five broad geographic areas are known, four of which are from coastal ranges and the Great Dividing Range from the NSW border to Gladstone.

Potential impacts to the Spotted-tailed Quoll from the Proposed Action are habitat loss. It is possible that a population of the Spotted-tailed Quoll may occur in the locality and may periodically occur within the Proposed Action Boundary as part of a larger home range, when seeking prey or as dispersing individuals from breeding events. The habitat to be removed supports viable prey resources (e.g. ground dwelling mammals). Nevertheless, no denning or breeding resources have been recorded within the Proposed Action Boundary.

The Proposed Action will remove up to 84.48 ha of potential habitat in the form of PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594, which are listed in BioNet as suitable for the species.

EPBC Act significant impact assessment

The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013b).

An action is likely to have a significant impact on an Endangered or Critically 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

A review of fauna records does not indicate this species is regularly recorded in the locality. If a population of the Spotted-tailed Quoll is present in the locality, individuals from this population may potentially occur periodically within the Proposed Action Boundary as part of a larger home range, when seeking prey or as dispersing subadults from breeding events.

Given their large home ranges and mobile nature, a population of Spotted-tailed Quoll is unlikely to permanently reside in the Proposed Action Boundary. Therefore, due to the relatively small area that the Proposed Action Boundary represents in the wider Leard State Forest communities, it is unlikely that the Proposed Action would lead to a long-term decrease of a population of the Spotted-tailed Quoll. Furthermore, individuals, for which the Proposed Action Boundary might represent part of the home range are considered most likely to establish core territory areas beyond Leard State Forest, due to its limited availability of old growth forest elements and the types of isolated and remote habitat locations that are favoured by the species. Therefore, the loss of vegetation from within the Proposed Action Boundary is considered unlikely to lead to a long-term decrease in the size of local Spotted-tailed Quoll populations.

Reduce the area of occupancy of the species

Spotted-tailed Quoll has not been recorded within the Leard State Forest or BCMs adjacent Biodiversity Offset Areas in over 10 years of ecological monitoring, and all records for the species are relatively distant from the Leard State Forest. There are anecdotal records by land holders to the east toward Dripping Rock and the habitats associated with the Nandewar Ranges in that locality suggest that the species likely persists in those areas, at least as part of the home range of individuals in populations, which would likely be extant in the Mount Kaputar National Park habitats.

The Proposed Action would add incrementally to the overall reduction of potential habitat for the species if regional individuals use it. Given their large home ranges and mobile nature, a population of Spotted-tailed Quoll is unlikely to permanently reside in the Proposed Action Boundary. The Proposed Action is unlikely to significantly reduce the area of occupancy of the Spotted-tailed Quoll (if present).

Fragment an existing population into two or more populations

Spotted-tailed Quolls are solitary animals that occur at low densities, with males having a home range of up to a few thousand ha in size, while females have smaller home ranges of several hundred ha (Threatened Species Conservation Advice, 2020).

The potential habitats for the Spotted-tailed Quoll within the wider locality is fragmented and historically disturbed by agriculture, thereby limiting the potential for any substantial additional fragmentation to occur. Given the ability of this species to disperse over these cleared areas, it is considered unlikely that the action would fragment an existing population or reduce the area of occupancy for the species significantly beyond the current state of fragmentation in the region. Moreover, the Leard State Forest Vegetation Corridor is a 500 m strip of remnant native vegetation reserved in perpetuity that links the eastern section of the Leard State Forest to the western sections of the forest and the Conservation Area beyond. The Proposed Action will not compromise the link between eastern and western sections of the forest such that it would fragment an existing population into two or more populations.

Adversely affect habitat critical to the survival of a species

No critical habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat. As outlined in the species' Conservation Advice (Commonwealth Department of Climate Change Energy the Environment and Water, 2023d), and the species' National Recovery Plan (Department of Environment Land Water and Planning, 2016), habitat critical to the survival of the Spotted-tailed Quoll (southeastern population) includes large patches of forest with adequate denning resources and relatively high densities of medium-sized mammalian prey. Given the species' threatened status, all habitats within its current distribution that are known to occupied are considered important (Department of Environment Land Water and Planning, 2016).

Whilst medium-sized mammalian prey and birds occupy the Proposed Action Boundary, in 16 years of ecological survey, assessment and monitoring (including camera trap methodologies) of the Leard State Forest, Vegetation Corridor and adjacent Biodiversity Offset Areas, the Spotted-tailed Quoll has not been accounted for. However, it is acknowledged that the Nandewar Range to the east of the Proposed Action is likely to retain individuals. Therefore, the Proposed Action Boundary is not likely to provide habitat critical to the survival of the species.

Disrupt the breeding cycle of a population

The Proposed Action would affect approximately 84.48 ha of potential habitat for this species, including foraging resources and potential den sites. However, in 16 years of ecological survey, assessment and monitoring (including camera trap methodologies) of the Leard State Forest, Vegetation Corridor and adjacent Biodiversity Offset Areas, the Spotted-tailed Quoll has not been recorded. Therefore, the Proposed Action is unlikely to impact the breeding cycle of a local population (if present), as the species is highly unlikely to breed within the Proposed Action Boundary.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

There are a number of historic records within the wider region, which are largely limited to areas within or adjacent to large areas of continuous forests. None of those records are associated with the Leard State Forest, and this could suggest the species is already in decline within the locality and may not actually use habitats within the Proposed Action Boundary. The potential habitat within the locality is highly fragmented and disturbed (i.e., agriculture and mining uses) and is relatively insignificant in contrast to the availability of larger contiguous and better-quality habitats in the wider region. It is therefore unlikely the Proposed Action would modify, destroy, remove or isolate or decrease the availability or quality of potential foraging 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

Considering the surrounding active mine operations, the removal of potential habitat is unlikely to contribute towards any increases in Fox or feral Cat populations, which may be harmful to the Spotted-tailed Quoll.

Introduce disease that may cause the species to decline

There are no known diseases that are harmful to the Spotted-tailed Quoll.

Interfere substantially with the recovery of the species

The *National Recovery Plan for the Spotted-tailed Quoll Dasyurus maculatus* (Department of Environment Land Water and Planning, 2016) identifies 11 specific objectives to guide the recovery of the Spotted-tailed Quoll, including:

1. Determine the distribution and status of Spotted-tailed Quoll populations throughout the range and identify key threats and implement threat abatement management practices.
2. Investigate key aspects of the biology and ecology of the Spotted-tailed Quoll to acquire targeted information to aid recovery.
3. Reduce the rate of habitat loss and fragmentation on private land.
4. Evaluate and manage the risk posed by silvicultural practices.
5. Determine and manage the threat posed by introduced predators (foxes, cats, wild dogs) and of predator control practices on Spotted-tailed Quoll populations.

6 Determine and manage the impact of fire regimes on Spotted-tailed Quoll populations.
7 Reduce deliberate killings of Spotted-tailed Quolls.
8 Reduce the frequency of Spotted-tailed Quoll road mortality.
9 Assess the threat Cane Toads pose to Spotted-tailed Quolls and develop threat abatement actions if necessary.
10 Determine the likely impact of climate change on Spotted-tailed Quoll populations.
11 Increase community awareness of the Spotted-tailed Quoll and involvement in the Recovery Program.

The Proposed Action would interfere with recovery objective 3. However, the Spotted-tailed Quoll has been captured as a predicted ecosystem credit based on habitat surrogates.

Conclusion

While the Proposed Action would add incrementally to the loss of Spotted-tailed Quoll (southeastern mainland population) habitat at the local scale, it is not likely to further fragment or isolate habitat or be detrimental to the long-term persistence of a local population of the species (if present). Spotted-tailed Quoll is a predicted ecosystem credit species and as such the loss of potential habitat will be offset through ecosystem credit obligation based on habitat surrogates. The Spotted-tailed Quoll was not recorded through substantial survey effort in the Proposed Action Boundary and the species has not been recorded from the Leard State Forest, Vegetation Corridor or BCMs Biodiversity Offset Areas over 16 years of ecological survey, assessment and monitoring, including camera trap methodologies. Consequently, the Proposed Action is unlikely to have a significant impact on the Spotted-tailed Quoll.

NSW Assessment Bilateral requirements

For each of the EPBC Act listed threatened species and migratory species likely to be impacted by the action the EIS must provide a separate:

Description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plan

A description of habitat for this species, important populations, habitat critical for survival and relevant Commonwealth documents are provided above, with a map showing the modelled distribution of the species provided in Figure C.10.

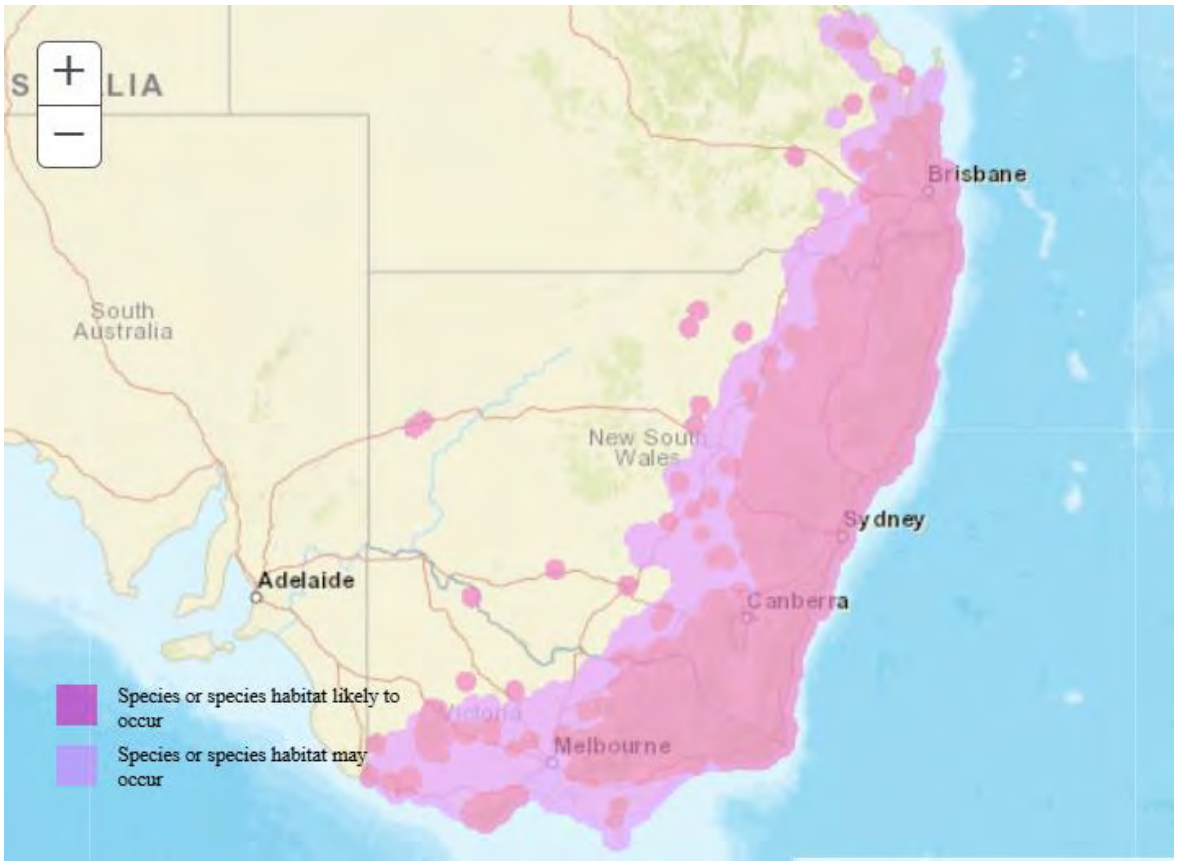


Figure C.10 Current distribution map for Spotted-tailed Quoll (southeastern mainland population) (Commonwealth Department of Climate Change Energy the Environment and Water, 2024c)

Details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements

Prior to survey, habitat constraints and microhabitats for threatened fauna species as listed within the NSW Threatened Biodiversity Data Collection (TBDC) was undertaken. In addition, a review of previous ecological survey and assessment and monitoring of the Leard State Forest, Vegetation Corridor, and subject land was undertaken.

Threatened mammal surveys completed within the Proposed Action Boundary were carried out in general accordance with the *NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (Department of Environment and Conservation, 2004)* and *Survey guidelines for Australia's threatened mammals (Department of the Environment, 2010)* including:

- 1,074 remote camera trap nights between October and December 2023
- 31 hollow-bearing trees stag watched in August 2023
- 45 person hours of parallel transects in August 2023
- 56 person hours of parallel transects in October 2023
- 57 person hours of spotlighting August and November 2023, and January and August 2024
- 29 call playback stations between August 2023 and January 2024
- five habitat assessments.

Further details of these surveys are provided in Section 2.4 and Table 5.9 of the BDAR.

The Spotted-tailed Quoll was not recorded during targeted survey and has been captured as a predicted ecosystem credit based on habitat surrogates. Targeted survey for ecosystem credit species is not required under the BAM.

Description of the specific impacts and its regard to the full national extent of the species or community's range

The Proposed Action will remove up to 84.48 ha of potential habitat in the form of PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594, which are listed in BioNet as suitable for the species. However, this species was not recorded from the Proposed Action Boundary during substantial survey effort and it has not been recorded from the Leard State Forest, Vegetation Corridor and BCMs adjacent Biodiversity Offset Areas in over 16 years of ecological survey, assessment and monitoring. While the Proposed Action would add incrementally to the loss of Spotted-tailed Quoll (southeastern mainland population) habitat at the local scale, it is not likely to further fragment or isolate habitat or be detrimental to the long-term persistence of a local population of the species (if present). Spotted-tailed Quoll is a predicted ecosystem credit species and as such the loss of potential habitat will be offset through ecosystem credit obligation based on habitat surrogates. Figure C.10 illustrates the current known generalised distribution. The Proposed Action is not at the limit of the known distribution.

Description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action

The proposed avoidance and mitigation measures are outlined in Section 7 and Section 8.4 of the BDAR. Regarding specific measures for this species, the following relevant mitigation measures are recommended for any related residual impacts:

- limit annual vegetation disturbance to the minimum necessary for planned mining operations
- timing of clearing works to avoid critical life cycle events
- demarcation of clearing boundaries using continuous high visibility flagging (or similar)
- pre-clearing surveys
- establishment of no-go zones to protect adjacent potential habitat during construction and operation.

Identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account

The residual direct impact to the Spotted-tailed Quoll (southeastern mainland population) includes 84.48 ha of box/ironbark habitat through associated PCTs, including PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594. However, as an ecosystem credit species, the Spotted-tailed Quoll is assumed present in all associated PCTs, and as such, contributes to the offset requirements for these PCTs.

A description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established

Details of offset requirements and obligations for this species as a result of residual impacts due to MOD 10 is addressed in Section 10.1.1 of the BDAR.

Details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts

The BDAR specifically addresses section 10 of the BAM and provides information on the application of the no net loss standard and MOD 10 biodiversity offset obligations.

Details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites

Section 11 of the BDAR outlines the biodiversity credit requirements for MOD 10. The offset obligations will be met through implementing a combination of the following offset delivery options, being:

- the purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register
- establishing a biodiversity stewardship site(s) on lands with like for like biodiversity values to those impacted by MOD 10
- through making a payment into the Biodiversity Conservation Fund.

C3.3.10 Corben's Long-eared Bat

Status

The Corben's Long-eared Bat (*Nyctophilus corbeni)* is listed as Vulnerable under the EPBC Act.

Description

Corben's Long-eared Bat distribution largely coincides with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for the species (Office of Environment & Heritage, 2024). The species inhabits a range inland vegetation types, including box eucalypt woodland, Buloke woodland, Brigalow woodland, Belah woodland, River Red Gum forest, Black Box woodland and mallee, but it is distinctly more common in box/ironbark/cypress pine communities on the western slopes and plains of NSW and southern Queensland (Office of Environment & Heritage, 2024) (Threatened Species Scientific Committee, 2015d). This insectivorous bat a slow flying but agile species that hunts in the understorey for beetles and caterpillars. Corben's Long-eared Bat roost in tree hollows, crevices and under loose bark, mating in autumn with one or two young born in late spring or early summer.

Relevant Commonwealth guidelines, policy statements including listing advice, conservation advice and recovery plan

A summary of the relevant Commonwealth guidelines and policy statements available for this species is as follows:

- Conservation Advice *Nyctophilus corbeni* South-eastern Long-eared Bat (Threatened Species Scientific Committee, 2015d)
- Commonwealth Listing Advice on ten species of Bats
- there is no adopted or made Recovery Plan for this species
- no Threat Abatement Plan has been identified as being relevant for this species.

Relevant survey guidelines for this species include:

- Survey guidelines for Australia's threatened bats: Guidelines for detecting bats listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (Department of the Environment Water Heritage and the Arts, 2010b).

Specific impacts

Targeted searches for Corben's Long-eared Bat in the Proposed Action Boundary were completed in November 2023 and January and November 2024, with two individuals recorded from separate locations. Additionally, Corben's Long-eared Bat has previously been recorded within and immediately adjacent to the Proposed Action Boundary during ecological monitoring of the Vegetation Corridor and it is known to occur in the larger Leard State Forest remnant and wider locality, including all BCMs Biodiversity Offset Areas.

The Proposed Action will remove up to 84.48 ha of habitat in the form of PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594, which contained foraging and roosting/breeding resources (hollow-bearing trees) for this species.

EPBC Act significant impact assessment

The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013b). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity, and/or
- at or near the limit of the species range.

Is an important population likely to be present?

The Corben's Long-eared Bat was recorded in the Proposed Action Boundary and the species is known from the larger Leard State Forest remnant and wider locality. Whilst there are no important populations outlined in the Commonwealth Species Profile and Threats Database (Commonwealth Department of Climate Change Energy the Environment and Water, 2024c), the Pilliga Forest in NSW is considered its stronghold. With respect to the State Threatened Biodiversity Database Collection, the Leard State Forest is designated as a Priority Management Area.

The Corben's Long-eared Bat population occurring in the Proposed Action Boundary is considered to be an important population in that the area could be considered 'core habitat' in terms of metapopulation dynamics, whereby large populations, occurring in larger patches provide a source population to smaller patches of habitat in the surrounding matrix (Hanski, 1999, ArnoldSteven and Weeldenburg, 1993, Lindenmayer and Burgman, 2005). Therefore, by reducing the size of the overall population of this species, the source for other remote populations is also reduced, potentially affecting the lifecycle of remote populations.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of an important population of a species

The population of Corben's Long-eared Bat in the Proposed Action Boundary is considered an important population.

Although the Corben's Long-eared Bat is mobile and known to forage more than three kilometres from roost sites, the removal of an additional 84.48 ha of habitat for this species, including roosting and foraging resources, will represent an incremental loss of habitats depleted by cumulative impacts locally. The removal of this remnant vegetation is likely to affect the species.

In terms of a metapopulation and given that the Brigalow Belt South bioregion retains less than 40 % of its original native vegetation (Resource and Conservation Assessment Council, 2000), it is likely that the Leard State Forest remnant occurs as 'core habitat' that provides a source population to smaller fragmented patches of habitat in the surrounding fragmented landscape. The reduction in the overall size of this population also reduces the source for other remote populations. Therefore, it is considered that the removal of 84.48 ha of habitat for this species would affect the dynamics of a local population and lead to a long-term decrease in the locality.

Reduce the area of occupancy of an important population

The population of Corben's Long-eared Bat in the Proposed Action Boundary is considered an important population.

While a local population of Corben's Long-eared Bat would not be restricted to habitat resources in the Proposed Action Boundary, the Proposed Action will reduce the area of occupancy for this species by an additional 84.48 ha, which represents an incremental loss of habitats depleted by cumulative impacts locally. This habitat is likely to consist of 'core habitat', and as such, is likely to act a source population for other remote populations.

Hollow-bearing trees are an important habitat resource for this species as such sites are used for both roosting and breeding purposes. Detailed systematic survey of tree hollow resources has previously been undertaken in the Leard State Forest remnant in association with the BCM. Although these surveys indicated that tree hollows within the Leard State

Forest remnant occurred at similar densities to those within the BCM lease area, the removal of an additional 84.48 ha of potential roost and breeding sites would reduce the area of occupancy for this species.

As Corben's Long-eared Bat inhabiting the Leard State Forest and the Proposed Action Boundary are likely to act as a source population for remote populations and given the large extent of potential foraging, roosting and breeding habitat that would be affected, it is considered that the Proposed Action would reduce the area of occupancy for this species.

Fragment an existing important population into two or more populations

Habitat connectivity is unlikely to be affected by the Proposed Action. Although the Proposed Action Boundary currently bolsters a corridor between extensive forest resources to the east in Leard State Forest and to the west in the Leard Forest Conservation Area, a Vegetation Corridor has been retained in perpetuity between BCM and MCCM to retain movement opportunities by Corben's Long-eared Bat and other fauna in the landscape. Therefore, the Proposed Action will not fragment an existing population into two or more populations.

Adversely affect habitat critical to the survival of a species

No critical habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat. Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment Water Heritage and the Arts, 2009).

Potential impacts associated with the Proposed Action include removal of up to 84.48 ha of vegetation, which contained foraging and breeding (hollowing-bearing trees) resources for this species.

Given the nature of the works and the subject land is typical of habitat in adjacent woodland, it is unlikely that the Proposed Action Boundary is important to the long-term survival of the species in the locality. The Proposed Action is therefore unlikely affect habitat of critical importance to this species.

Disrupt the breeding cycle of an important population

The population of Corben's Long-eared Bat in the Proposed Action Boundary is considered an important population.

The Proposed Action would remove an additional 84.48 ha of habitat for this species, which represents an incremental loss of roosting, breeding and foraging habitat depleted by cumulative impacts locally. Whilst similar densities of hollow-bearing tree resources were previously shown to occur within the Leard State Forest remnant and BCM lease area, the loss of an additional 84.48 ha of habitat will further exacerbate processes affecting the dynamics of a local population and may disrupt the breeding cycle of an important population.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Whilst the Proposed Action will not result in the isolation of habitat, it will remove an additional 84.48 ha of roosting, breeding and foraging habitat, which represents an incremental loss of habitat depleted by cumulative impacts locally. The further loss of a relatively large tract of known habitat will add incrementally to and exacerbate process that affect this species. Therefore, the Proposed Action could be considered as contributing to a decline in the species.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat

Invasion of predator species are unlikely to increase as a result of the Proposed Action given the existing nature and location of the Proposed Action Boundary and larger Leard State Forest remnant.

Introduce disease that may cause the species to decline

There are no known diseases causing potential species decline to Corben's Long-eared Bat.

Interfere with the recovery of the species?

An EPBC Act recovery plan has not been prepared for the Corben's Long-eared Bat, however, the Proposed Action will contribute to one known and one potential threat identified in the species' approved Conservation Advice (Threatened Species Scientific Committee, 2015d) being 'habitat loss and fragmentation' and 'reduction in hollow availability' respectively.

Despite this, impacts associated with the Proposed Action are unlikely to significantly interfere with identified conservation actions.

Conclusion

The Corben's Long-eared Bat was recorded in the Proposed Action Boundary during targeted survey and the species is known from the larger Leard State Forest remnant, adjacent Biodiversity Offset Areas, and wider locality. About 84.48 ha of roosting, foraging and breeding habitat would be affected by the Proposed Action, representing an incremental loss of habitat depleted by cumulative impacts locally. Given that the Brigalow Belt South bioregion retains less than 40% of its original native vegetation, it is likely that the Leard State Forest remnant and Proposed Action Boundary occur as 'core habitat' that provides a source population to smaller fragmented patches of habitat in the surrounding fragmented landscape. Therefore, the predicted impacts to known habitat for this species is likely to be significant and important regarding the context and intensity.

Given the impact to Corben's Long-eared Bat habitat in the Leard State Forest as a consequence of current mining operations in the Leard Forest Mining Precinct, the incremental loss of known habitat depleted by cumulative impacts locally will modify, destroy or remove habitat for the species. Consequently, the Proposed Action is considered to have a significant impact on the Corben's Long-eared Bat.

NSW Assessment Bilateral requirements

For each of the EPBC Act listed threatened species and migratory species likely to be impacted by the action the EIS must provide a separate:

Description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plan

A description of habitat for this species, important populations, habitat critical for survival and relevant Commonwealth documents are provided above, with a map showing the modelled distribution of the species provided in Figure C.11.

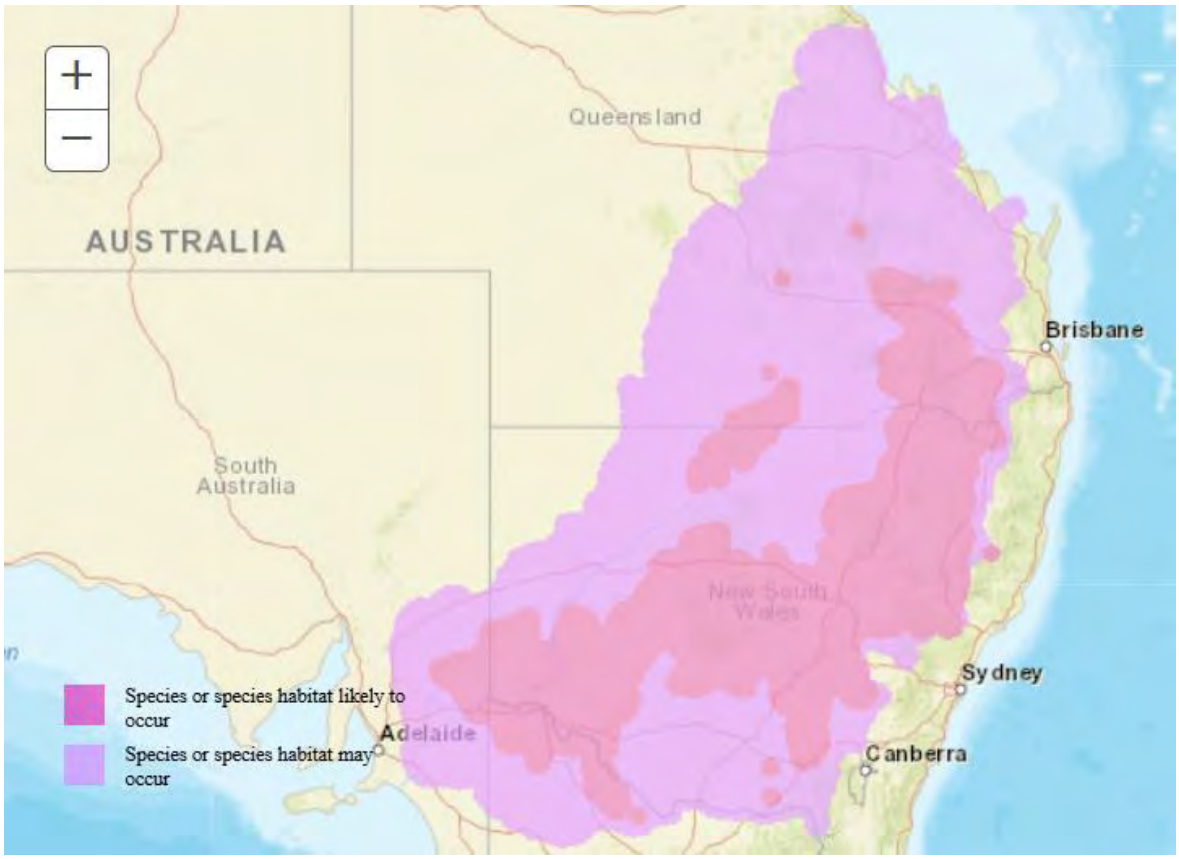


Figure C.11 Current distribution map for Corben's Long-eared Bat
(Commonwealth Department of Climate Change Energy the Environment and Water, 2024c)

Details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements

Prior to survey, habitat constraints and microhabitats for threatened fauna species as listed within the NSW Threatened Biodiversity Data Collection was undertaken. In addition, a review of previous ecological survey and assessment and monitoring of the Leard State Forest, Vegetation Corridor, and subject land was undertaken.

Threatened bat surveys completed within the Proposed Action Boundary were carried out in general accordance with the *NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (Department of Environment and Conservation, 2004), the *'Species credit' threatened bats and their habitat – NSW survey guide for the Biodiversity Assessment Method* (Office of Environment & Heritage, 2018b) and *Survey guidelines for Australia's threatened bats* (Department of the Environment Water Heritage and the Arts, 2010b), including:

- 32 ultrasonic detector nights over two separate four-night periods in January 2024
- 20 harp trap nights between in November 2023, January 2024 and November 2024
- five habitat assessments.

Further details of these surveys are provided in Section 2.4 and Table 5.9 of the BDAR.

Corben's Long-eared Bat was recorded from two separate locations during targeted survey and this species has been captured as a predicted ecosystem credit based on habitat surrogates. Targeted survey for ecosystem credit species is not required under the BAM.

Description of the specific impacts and its regard to the full national extent of the species or community's range

The Proposed Action will remove up to 84.48 ha of known habitat in the form of PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594, which are listed in BioNet as suitable for the species. Habitat likely to be impacted in association with the Proposed Action will exacerbate impacts to Corben's Long-eared Bat as a consequence of current mining operations in the Leard Forest Mining Precinct and the incremental loss of known habitat depleted by cumulative impacts locally. Notwithstanding this, Corben's Long-eared Bat is known from the wider Leard State Forest remnant, the Vegetation Corridor, and from all BCMs Biodiversity Offset Areas.

Corben's Long-eared Bat is a predicted ecosystem credit species, and as such, the loss of known habitat will be offset through ecosystem credit obligation based on habitat surrogates. Figure C.11 illustrates the current known generalised distribution. The Proposed Action is not at the limit of the known distribution.

Description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action

The proposed avoidance and mitigation measures are outlined in Section 7 and Section 8.4 of the BDAR. Regarding specific measures for this species, the following relevant mitigation measures are recommended for any related residual impacts:

- limit annual vegetation disturbance to the minimum necessary for planned mining operations
- timing of clearing works to avoid critical life cycle events
- demarcation of clearing boundaries using continuous high visibility flagging (or similar)
- pre-clearing surveys
- two-staged clearing procedure
- presence of suitably qualified animal handlers during all clearing events to relocate any displaced fauna to appropriate habitat
- establishment of no-go zones to protect adjacent potential habitat during construction and operation
- implementation of the nest box management plan.

Identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account

The residual direct impact to Corben's Long-eared Bat includes 84.48 ha of box/ironbark habitat, including PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594. As an ecosystem credit species, Corben's Long-eared Bat is assumed present in all associated PCTs, and as such, contributes to the offset requirements for these PCTs.

A description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established

Details of offset requirements and obligations for this species as a result of residual impacts due to MOD 10 is addressed in Section 10.1.1 of the BDAR.

Details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts

The BDAR specifically addresses section 10 of the BAM and provides information on the application of the no net loss standard and MOD 10 biodiversity offset obligations.

Details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites

Section 11 of the BDAR outlines the biodiversity credit requirements for MOD 10. The offset obligations will be met through implementing a combination of the following offset delivery options, being:

- the purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register
- establishing a biodiversity stewardship site(s) on lands with like for like biodiversity values to those impacted by MOD 10
- through making a payment into the Biodiversity Conservation Fund.

C3.3.11 Koala

Status

The Koala (*Phascolarctos cinereus)* is listed as Endangered under the EPBC Act.

Description

The range of the Koala differs slightly between the biological species range and listed species range. The biological species range extends from north-eastern Queensland to the south-east corner of SA. Several sub-populations of the biological species occur outside this range in south-eastern SA (i.e., Kangaroo Island) and some parts of Victoria, due to translocations. The listed species range extends from north-eastern Queensland to the Victorian border. Distribution of the Koala is influenced by altitude (generally limited to <800 m above sea level) tied to temperature. Distribution is also influenced by leaf moisture at the western and northern ends of the range. Koala population density is typically greater towards the coast than inland in these areas (Office of Environment & Heritage, 2024).

In NSW, Koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests and some smaller populations on the plains west of the Great Dividing Range (Office of Environment & Heritage, 2024). Koalas naturally inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by Eucalyptus species. They are a leaf-eating specialist that feed primarily during dawn, dusk or night. Koalas feed primarily on the foliage of Eucalyptus species; though may sometimes consume Corymbia, Angophora and Lophostemon species (Department of Agriculture Water and the Environment, 2022). Individual Koalas typically get their nutrition from just one or a few species present at a site and home ranges sizes vary with habitat quality, ranging from less than two ha to several hundred ha (Office of Environment & Heritage, 2024).

Koalas typically give birth between October and May and generally produce one offspring each year. Young remain in the pouch for 6-8 months and remain with their mothers until they become independent at approximately 12 months of age (DAWE, 2022).

Relevant Commonwealth guidelines, policy statements including listing advice, conservation advice and recovery plan

A summary of the relevant Commonwealth guidelines and policy statements available for this species is as follows:

- Conservation Advice for *Phascolarctos cinereus* (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory (Department of Agriculture Water and the Environment, 2022)
- listing assessment information may be available in the approved Conservation Advice
- National Recovery Plan for the Koala *Phascolarctos cinereus* (combined populations of Queensland, New South Wales and the Australian Capital Territory) (DAWE, 2022)
- no Threat Abatement Plan has been identified as being relevant for this species.

Policy statements and guidelines relevant to this species include:

- identifying habitat for the endangered Koala
- referral guidance for the endangered Koala.

Specific impacts

Although this species was not recorded during targeted surveys, potential habitat was observed and there are records locally for this species. Suitable foraging habitat for the Koala was identified in the Proposed Action Boundary, which comprised a very small number of high use feed tree species only, being limited one species of tree, *Eucalyptus albens* (White Box). Therefore, it is possible that the Proposed Action Boundary may be used on an intermittent basis during local movements. In Addition, the Proposed Action Boundary contained tree species of local high or significant use (shelter or feed trees) in the form of *Callitris glaucophylla* and *E. melanophloia* (Silver-leaved Ironbark), whilst *E. crebra* was nominated as low use in the Western Slopes and Plains Koala Management Area (Office of Environment & Heritage, 2018a). The Proposed Action will remove up to 84.48 ha of potential habitat in the form of PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594, which are listed in BioNet as suitable for the species. Large areas of similar or higher quality habitat for the species occur in surrounding woodland/ forest in the locality.

EPBC Act significant impact assessment

The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013b).

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

An action is likely to have a significant impact on an Endangered or Critically 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

Approximately 84.48 ha of potential habitat for the Koala would be affected by the Proposed Action, the majority of which is dominated by *E. crebra* (Narrow-leaved Ironbark). No individuals have been recorded within the Proposed Action Boundary, however, there are small number of records in databases for the Koala in the Leard State Forest. A detailed systematic Koala habitat utilisation survey and habitat modelling of the existing Project Boundary and remaining Leard State Forest (previously undertaken as part of the Continuation of Boggabri Coal Mine Environmental Assessment (Hansen Bailey, 2010)) indicated a low population density and low habitat utilisation in a small area in the south of the Leard State Forest. *Eucalyptus blakelyi* (Blakely's Red Gum) was inferred as the dominant tree species utilised, followed by *E. pilligaensis* (Pilliga Box), *E. albens* and *E. crebra*.

Whilst suitable Koala habitat identified in the Proposed Action Boundary may be used intermittently, its value to the species is likely to be limited. A very small number of high use feed tree individuals were recorded in the Proposed Action Boundary and comprised of one species, being *E. albens*. There are no additional regional or local high use feed tree species, such as *Eucalyptus camaldulensis* (Rivier Red Gum) *E. blakelyi*, *E. pilligaensis* or *E. populnea* (Poplar Box), present in the Proposed Action Boundary.

The area to be removed is unlikely to be significant in terms of foraging resources, or territory establishment for the Koala, due to the quality of foraging habitat therein. Therefore, there is no real chance or possibility that it will lead to a long-term decrease in the size of a population. Nevertheless, the removal of 84.48 ha of woodland habitat further reduces the extent of high-quality local forest vegetation, which may be used by this species and together with considerable losses of suitable and higher quality habitats elsewhere in the forest, the Proposed Action Boundary is assessed as an additional incremental loss of potential habitat for the species.

Reduce the area of occupancy of the species

The Proposed Action Boundary is unlikely to be important for extending the area of occupancy for the Koala, due to the relatively low quality of habitat for the species. Although the site currently bolsters a corridor for Koalas between extensive forest resources to the east in the Leard State Forest and to the west in the Leard Forest Conservation Area, the Leard State Forest Vegetation Corridor, which is a 500 m wide strip of remnant native vegetation has been retained in perpetuity between BCM and MCCM to retain movement opportunities by Koalas and other less mobile fauna in the landscape.

Fragment an existing population into two or more populations

Although the Proposed Action Boundary currently bolsters a corridor for Koalas between extensive forest resources to the east in the Leard State Forest and to the west in the Leard Forest Conservation Area, the Leard State Forest Vegetation Corridor, which is a 500 m wide strip of remnant native vegetation, has been retained in perpetuity between BCM and MCCM to retain movement opportunities by Koalas and other less mobile fauna in the landscape. Therefore, the Proposed Action will not fragment an existing population into two or more populations.

Adversely affect habitat critical to the survival of a species

No critical habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat. Conservation Advice for *Phascolarctos cinereus* (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory (Department of Agriculture Water and the Environment, 2022) defines habitat critical to the survival of the species as the area the species relies on to halt decline and promote the recovery of the species. Whilst ideally this would be identified spatially, the distribution of the listed Koala population is confounded by the absence of data on Koala distribution and abundance and consequently their habitat requirements in those areas. The *Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory* (2022) and *National Recovery Plan for the Koala Phascolarctos cinereus* (2022) describe the functional ecology of the Koala in terms of the combined assemblage of habitat qualities theoretically required to stop decline and promote recover. Key questions in evaluating habitat for Koala are:

- whether the habitat is used during periods of stress
- whether the habitat is used to meet essential life cycle requirements
- the extent to which habitat is used by important populations
- whether the habitat is necessary to maintain genetic diversity and long-term evolutionary development
- whether the habitat is necessary for use as corridors to allow the species to move freely between sites used to meet essential life cycle requirements
- whether the habitat is necessary to ensure the long-term future of the species or ecological community through reintroduction or recolonisation
- any other way in which habitat may be critical to the survival of a listed threatened species or listed threatened ecological community (EPBC Act).

No Koalas were recorded in the Proposed Action Boundary during targeted survey and a small number of records exist in the Leard State Forest and wider locality. A detailed systematic Koala habitat utilisation survey and habitat modelling undertaken previously within the existing Project Boundary and remaining Leard State Forest, indicated a low population density and low habitat utilisation in a small area in the south of the Leard State Forest. *Eucalyptus blakelyi* (Blakely's Red Gum) was inferred as the dominant tree species utilised, followed by *E. pilligaensis* (Pilliga Box), *E. albens* and *E. crebra*. An appraisal of Koala records in the Leard State Forest (BioNet Atlas of NSW Wildlife) indicate an association with lowland areas most likely associated with grassy woodlands on fertile soils, in contrast to the topographical position of the Proposed Action Boundary, which is associated with skeletal soils along the upper slopes of Willowtree Range ridgeline. Whilst feed tree species are associated with Proposed Action Boundary, the habitat contained therein is considered marginal potential foraging habitat and similar and more preferable habitat occurs more widely in the locality, including Biodiversity Offset Areas that are currently managed for in perpetuity conservation.

Whilst the Proposed Action Boundary currently bolsters a corridor for Koalas between extensive forest resources to the east in the Leard State Forest and to the west in the Leard Forest Conservation Area, a Vegetation Corridor has been retained in perpetuity between BCM and MCCM to retain movement opportunities by Koalas and other less mobile fauna in the landscape. Therefore, whilst the Proposed Action Boundary may be used on an intermittent basis during local movements, it is not likely to represent important habitat for this species. Accordingly, the Proposed Action is not likely to affect habitat critical to the survival of the Koala.

Disrupt the breeding cycle of a population

No individuals, or evidence of habitat usage, has been recorded in the Proposed Action Boundary, however, a small number of records do occur in the locality. Vegetation in the Proposed Action Boundary contained local feed tree species, and the study area may be rarely used on an intermittent basis during local movements, but it is not likely to represent important habitat. Similar and preferable habitat, such as *E. albens* stands, occur more widely within the locality. Therefore, it is considered unlikely that the Proposed Action will disrupt the breeding cycle of a koala population.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Proposed Action will impact approximately 84.48 ha of potential marginal foraging habitat in the Proposed Action Boundary. However, this does not constitute a significant proportion of the habitat available in the locality, and as such, is not likely to result in the decline of the species. Although the Proposed Action Boundary comprised a very small number of high use feed tree species (*E. albens*) and tree species of local high or significant use (*Callitris glaucophylla* and *E. melanophloia*), similar and more preferable habitat occurs more widely within the locality. The Proposed Action Boundary may be used on an intermittent basis during local movements, but it is not likely to represent important habitat for this species. Considering these species large home ranges and mobility, the Proposed Action is therefore unlikely to fragment or modify the habitat in a way that will cause these species 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

It is not likely that invasive species (such as introduced predators) that are potentially harmful to the Koala would become further established as a result of the Proposed Action.

Introduce disease that may cause the species to decline

Chlamydia bacteria in Koalas and Koala Retrovirus are primarily transmitted between Koala individuals (Department of Environment and Climate Change, 2008). There are no known disease issues affecting this species in relation to the Proposed Action and it is unlikely to increase the potential for significant disease vectors to affect the species.

Interfere substantially with the recovery of the species

The *National Recovery Plan for the Koala Phascolarctos cinereus (combined populations of Queensland, New South Wales and the Australian Capital Territory)* (DAWE, 2022) identifies the following specific objectives to guide the recovery of the Koala:

- the area of occupancy and estimated size of populations that are declining, suspected to be declining, or predicted to decline are instead stabilised then increased
- the area of occupancy and estimated size of populations that are suspected and predicated to be stable are maintained or increased
- metapopulation processes are maintained or improved
- partners, communities and individuals have a greater role and capability in listed Koala monitoring, conservation and management.

To meet these objectives, strategies and associated actions have been nominated to organise and implement coordinated action, including:

- strategy 1 – build and share knowledge
- engage and partner with the community in listed Koala conservation
- increase the area of protected habitat for the Koala
- integrate listed Koala conservation into policy, statutory and land use plans
- strategically restore listed Koala habitat
- actively manage listed Koala metapopulations.

The Proposed Action is not likely to interfere with any of the listed recovery strategies or actions. Furthermore, the Proposed Action does not occur in a Priority Population for the NSW Koala Strategy (2021-2026) (DPE, 2022). The closest Priority Population is the Liverpool Plains population, which is mapped to the south of Boggabri, NSW (2018).

Conclusion

Vegetation in the Proposed Action Boundary contained a very small number of high use feed tree individuals, being *E. albens* (White Box). There are no additional regional or local high use feed tree species, such as *E. camaldulensis* (Rivier Red Gum), *E. blakelyi* (Blakely's Red Gum), *E. pilligaensis* (Pilliga Box) or *E. populnea* (Poplar Box), present in the Proposed Action Boundary. However, it is likely that the Proposed Action Boundary may be used on an intermittent basis during local movements.

While the Proposed Action would remove up to 84.48 ha of potential marginal habitat, which will incrementally add to the remnant woodland already removed as part of the wider Leard Forest Mining Precinct, it is considered that the Proposed Action would not reduce the area of occupancy of this species given the occurrence of greater-quality habitat in the locality and wider region. The Proposed Action is unlikely to represent significant increases to habitat isolation and or fragmentation. Considering the large home ranges and mobility of this species, the Proposed Action would not impact the long-term survival of populations in the locality and is unlikely to further create a movement barrier for these species. Due to the low utilisation of habitat, and the lack of preferred feed trees, the Proposed Action is considered unlikely to have a significant impact on the species.

NSW Assessment Bilateral requirements

For each of the EPBC Act listed threatened species and migratory species likely to be impacted by the action the EIS must provide a separate:

Description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plan

A description of habitat for this species, important populations, habitat critical for survival and relevant Commonwealth documents are provided above, with a map showing the modelled distribution of the species provided in Figure C.12. A map showing the species polygon in the Proposed Action Boundary (subject land) is provided in Figure 15.17 in the main BDAR document.



Figure C.12 Current distribution map for Koala
(Commonwealth Department of Climate Change Energy the Environment and Water, 2024c)

Details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements

Prior to survey, habitat constraints and microhabitats for threatened fauna species as listed within the NSW Threatened Biodiversity Data Collection was undertaken. In addition, a review of previous ecological survey and assessment and monitoring of the Leard State Forest, Vegetation Corridor, and subject land was undertaken.

Koala surveys completed in the Proposed Action Boundary were carried out in general accordance with the *Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide* (Department of Planning and Environment, 2022a) and the *NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (Department of Environment and Conservation, 2004), including:

- 57 person hours of spotlighting in August and November 2023, and January and August 2024
- 27 call playback stations completed in August and November 2023 and January and August 2024. Three locations were sampled on each of six nights.
- 25 Koala SATs
- five habitat assessments.

Further details of these surveys are provided in Section 2.4 and Table 5.9 of the BDAR.

Description of the specific impacts and its regard to the full national extent of the species or community's range

The Proposed Action will remove up to 84.48 ha of potential marginal habitat in the form of PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594, which are listed in BioNet as suitable for the species. Koala was not recorded in the Proposed Action Boundary during targeted survey but was considered potential to use extant habitat irregularly during local movements. Habitat to be impacted in association with the Proposed Action will exacerbate impacts to Koala as a consequence of current mining operations in the Leard Forest Mining Precinct and the incremental loss of habitat depleted by cumulative impacts locally. However, only a very small number of high use feed tree individuals, being *E. albens* (White Box) were recorded in the Proposed Action Boundary. There were no additional regional or local high use feed tree species, such as *E. camaldulensis* (River Red Gum), *E. blakelyi* (Blakely's Red Gum), *E. pilligaensis* (Pilliga Box) or *E. populnea* (Poplar Box), present in the Proposed Action Boundary. Figure C.12 illustrates the current known generalised distribution.

Description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action

The proposed avoidance and mitigation measures are outlined in Section 7 and Section 8.4 of the BDAR. Regarding specific measures for this species, the following relevant mitigation measures are recommended for any related residual impacts:

- limit annual vegetation disturbance to the minimum necessary for planned mining operations
- demarcation of clearing boundaries using continuous high visibility flagging (or similar)
- pre-clearing surveys
- two-staged clearing procedure
- presence of suitably qualified animal handlers during all clearing events to relocate any displaced fauna to appropriate habitat
- establishment of no-go zones to protect adjacent potential habitat during construction and operation.

Identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account

The residual direct impact to Koala includes 84.48 ha of predominately ironbark habitat, including PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594. Although this species was not recorded during targeted survey, the Koala is assumed present in all associated PCTs as a species credit species (Figure 15.17), and as such, contributes its own offset requirements.

A description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established

Details of offset requirements and obligations for this species as a result of residual impacts due to MOD 10 is addressed in Section 10.1 of the BDAR.

Details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts

The BDAR specifically addresses section 10 of the BAM and provides information on the application of the no net loss standard and MOD 10 biodiversity offset obligations.

Details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites

Section 11 of the BDAR outlines the biodiversity credit requirements for MOD 10. The offset obligations will be met through implementing a combination of the following offset delivery options, being:

- the purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register
- establishing a biodiversity stewardship site(s) on lands with like for like biodiversity values to those impacted by MOD 10
- through making a payment into the Biodiversity Conservation Fund.

C3.3.12 Border Thick-tailed Gecko

Status

The Border Thick-tailed Gecko (*Uvidicolus sphyrurus*) is listed as Vulnerable under the EPBC Act.

Description

The Border Thick-tailed Gecko is a pale fawn to brown reptile growing to 7 cm with faint, darker brown flecks, very small white spots scattered over the head, neck, back, sides and limbs and dark grey-brown/black tail with alternate dark and pale cross-bands formed by rows of large tubercles (Cogger, 2014). The tail is fat and rectangular with a thin tapering tip and typically has four pale rings.

The Border Thick-tailed Gecko occurs on the northern slopes and tablelands of NSW and adjacent border regions of southern Queensland. Its geographic range is located from around Quirindi in the south (NSW) to Stanthorpe in the north (Queensland) and west to Moree (Commonwealth Department of Climate Change Energy the Environment and Water, 2024a).

Relevant Commonwealth guidelines, policy statements including listing advice, conservation advice and recovery plan

A summary of the relevant Commonwealth guidelines and policy statements available for this species is as follows:

- approved conservation advice: Conservation Advice for *Uvidicolus sphyrurus* (Border Thick-tailed Gecko) (Commonwealth Department of Climate Change Energy the Environment and Water, 2024a)
- listing assessment information may be available in the approved Conservation Advice
- there is no adopted or made Recovery Plan for this species
- one Threat Abatement Plan has been identified as being relevant for this species, being *Threat abatement plan for predation by feral cats* (Commonwealth of Australia, 2015).

Specific impacts

The Proposed Action will result in the removal of 84.48 ha of potential PCT habitat in the form of PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594. However, infrequent areas where small isolated rocky habitats associated with the Proposed Action Boundary occur, is a much smaller subset of associated woodland habitats, and a cumulative estimate of their extent is estimated to be less than 4 ha.

There are no records for this species from Leard State Forest or the Leard State Conservation Area. Records from the wider region are confined to the Nandewar ranges to the east and the New England Tableland beyond (Department of Planning and Environment, 2023a). While small areas of potential habitat were identified in the Proposed Action Boundary, targeted reptile searches completed in October and November 2023, and January 2024, did not account for this species. The species has been recorded in more rocky habitats of Boggabri Coal's Nioka North Biodiversity Offset

Property, on the east of the Nandewar Range about 15 km to the east of the Leard State Forest, with remaining locality records elsewhere in the Nandewar's and Kelvin State Forest some 25 km east of the Proposed Action Boundary.

Regarding potential habitat in the Proposed Action Boundary, the species is more regularly recorded in association with steep rocky or scree slopes, which are not present within the Proposed Action Boundary. Ecological surveys conducted throughout the Leard State Forest over the past 16 years have not encountered this species. The record at Nioka North is unlikely to be isolated, as suitable rocky habitats are abundant in the ranges to the east of the Leard State Forest.

The central ridgeline of the Leard State Forest with which the Proposed Action is associated with, has small, scattered areas of stone along its ridge and occasional rocky shelf lines on its flanks, however neither of these features are abundant throughout the area. In contrast, the Nandewar Ranges and the ridges of Kelvin State Forest, where wider locality records occur are characterised by large areas of continuous rocky sheets, rocky knobs and cliff lines, which provide extensive areas of suitable habitat for this species.

EPBC Act significant impact assessment

The following assessment has been undertaken following the Matters of National Environmental Significance, Significant Impact Guidelines 1.1 (Department of the Environment, 2013b). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity, and/or
- at or near the limit of the species range.

Is this part of an important population?

There are no known important populations of the species recorded in the Proposed Action Boundary. Furthermore, no individuals have been recorded within the Proposed Action Boundary or wider Leard State Forest, although records occur within habitat of much higher quality in the wider locality. The Proposed Action Boundary lacks preferred habitats of steep rock or scree slopes.

Due to this lack of preferred habitat for the species, and survey records for the species within habitats associated with the Leard State Forest, it is unlikely that the Proposed Action would support an important population of Border Thick-tailed Gecko.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will result in one or more of the following:

Lead to a long-term decrease in the size of an important population of a species

The species was not recorded during targeted biodiversity surveys, and no known important populations of the Border Thick-tailed Gecko are known to occur within the Proposed Action Boundary. Therefore, it is unlikely the Proposed Action would lead to the long-term decrease in the size of an important population of the Border Thick-tailed Gecko.

Reduce the area of occupancy of an important population of the species

It is unlikely the Proposed Action would reduce the area of occupancy of an important population as the species was not recorded during targeted biodiversity surveys, and no known important populations of the Border Thick-tailed Gecko are known to occur within the Proposed Action Boundary.

Fragment an existing important population into two or more populations

The species was not recorded during targeted biodiversity surveys, and no known important populations of the Border Thick-tailed Gecko are known to occur within the Proposed Action Boundary. Therefore, it is unlikely the Proposed Action would fragment an existing important population into two or more.

Adversely affect habitat critical to the survival of a species

No critical habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat. However, given the species is particularly sensitive to disturbance, undisturbed habitat that is suitable for the species should be considered critical to its survival (Commonwealth Department of Climate Change Energy the Environment and Water, 2024a).

The area of potential habitat likely to be affected by Proposed Action (84.48 ha) represents a small and marginal component of locally occurring resources that would be accessible to this species. As this species was not recorded during targeted searches to inform this BDAR, or over the last 16 years of biodiversity survey assessment and monitoring, the removal of about 84.48 ha of potential habitat would not be considered critical to the survival of this species.

Disrupt the breeding cycle of an important population

Not applicable, Border Thick-tailed Gecko occurring in the Proposed Action Boundary is not part of an important population.

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

The Proposed Action will likely affect up to 84.48 ha of marginal potential habitat to the species. The Border Thick-tailed Gecko has not been recorded in the Leard State Forest over the last 16 years of biodiversity survey and assessment and monitoring, including targeted searches in accordance with the Biodiversity Assessment Method survey guide for threatened reptiles (Department of Planning and Environment, 2022b). Due to this lack of preferred habitat of steep rocky or scree slopes in the Proposed Action Boundary, and the absence of species records, it is unlikely that the Proposed Action would have an impact on habitat to the extent that the species is likely to decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat

It is not likely that invasive species (such as introduced predators) that are harmful to the Border Thick-tailed Gecko would become further established as a result of the Proposed Action.

Introduce disease that may cause the species to decline

There are no known disease issues affecting this species in relation to the Proposed Action. The Proposed Action would be unlikely to increase the potential for significant disease vectors to affect the species.

Will the action interfere with the recovery of the species?

No recovery plan has been prepared for this species. The conservation advice for the species outlines several local and regional priority recovery and threat abatement actions can be done to support the recovery of the Border Thick-tailed Gecko. As the Proposed Action involves removal of potential habitat for the species, it could interfere with the recovery of the species.

Conclusion

This Gecko species has not been recorded in the Leard State Forest over the last 16 years of biodiversity survey and assessment and monitoring. While small areas of potential habitat were identified in the Proposed Action Boundary, targeted reptile searches completed in October and November 2023, and January 2024, did not account for this species. The extent of native vegetation clearing and habitat removal associated with the Proposed Action is of marginal quality for this species within the surrounding landscape and represents 84.48 ha. However, the occurrence of rocky habitat substrates is estimated to be less than 4 ha. Although the loss of marginal habitat for the Border Thick-tailed Gecko is an incremental loss of potential habitat locally, the Proposed Action is not likely to have a significant impact upon this species and habitats to be impacted are not considered likely to be important to the long-term survival of the Border Thick-tailed Gecko.

NSW Assessment Bilateral requirements

For each of the EPBC Act listed threatened species and migratory species likely to be impacted by the action the EIS must provide a separate:

Description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plan

A description of habitat for this species, important populations, habitat critical for survival and relevant Commonwealth documents are provided above, with a map showing the modelled distribution of the species provided in Figure C.13.



Figure C.13 Current distribution map for Border Thick-tailed Gecko (Commonwealth Department of Climate Change Energy the Environment and Water, 2024d)

Details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements

Prior to survey, habitat constraints and microhabitats for candidate threatened fauna (species credit) species as listed within the NSW Threatened Biodiversity Data Collection was undertaken. In addition, a review of previous ecological survey and assessment and monitoring of the Leard State Forest, Vegetation Corridor, and subject land was undertaken.

Field survey techniques were used to undertake targeted seasonal surveys in general accordance with *Survey guidelines for Australia's threatened reptiles* (Department of the Environment Water Heritage and the Arts, 2011) and the *Threatened reptiles Biodiversity Assessment Method survey guide* (Department of Planning and Environment, 2022b), including:

- nocturnal search/ spotlighting in November 2023 and January 2024
- diurnal searches of rocky substrates in October 2023
- five habitat assessments.

Further details of these surveys are provided in Section 2.4 of the BDAR.

Description of the specific impacts and its regard to the full national extent of the species or community's range

The Proposed Action will result in the removal of 84.48 ha of potential PCT habitat in the form of PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594. However, infrequent areas where small isolated rocky habitats associated with the Proposed Action Boundary occur, is a much smaller subset of associated woodland habitats, and a cumulative estimate of their extent is estimated to be less than 4 ha. Figure C.13 illustrates the current known generalised distribution.

Description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action

The proposed avoidance and mitigation measures are outlined in Section 7 and Section 8.4 of the BDAR. Regarding specific measures for this species, the following relevant mitigation measures are recommended for any related residual impacts:

- demarcation of clearing boundaries using continuous high visibility flagging (or similar)
- pre-clearing surveys
- salvage of habitat resources for reuse in rehabilitation and restoration activities
- establishment of no-go zones to protect adjacent potential habitat during construction and operation.

Identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account

The residual direct impact to Border Thick-tailed Gecko includes 84.48 ha of potential PCT habitat in the form of PCT 531, PCT 462, PCT 588, PCT 592 and PCT 594. However, infrequent areas where small isolated rocky habitats associated with the Proposed Action Boundary occur, is a much smaller subset of associated woodland habitats, and a cumulative estimate of their extent is estimated to be less than 4 ha.

A description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established

Details of offset requirements and obligations for this species as a result of residual impacts due to MOD 10 is addressed in Section 10.1.2 of the BDAR.

Details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts

The BDAR specifically addresses section 10 of the BAM and provides information on the application of the no net loss standard and MOD 10 biodiversity offset obligations.

Details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites

Section 11 of the BDAR outlines the biodiversity credit requirements for MOD 10. The offset obligations will be met through implementing a combination of the following offset delivery options, being:

- the purchase and retirement of existing biodiversity credits currently available on the biodiversity credit register
- establishing a biodiversity stewardship site(s) on lands with like for like biodiversity values to those impacted by MOD 10
- through making a payment into the Biodiversity Conservation Fund.

Appendix D

Vegetation survey data



D1 Vegetation survey data and locations

The table below provides the vegetation survey data and locations as used in the BAM-C. All plots were used for plot-based vegetation survey and vegetation integrity survey as identified in the BAM. The field datasheets for each of these plots is also provided after this table.

Plot	PCT	Area	Patch size	Condition class	Zone	Easting	Northing	Bearing	CompTree	CompShrub	CompGrass	CompForbs	CompFerns	CompOther	StrucTree	StrucShrub	StrucGrass	StrucForbs	StrucFerns	StrucOther	FunLargeTrees	FunHollowtrees	FunLitterCover	FunLenFallenLogs	FunTreeStem5to9	FunTreeStem10to19	FunTreeStem20to29	FunTreeStem30to49	FunTreeStem50to79	FunTreeRegen	FunHighThreatExotic	Plot-based vegetation survey?	Vegetation integrity survey?
Bog-NE-1	531	7.32	101	Mod	56	224422	6611835	214	5	9	4	14	2	1	15.4	12.7	6.0	10.7	1.5	0.1	3	1	78.0	48.0	1	1	1	1	1	1	0.0	☒ Yes ☐ No	☒ Yes ☐ No
Bog-NE-2	531	7.32	101	Mod	56	224563	6611944	269	6	7	4	8	1	1	25.2	4.0	13.2	5.9	1.0	0.2	0	1	63.0	34.0	1	1	1	1	0	1	0.0	☒ Yes ☐ No	☒ Yes ☐ No
Bog-NE-3	531	7.32	101	Mod	56	224675	6612031	222	5	8	3	7	0	0	30.1	2.7	1.2	7.6	0.0	0.0	0	0	82.0	33.0	1	1	1	1	0	1	0.0	☒ Yes ☐ No	☒ Yes ☐ No
Bog-NE-4	588	3.59	101	Mod	56	226120	6612980	265	5	13	6	14	2	5	10.0	20.9	28.4	4.8	0.6	1.4	1	3	52.0	44.0	1	1	1	1	1	1	0.0	☒ Yes ☐ No	☒ Yes ☐ No
Bog-NE-5	588	3.59	101	Mod	56	225702	6612890	202	4	10	5	6	1	2	17.7	7.5	3.8	3.6	0.2	0.2	0	6	66.0	37.0	1	1	1	1	0	1	0.0	☒ Yes ☐ No	☒ Yes ☐ No
Bog-NE-6	462	16.35	101	Mod	56	225969	6612917	285	5	3	3	7	1	2	16.2	61.5	1.2	2.2	0.1	0.3	0	2	59.0	50.0	1	1	1	1	0	1	0.0	☒ Yes ☐ No	☒ Yes ☐ No
Bog-NE-7	592	51.51	101	High	56	226315	6612974	106	2	9	3	13	1	2	17.0	18.6	10.7	3.2	0.3	0.6	4	3	67.0	29.0	1	1	1	1	1	1	0.1	☒ Yes ☐ No	☒ Yes ☐ No
Bog-NE-8	594	5.71	101	Mod	56	225487	6612930	296	5	8	4	13	1	4	23.1	9.9	7.2	2.7	0.2	1.7	0	2	81.0	67.0	1	1	1	1	0	1	0.1	☒ Yes ☐ No	☒ Yes ☐ No
Bod-NE-9	594	5.71	101	Mod	56	225318	6612913	162	6	3	4	10	2	2	19.1	5.7	6.2	4.0	6.0	0.3	0	1	49.0	34.0	1	1	1	1	0	1	0.0	☒ Yes ☐ No	☒ Yes ☐ No
Bog-NE-10	594	5.71	101	Mod	56	225381	6612833	332	6	11	3	9	0	2	37.5	12.4	7.5	1.9	0	0.2	0	0	46	31	1	1	1	1	0	1	0.1	☒ Yes ☐ No	☒ Yes ☐ No
Bog-NE-11	462	16.35	101	Mod	56	225260	6612740	323	5	4	4	8	2	4	30.7	6.6	4.5	0.9	0.6	1.2	0	3	61	80	1	1	1	1	0	1	0.0	☒ Yes ☐ No	☒ Yes ☐ No
Big-NE-12	462	16.35	101	Mod	56	225254	6612448	207	6	10	3	10	1	3	26.1	19.7	7.1	2.4	0.2	0.7	1	1	53	27	1	1	1	1	1	1	0.1	☒ Yes ☐ No	☒ Yes ☐ No

Plot	PCT	Area	Patch size	Condition class	Zone	Easting	Northing	Bearing	CompTree	CompShrub	CompGrass	CompForbs	CompFerns	CompOther	StrucTree	StrucShrub	StrucGrass	StrucForbs	StrucFerns	StrucOther	FunLargeTrees	FunHollowtrees	FunLitterCover	FunLenFallenLogs	FunTreeStem5to9	FunTreeStem10to19	FunTreeStem20to29	FunTreeStem30to49	FunTreeStem50to79	FunTreeRegen	FunHighThreatExotic	Plot-based vegetation survey?	Vegetation integrity survey?
Bog-NE-13	592	51.51	101	High	56	224932	6612370	238	6	12	7	17	2	4	24.1	19	4.5	5.6	0.4	0.5	0	3	64	58	1	1	1	1	0	1	0.1	☒ Yes ☐ No	☒ Yes ☐ No
Bog-NE-14	592	51.51	101	High	56	225161	6612239	51	5	9	5	14	1	2	32.6	14.4	3.2	4.3	0.5	0.2	1	2	53	51	1	1	1	1	1	1	0.1	☒ Yes ☐ No	☒ Yes ☐ No
Bog-NE-15	592	51.51	101	High	56	225793	6612656	220	4	10	4	16	0	3	28	13.7	4.5	4.5	0	0.3	2	3	45	65	1	1	1	1	1	1	0.1	☒ Yes ☒ No	☒ Yes ☐ No
Bog-NE-16	592	51.51	101	High	56	225920	6612808	266	6	10	5	12	2	4	28.2	13.5	17.8	4.3	0.3	0.9	5	5	62	51	1	1	1	1	1	1	0.1	☒ Yes ☐ No	☒ Yes ☐ No

D2 Bog_NE_1

Date	19/08/2024
Plot Name	Bog-NE-1
PCT	531

Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
35	35	5	9	4	14	2	1	0	0
Sum cove	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
46.4	46.4	15.4	12.7	6	10.7	1.5	0.1	0	0

Species	Cover	Abundanc		Trees	Shrubs	Grass	Forb	Fern	Other
Eucalyptus crebra	15	6	TG	15					
Callitris glaucophylla		45	TG	0					
Dodonaea viscosa subsp. angustifoli	0.5	1	SG		0.5				
Olearia elliptica subsp. elliptica	5	500	SG		5				
Melichrus urceolatus	1	30	SG		1				
Notelaea microcarpa	0.1	1	TG	0.1					
Pimelea neo-anglica	2	30	SG		2				
Glycine clandestina	0.1	20	OG						0.1
Breynia oblongifolia	1	15	SG		1				
Pultenaea cuneata	2	30	SG		2				
Goodenia hederacea	3	1000	FG				3		
Cheilanthes sieberi	1	300	EG					1	
Dichondra sp. Inglewood	2	1000	FG				2		
Daucus glochidiatus	1	300	FG				1		
Oxytes brachypoda	0.1	20	FG				0.1		
Cheilanthes distans	0.5	200	EG					0.5	
Alphitonia excelsa	0.1	1	TG	0.1					
Pterostylis spp.	0.5	300	FG				0.5		
Chrysocephalum semipapposum	2	1000	FG				2		
Austrostipa scabra	3	100	GG			3			
Aristida ramosa	2	300	GG			2			
Lomandra multiflora subsp. multiflora	0.5	10	GG			0.5			
Cyanicula caerulea	0.1	1	FG				0.1		
Einadia hastata	0.1	10	FG				0.1		
Pomax umbellata	0.2	500	FG				0.2		
Hibbertia obtusifolia	0.2	10	SG		0.2				
Gonocarpus elatus	0.1	10	FG				0.1		
Calotis lappulacea	0.5	10	FG				0.5		
Cyperus gracilis	0.5	50	GG			0.5			
Stackhousia viminea	0.5	5	FG				0.5		
Brunoniella australis	0.5	100	FG				0.5		
Arthropodium milleflorum	0.1	10	FG				0.1		
Acacia decora	0.5	1	SG		0.5				
Acacia cheelii	0.2	1	TG	0.2					
Exocarpos cupressiformis	0.5	1	SG		0.5				

Easting	224422
Northing	6611835
Orientation	214
Plot size	20 X 20 X 50
AM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	3
30-49	5
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Regen	Yes
Hollows	1
Length logs (m)	48
AM Attributes 3x1 plot 1	28

D3 Bog_NE_2

Date	19/08/2024
Plot Name	Bog-NE-2
PCT	531

	Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
	# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
	27	27	6	7	4	8	1	1	0	0
	Sum cove	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	49.5	49.5	25.2	4	13.2	5.9	1	0.2	0	0

Species	Cover	Abundanc									
Eucalyptus crebra	8	8	TG		8						
Corymbia trachyphloia subsp. amphistomatica	3	6	TG		3						
Callitris glaucophylla	2	3	TG		2						
Acacia cheelii	10	40	TG		10						
Alphitonia excelsa	2	2	TG		2						
Geijera parviflora	1	1	SG			1					
Cassinia laevis	2	10	SG			2			FG		
Melichrus urceolatus	0.1	2	SG			0.1					
Hovea apiculata	0.2	2	SG			0.2					
Notelaea microcarpa	0.2	1	TG		0.2						
Goodenia rotundifolia	2	500	FG				2				
Gonocarpus elatus	2	500	FG				2				
Goodenia hederacea	1	300	FG				1				
Caladenia spp.	0.1	1	FG				0.1				
Amyema quandang var. quandang	0.2	1	OG					0.2			
Prostanthera granitica	0.5	6	SG			0.5					
Pomax umbellata	0.2	50	FG				0.2				
Sida cunninghamii	0.2	100	FG				0.2				
Sida corrugata	0.2	100	FG				0.2				
Chrysocephalum semipapposum	0.2	20	FG				0.2				
Aristida ramosa	10	300	GG			10					
Hibbertia obtusifolia	0.1	5	SG	0.1							
Solanum parvifolium subsp. parvifolium	0.1	1	SG	0.1							
Cheilanthes sieberi	1	200	EG					1			
Lomandra multiflora subsp. multiflora	0.1	2	GG			0.1					
Aristida leptopoda	3	150	GG			3					
Lepidosperma cf. laterale	0.1	3	GG			0.1					

Easting	224563
Northing	6611944
Orientation	269
Plot size	20 X 20 X 50

AM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	4
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Regen	Yes
Hollows	1
Length logs (m)	34

AM Attributes 1x1 plot (	63

D4 Bog_NE_3

Date	19/08/2024		Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Plot Name	Bog-NE-3		# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
PCT	531		23	23	5	8	3	7	0	0	0	0
			Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	Cover	Abundance	41.6	41.6	30.1	2.7	1.2	7.6	0	0	0	0
Eucalyptus crebra	5	2	TG		5							
Callitris glaucophylla	10	7	TG		10							
Corymbia trachyphloia subsp. amphistomatica	10	4	TG		10							
Acacia cheelii	5	30	TG		5							
Melichrus urceolatus	0.2	5	SG			0.2						
Chrysocephalum semipapposum	2	200	FG					2				
Gonocarpus elatus	2	500	FG					2				
Goodenia hederacea	1	300	FG					1				
Goodenia rotundifolia	1	200	FG					1				
Pomax umbellata	1	500	FG					1				
Lepidosperma cf. laterale	0.2	10	GG				0.2					
Prostanthera granitica	0.1	1	SG			0.1						
Einadia hastata	0.5	100	FG					0.5				
Dianella revoluta var. revoluta	0.1	20	FG					0.1				
Alphitonia excelsa	0.1	1	TG		0.1							
Persoonia sericea	0.2	1	SG			0.2						
Hovea apiculata	0.5	3	SG		0.5							
Cassinia laevis	1	20	SG		1							
Olearia elliptica	0.1	5	SG		0.1							
Breynia oblongifolia	0.5	5	SG		0.5							
Lomandra multiflora subsp. multiflora	0.5	10	GG				0.5					
Lomandra filiformis	0.5	5	GG				0.5					
Solanum parvifolium subsp. parvifolium	0.1	1	SG		0.1							

Easting	224675
Northing	6612031
Orientation	222
Plot size	20 X 20 X 50
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	4
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Regen	Yes
Hollows	0
Length logs (m)	33
BAM Attributes 1x1 plot (%)	32

D5 Bog_NE_4

Date	20/08/2024			Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	ligh Threat
Plot Name	Bog-NE-4			# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
PCT	588			49	45	5	13	6	14	2	5	4	0
				Sum cove	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	Cover	Abundance		66.5	66.1	10	20.9	28.4	4.8	0.6	1.4	0.4	0
Eucalyptus albens	5	5	TG			5							
Acacia cheelii	1	1	TG			1							
Geijera parviflora	2	3	SG				2						
Alphitonia excelsa	1	1	TG			1							
Callitris glaucophylla	2	2	TG			2							
Persoonia sericea	1	1	SG				1						
Dodonaea viscosa	10	20	SG				10						
Amyema quandang	0.1	1	OG								0.1		
Notelaea microcarpa	1	3	TG			1							
Amyema miquelii	0.1	1	OG								0.1		
Denhamia cunninghamii	1	1	SG				1						
Pimelea neo-anglica	2	30	SG				2						
Beyeria viscosa	3	20	SG				3						
Sonchus oleraceus	0.1	1	EX									0.1	
Olearia elliptica subsp. elliptica	0.5	2	SG				0.5						
Swainsona galegifolia	0.2	10	FG						0.2				
Oxytes brachypoda	1	200	FG						1				
Dichondra sp. Inglewood	2	1000	FG						2				
Solanum parvifolium subsp. parvifolium	0.5	100	SG				0.5						
Rhagodia parabolica	0.5	1	SG				0.5						
Aristida ramosa	15	1000	GG					15					
Poa sieberiana	10	1000	GG					10					
Cyperus gracilis	3	500	GG					3					
Einadia hastata	0.5	50	FG						0.5				
Parsonsia eucalyptophylla	1	100	OG								1		
Cheilanthes sieberi	0.5	200	EG							0.5			
Sida corrugata	0.2	50	FG						0.2				
Daucus glochidiatus	0.1	10	FG						0.1				
Breynia oblongifolia	0.1	5	SG				0.1						
Hypochaeris glabra	0.1	2	EX									0.1	
Melichrus urceolatus	0.1	5	SG				0.1						
Verbena spp.	0.1	1	EX									0.1	
Oxalis perennans	0.1	20	FG						0.1				
Haloragis heterophylla	0.1	50	FG						0.1				
Sigesbeckia australiensis	0.1	5	FG						0.1				
Lysimachia arvensis	0.1	10	EX									0.1	
Chrysocephalum semipapposum	0.1	5	FG						0.1				
Phyllanthus virgatus	0.1	5	FG						0.1				
Sida cunninghamii	0.1	5	FG						0.1				
Indigofera adesmiifolia	0.1	5	SG				0.1						
Cheilanthes distans	0.1	2	EG							0.1			
Sigesbeckia australiensis	0.1	10	FG						0.1				
Glycine clandestina	0.1	10	OG								0.1		
Rytidosperma racemosum var. obtusatum	0.1	5	GG					0.1					
Paspalidium constrictum	0.2	50	GG					0.2					
Arthropodium milleflorum	0.1	5	FG						0.1				
Eremophila debilis	0.1	1	SG				0.1						
Microlaena stipoides	0.1	1	GG					0.1					
Glycine tabacina	0.1	10	OG								0.1		

Easting	226120
Northing	6612980
Orientation	265
Plot size	20 X 20 X 50
AM Attributes 20x50m plot:	
Stem classes	
80+	0
50-79	1
30-49	4
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Regen	Yes
Hollows	3
Length logs (m)	44
AM Attributes 1x1 plot (:	52

D6 Bog_NE_5

Date	20/08/2024		Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Plot Name	Bog-NE-5		# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
PCT	588		31	28	4	10	5	6	1	2	3	0
			Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	Cover	Abundance	33.3	33	17.7	7.5	3.8	3.6	0.2	0.2	0.3	0
Eucalyptus albens	15	6	TG		15							
Amyema miquelii	0.1	1	OG							0.1		
Geijera parviflora	2	1	SG			2						
Notelaea microcarpa	2	1	TG		2							
Acacia cheelii	0.5	1	TG		0.5							
Alphitonia excelsa	0.2	1	TG		0.2							
Dodonaea viscosa	3	100	SG			3						
Acacia decora	1	5	SG			1						
Pimelea neo-anglica	0.5	8	SG			0.5						
Rhagodia parabolica	0.1	2	SG			0.1						
Oxytes brachypoda	1	500	FG					1				
Dichondra sp. Inglewood	2	1000	FG					2				
Aristida leptopoda	2	500	GG				2					
Sigesbeckia australiensis	0.1	30	FG					0.1				
Rytidosperma racemosum	0.5	50	GG				0.5					
Lysimachia arvensis	0.1	50	EX								0.1	
Swainsona galegifolia	0.2	50	FG					0.2				
Indigofera adesmiifolia	0.1	10	SG			0.1						
Glycine clandestina	0.1	20	OG							0.1		
Sonchus oleraceus	0.1	20	EX								0.1	
Cyperus gracilis	1	300	GG				1					
Melichrus urceolatus	0.1	10	SG			0.1						
Brassica x napus	0.1	1	EX								0.1	
Cheilanthes sieberi	0.2	50	EG						0.2			
Lomandra multiflora subsp. multiflora	0.1	5	GG				0.1					
Olearia elliptica	0.5	10	SG			0.5						
Einadia hastata	0.1	5	FG					0.1				
Scutellaria humilis	0.2	15	FG					0.2				
Breynia oblongifolia	0.1	1	SG			0.1						
Solanum parvifolium subsp. parvifolium	0.1	5	SG			0.1						
Digitaria diffusa	0.2	50	GG				0.2					

Easting	225702
Northing	6612890
Orientation	202
Plot size	20 X 20 X 50
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	6
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Regen	Yes
Hollows	6
Length logs (m)	37
BAM Attributes 1x1 plot (%)	66

D7 Bog_NE_6

Date	20/08/2024		Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Plot Name	Bog-NE-6		# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
PCT	462		22	21	5	3	3	7	1	2	1	0
			Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	Cover	Abundance	81.6	81.5	16.2	61.5	1.2	2.2	0.1	0.3	0.1	0
Eucalyptus dwyeri	5	7	TG		5							
Acacia cheelii	10	20	TG		10							
Callitris glaucophylla	1	2	TG		1							
Amyema quandang	0.2	3	OG							0.2		
Beyeria viscosa	1	5	SG			1						
Prostanthera granitica	60	1000	SG			60						
Gonocarpus elatus	1	100	FG					1		FG		
Dodonaea viscosa subsp. angustifolia	0.5	10	SG			0.5						
Notelaea microcarpa	0.1	1	TG		0.1							
Parsonsia eucalyptophylla	0.1	5	OG							0.1		
Alphitonia excelsa	0.1	1	TG		0.1							
Geranium solanderi	0.2	200	FG					0.2				
Aristida personata	1	100	GG				1					
Oxytes brachypoda	0.2	30	FG					0.2				
Digitaria diffusa	0.1	20	GG				0.1					
Pterostylis spp.	0.1	1	FG					0.1				
Arthropodium milleflorum	0.5	50	FG					0.5				
Goodenia hederacea	0.1	10	FG					0.1				
Cheilanthes sieberi	0.1	20	EG						0.1			
Sonchus oleraceus	0.1	10	EX								0.1	
Einadia hastata	0.1	1	FG					0.1				
Lomandra filiformis	0.1	3	GG				0.1					

Easting	225969
Northing	6612917
Orientation	285
Plot size	20 X 20 X 50
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	1
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Regen	Yes
Hollows	2
Length logs (m)	50
BAM Attributes 1x1 plot (%)	59

D8 Bog_NE_7

Date	20/08/2024		Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Plot Name	Bog-NE-7		# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
PCT	592		33	30	2	9	3	13	1	2	2	1
			Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	Cover	Abundance	50.8	50.4	17	18.6	10.7	3.2	0.3	0.6	0.3	0.1
Eucalyptus crebra	15	7	TG		15							
Callitris glaucophylla	2	9	TG		2							
Dodonaea viscosa subsp. angustifolia	2	9	SG			2						
Beyeria viscosa	15	80	SG			15						
Cassinia laevis	0.1	1	SG			0.1						
Melichrus urceolatus	0.1	2	SG			0.1						
Pimelea neo-anglica	0.1	5	SG			0.1				FG		
Breynia oblongifolia	0.1	5	SG			0.1						
Olearia elliptica	0.2	10	SG			0.2						
Sonchus oleraceus	0.1	20	EX								0.1	
Geranium solanderi	0.1	100	FG					0.1				
Swainsona galegifolia	0.1	20	FG					0.1				
Cheilanthes sieberi	0.3	100	EG						0.3			
Hypochaeris radicata	0.2	50	EX								0.2	
Daucus glochidiatus	0.5	500	FG					0.5				
Glycine clandestina	0.1	20	OG							0.1		
Denhamia cunninghamii	0.5	30	SG			0.5						
Oxytes brachypoda	0.5	30	FG					0.5				
Aristida personata	10	1000	GG				10					
Chrysocephalum semipapposum	0.2	30	FG					0.2				
Dichondra sp. Inglewood	0.2	500	FG					0.2				
Gonocarpus elatus	0.5	200	FG					0.5				
Lomandra multiflora subsp. multiflora	0.2	10	GG				0.2					
Phyllanthus virgatus	0.1	100	FG					0.1				
Pterostylis spp.	0.5	100	FG					0.5				
Brunoniella australis	0.2	200	FG					0.2				
Cyperus gracilis	0.5	500	GG				0.5					
Opuntia stricta	0.1	2	HT								0.1	
Stackhousia viminea	0.1	1	FG					0.1				
Caladenia spp.	0.1	1	FG					0.1				
Exocarpos cupressiformis	0.5	1	SG		0.5							
Lysiana subfalcata	0.5	1	OG							0.5		
Calochilus spp.	0.1	1	FG					0.1				

Easting	226315
Northing	6612974
Orientation	106
Plot size	20 X 20 X 50
BAM Attributes 20x50m plot	
Stem classes	
80+	1
50-79	3
30-49	6
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Regen	Yes
Hollows	3
Length logs (m)	29
BAM Attributes 1x1 plot (%)	57

D9 Bog_NE_8

Date	21/08/2024		Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Plot Name	Bog-NE-8		# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
PCT	594		37	35	5	8	4	13	1	4	1	1
			Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	Cover	Abundance	45	44.8	23.1	9.9	7.2	2.7	0.2	1.7	0.1	0.1
Eucalyptus melanophloia	7	8	TG		7							
Acacia cheelii	10	18	TG		10							
Amyema quandang	1	3	OG							1		
Marsdenia viridiflora subsp. viridiflora	0.5	1	OG							0.5		
Alphitonia excelsa	5	3	TG		5							
Brachychiton populneus subsp. populneus	0.1	1	TG		0.1							
Dodonaea viscosa subsp. angustifolia	5	100	SG			5				FG		
Pimelea neo-anglica	1	20	SG			1						
Notelaea microcarpa	1	10	TG		1							
Senna artemisioides <--> zygophylla	3	20	SG			3						
Indigofera adesmiifolia	0.1	10	SG			0.1						
Swainsona galegifolia	0.1	10	FG					0.1				
Chrysocephalum semipapposum	0.2	100	FG					0.2				
Aristida caput-medusae	5	500	GG				5					
Cheilanthes sieberi	0.2	100	EG						0.2			
Digitaria diffusa	1	200	GG				1					
Oxytes brachypoda	0.2	200	FG					0.2				
Dichondra sp. Inglewood	1	1000	FG					1				
Hibiscus sturtii var. sturtii	0.2	30	FG					0.2				
Sigesbeckia australiensis	0.2	75	FG					0.2				
Gonocarpus elatus	0.1	100	FG					0.1				
Solanum parvifolium subsp. parvifolium	0.1	30	SG			0.1						
Sonchus oleraceus	0.1	10	EX								0.1	
Glycine clandestina	0.1	50	OG							0.1		
Parsonsia eucalyptophylla	0.1	100	OG							0.1		
Phyllanthus virgatus	0.1	100	FG					0.1				
Arthropodium milleflorum	0.2	500	FG					0.2				
Olearia elliptica	0.5	20	SG			0.5						
Pterostylis spp.	0.1	10	FG					0.1				
Daucus glochidiatus	0.1	200	FG					0.1				
Einadia hastata	0.1	5	FG					0.1				
Melichrus urceolatus	0.1	1	SG			0.1						
Breynia oblongifolia	0.1	1	SG			0.1						
Aristida personata	1	200	GG				1					
Lomandra multiflora subsp. multiflora	0.2	20	GG				0.2					
Stackhousia viminea	0.1	1	FG					0.1				
Opuntia stricta	0.1	1	HT									0.1

Easting	225487
Northing	6612930
Orientation	296
Plot size	20 X 20 X 50
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	2
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Regen	Yes
Hollows	2
Length logs (m)	67
BAM Attributes 1x1 plot (%)	61

D10 Bog_NE_9

Date	21/08/2024		Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Plot Name	Bod-NE-9		# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
PCT	594		30	27	6	3	4	10	2	2	3	0
			Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	Cover	Abundance	41.6	41.3	19.1	5.7	6.2	4	6	0.3	0.3	0
Eucalyptus melanophloia	2	1	TG		2							
Callitris glaucophylla	1	1	TG		1							
Acacia cheelii	5	6	TG		5							
Notelaea microcarpa	10	50	TG		10							
Dodonaea viscosa subsp. angustifolia	5	100	SG			5						
Alphitonia excelsa	1	20	TG		1							
Cheilanthes distans	5	1000	EG						5 FG			
Oxytes brachypoda	1	500	FG					1				
Solanum parvifolium subsp. parvifolium	0.5	100	SG			0.5						
Digitaria diffusa	2	500	GG				2					
Sporobolus caroli	2	300	GG				2					
Arthropodium milleflorum	1	1000	FG					1				
Daucus glochidiatus	0.5	1000	FG					0.5				
Oxalis perennans	0.1	100	FG					0.1				
Cheilanthes sieberi	1	200	EG						1			
Gonocarpus elatus	0.5	1000	FG					0.5				
Sonchus oleraceus	0.1	50	EX								0.1	
Breynia oblongifolia	0.2	20	SG			0.2						
Marsdenia viridiflora subsp. viridiflora	0.2	1	OG							0.2		
Glycine clandestina	0.1	30	OG							0.1		
Sigesbeckia australiensis	0.5	50	FG					0.5				
Lysimachia arvensis	0.1	100	EX								0.1	
Dichondra sp. Inglewood	0.1	300	FG					0.1				
Hypochaeris radicata	0.1	50	EX								0.1	
Aristida personata	2	200	GG				2					
Sida cunninghamii	0.1	20	FG					0.1				
Eucalyptus crebra	0.1	1	TG		0.1							
Geranium solanderi	0.1	50	FG					0.1				
Paspalidium constrictum	0.2	100	GG				0.2					
Brunoniella australis	0.1	50	FG					0.1				

Easting	225318
Northing	6612913
Orientation	162
Plot size	20 X 20 X 50
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	3
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Regen	Yes
Hollows	1
Length logs (m)	34
BAM Attributes 1x1 plot (%)	40

D11 Bog_NE_10

Date	21/08/2024		Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Plot Name	Bog-NE-10		# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
PCT	594		34	31	6	11	3	9	0	2	2	1
			Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	Cover	Abundance	59.8	59.5	37.5	12.4	7.5	1.9	0	0.2	0.2	0.1
Eucalyptus melanophloia	10	5	TG		10							
Brachychiton populneus subsp. populneus	2	1	TG		2							
Alphitonia excelsa	5	3	TG		5							
Acacia cheelii	15	20	TG		15							
Amyema quandang	0.1	1	OG							0.1		
Psydrax odorata subsp. australiana	0.5	1	SG			0.5						
Alstonia constricta	0.5	1	TG		0.5					SG		
Dodonaea viscosa subsp. angustifolia	5	80	SG			5						
Pimelea neo-anglica	2	50	SG			2						
Geijera parviflora	2	5	SG			2						
Notelaea microcarpa	5	20	TG		5							
Solanum parvifolium subsp. parvifolium	1	30	SG			1						
Senna aciphylla	0.1	5	SG			0.1						
Opuntia stricta	0.1	1	HT									0.1
Sonchus oleraceus	0.1	10	EX								0.1	
Aristida spp.	5	500	GG				5					
Breynia oblongifolia	0.5	20	SG			0.5						
Daucus glochidiatus	0.2	200	FG					0.2				
Lysimachia arvensis	0.1	100	EX								0.1	
Sigesbeckia australiensis	0.1	50	FG					0.1				
Arthropodium milleflorum	0.1	100	FG					0.1				
Dichondra sp. Inglewood	1	1000	FG					1				
Oxalis perennans	0.1	100	FG					0.1				
Oxytes brachypoda	0.1	100	FG					0.1				
Glycine clandestina	0.1	50	OG							0.1		
Einadia hastata	0.1	30	FG					0.1				
Rhagodia parabolica	0.5	2	SG			0.5						
Beyeria viscosa	0.5	5	SG			0.5						
Asteraceae spp.	0.1	10	FG					0.1				
Lomandra multiflora subsp. multiflora	0.5	20	GG				0.5					
Paspalidium constrictum	2	500	GG				2					
Senna artemisioides subsp. zygophylla	0.1	1	SG			0.1						
Phyllanthus virgatus	0.1	10	FG					0.1				
Olearia elliptica	0.2	10	SG			0.2						

Easting	225381
Northing	6612833
Orientation	332
Plot size	20 X 20 X 50
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	5
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Regen	Yes
Hollows	0
Length logs (m)	31
BAM Attributes 1x1 plot (%)	46

D12 Bog_NE_11

Date	21/08/2024		Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Plot Name	Bog-NE-11		# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
PCT	462		30	27	5	4	4	8	2	4	3	0
			Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	Cover	Abundance	45.2	44.5	30.7	6.6	4.5	0.9	0.6	1.2	0.7	0
Eucalyptus dwyeri	5	5	TG		5							
Acacia cheelii	20	30	TG		20							
Notelaea microcarpa	5	100	TG		5							
Pandorea pandorana	0.5	1	OG							0.5		
Dodonaea viscosa subsp. angustifolia	5	300	SG			5						
Alphitonia excelsa	0.2	10	TG		0.2							
Gonocarpus elatus	0.1	100	FG					0.1		FG		
Marsdenia viridiflora subsp. viridiflora	0.1	1	OG							0.1		
Cheilanthes sieberi	0.5	200	EG						0.5			
Solanum parvifolium subsp. parvifolium	1	200	SG			1						
Lysimachia arvensis	0.5	50	EX								0.5	
Sigesbeckia australiensis	0.1	50	FG					0.1				
Beyeria viscosa	0.5	5	SG			0.5						
Daucus glochidiatus	0.1	100	FG					0.1				
Sonchus oleraceus	0.1	30	EX								0.1	
Rytidosperma spp.	0.5	20	GG				0.5					
Phyllanthus virgatus	0.1	20	FG					0.1				
Arthropodium milleflorum	0.1	30	FG					0.1				
Parsonsia eucalyptophylla	0.5	50	OG							0.5		
Digitaria diffusa	1	200	GG				1					
Glycine tabacina	0.1	10	OG							0.1		
Oxalis perennans	0.2	100	FG					0.2				
Microlaena stipoides	2	500	GG				2					
Aristida personata	1	200	GG				1					
Cheilanthes distans	0.1	30	EG						0.1			
Pimelea neo-anglica	0.1	1	SG			0.1						
Conyza spp.	0.1	1	EX								0.1	
Geranium solanderi	0.1	50	FG					0.1				
Alstonia constricta	0.5	1	TG	0.5								
Oxytes brachypoda	0.1	10	FG					0.1				

Easting	225260
Northing	6612740
Orientation	323
Plot size	20 X 20 X 50
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	1
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Regen	Yes
Hollows	3
Length logs (m)	80
BAM Attributes 1x1 plot (%)	51

D13 Bog_NE_12

Date	21/08/2024		Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Plot Name	Bog-NE-12		# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
PCT	462		37	33	6	10	3	10	1	3	3	1
			Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	Cover	Abundance	56.7	56.2	26.1	19.7	7.1	2.4	0.2	0.7	0.4	0.1
Eucalyptus dwyeri	7	3	TG		7							
Callitris glaucophylla	3	4	TG		3							
Acacia cheelii	10	10	TG		10							
Alphitonia excelsa	1	20	TG		1							
Notelaea microcarpa	5	30	TG		5							
Geijera parviflora	2	5	SG			2						
Dodonaea viscosa subsp. angustifolia	15	200	SG			15				OG		
Gonocarpus elatus	0.5	200	FG					0.5				
Breynia oblongifolia	0.5	50	SG			0.5						
Aristida personata	5	200	GG				5					
Grona varians	0.5	30	OG							0.5		
Glycine clandestina	0.1	30	OG							0.1		
Microlaena stipoides	2	500	GG				2					
Solanum parvifolium subsp. parvifolium	0.5	50	SG			0.5						
Pimelea neo-anglica	0.5	15	SG			0.5						
Brachychiton populneus	0.1	1	TG		0.1							
Daucus glochidiatus	0.1	200	FG					0.1				
Geranium solanderi	0.1	200	FG					0.1				
Lysimachia arvensis	0.1	100	EX								0.1	
Conyza spp.	0.1	20	EX								0.1	
Marsdenia viridiflora subsp. viridiflora	0.1	20	OG							0.1		
Denhamia cunninghamii	0.5	5	SG			0.5						
Beyeria viscosa	0.2	1	SG			0.2						
Sonchus oleraceus	0.2	15	EX								0.2	
Dichondra sp. Inglewood	1	1000	FG					1				
Olearia elliptica subsp. elliptica	0.2	10	SG			0.2						
Ajuga australis	0.2	20	FG					0.2				
Cheilanthes sieberi	0.2	100	EG						0.2			
Senna aciphylla	0.1	1	SG			0.1						
Melichrus urceolatus	0.2	2	SG			0.2						
Scutellaria humilis	0.1	30	FG					0.1				
Arthropodium milleflorum	0.1	30	FG					0.1				
Pterostylis spp.	0.1	10	FG					0.1				
Dianella revoluta	0.1	1	FG					0.1				
Asteraceae spp.	0.1	10	FG					0.1				
Opuntia stricta	0.1	1	HT									0.1
Rytidosperma racemosum	0.1	10	GG				0.1					

Easting	225254
Northing	6612448
Orientation	207
Plot size	20 X 20 X 50
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	1
30-49	1
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Regen	Yes
Hollows	1
Length logs (m)	27
BAM Attributes 1x1 plot (%)	53

D14 Bog_NE_13

Date	22/08/2024		Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Plot Name	Bog-NE-13		# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
PCT	592		51	48	6	12	7	17	2	4	2	1
			Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	Cover	Abundance	55.4	54.1	24.1	19	4.5	5.6	0.4	0.5	1.2	0.1
Eucalyptus crebra	10	7	TG		10							
Callitris glaucophylla	5	3	TG		5							
Alphitonia excelsa	2	2	TG		2							
Acacia cheelii	5	4	TG		5							
Notelaea microcarpa	2	4	TG		2							
Geijera parviflora	1	1	SG			1						
Dodonaea viscosa subsp. angustissima	5	20	SG			5				SG		
Pimelea neo-anglica	0.5	10	SG			0.5						
Beyeria viscosa	10	40	SG			10						
Senna aciphylla	1	5	SG			1						
Acacia decora	0.5	2	SG			0.5						
Breynia oblongifolia	0.2	10	SG			0.2						
Amyema quandang	0.1	1	OG							0.1		
Gonocarpus elatus	2	1000	FG					2				
Geranium solanderi	1	1000	FG					1				
Melichrus urceolatus	0.2	5	SG			0.2						
Lysimachia arvensis	1	1000	EX								1	
Grona varians	0.2	200	OG							0.2		
Ajuga australis	0.1	50	FG					0.1				
Dichondra sp. Inglewood	1	1000	FG					1				
Daucus glochidiatus	0.2	500	FG					0.2				
Senecio phelleus	0.1	20	FG					0.1				
Hibbertia obtusifolia	0.1	1	SG			0.1						
Solanum parvifolium subsp. parvifoliu	0.2	100	SG			0.2						
Sonchus oleraceus	0.2	100	EX								0.2	
Scutellaria humilis	0.1	500	FG					0.1				
Microlaena stipoides	0.5	200	GG				0.5					
Arthropodium milleflorum	0.1	200	FG					0.1				
Aristida personata	2	200	GG				2					
Aristida ramosa	1	200	GG				1					
Austrostipa scabra	0.5	200	GG				0.5					
Cheilanthes sieberi	0.2	150	EG						0.2			
Cheilanthes distans	0.2	150	EG						0.2			
Einadia hastata	0.1	20	FG					0.1				
Lomandra multiflora subsp. multiflora	0.1	2	GG				0.1					
Glycine tabacina	0.1	50	OG							0.1		
Phyllanthus virgatus	0.1	30	FG					0.1				
Stackhousia viminea	0.1	5	FG					0.1				
Cyperus gracilis	0.2	50	GG				0.2					
Glycine clandestina	0.1	20	OG							0.1		
Chrysocephalum semipapposum	0.1	20	FG					0.1				
Rhagodia parabolica	0.1	1	SG			0.1						
Oxytes brachypoda	0.2	100	FG					0.2				
Olearia elliptica	0.2	10	SG			0.2						
Pterostylis mutica	0.1	50	FG					0.1				
Brachychiton populneus	0.1	1	TG		0.1							
Parietaria debilis	0.1	10	FG					0.1				
Hibiscus sturtii	0.1	5	FG					0.1				
Brunoniella australis	0.1	20	FG					0.1				
Opuntia stricta	0.1	5	HT									0.1
Digitaria diffusa	0.2	100	GG				0.2					

Easting	224932
Northing	6612370
Orientation	238
Plot size	20 X 20 X 50
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	0
30-49	8
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Regen	Yes
Hollows	3
Length logs (m)	58
BAM Attributes 1x1 plot (%)	63

D15 Bog_NE_14

Date	22/08/2024		Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Plot Name	Bog-NE-14		# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
PCT	592		38	36	5	9	5	14	1	2	1	1
			Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	Cover	Abundance	55.4	55.2	32.6	14.4	3.2	4.3	0.5	0.2	0.1	0.1
Eucalyptus crebra	15	7	TG		15							
Callitris glaucophylla	15	15	TG		15							
Notelaea microcarpa	2	2	TG		2							
Acacia cheelii	0.5	1	TG		0.5							
Exocarpos cupressiformis	0.5	1	SG			0.5						
Beyeria viscosa	5	30	SG			5						
Dodonaea viscosa subsp. angustifolia	3	40	SG			3						
Acacia decora	1	10	SG			1						
Melichrus urceolatus	0.2	5	SG			0.2						
Chrysocephalum semipapposum	1	200	FG					1				
Goodenia hederacea	2	1000	FG					2				
Caladenia spp.	0.1	20	FG					0.1				
Diuris spp.	0.1	2	FG					0.1				
Cymbidium canaliculatum	0.1	1	OG							0.1		
Pterostylis mutica	0.1	20	FG					0.1				
Pultenaea cuneata	4	30	SG			4						
Breynia oblongifolia	0.5	30	SG			0.5						
Austrostipa scabra subsp. scabra		30	GG				0					
Digitaria diffusa	0.5	200	GG				0.5					
Cheilanthes sieberi	0.5	300	EG						0.5			
Lomandra multiflora subsp. multiflora	0.5	20	GG				0.5					
Alphitonia excelsa	0.1	10	TG		0.1							
Aristida caput-medusae	2	100	GG				2					
Dianella revoluta	0.2	10	FG					0.2				
Pimelea neo-anglica	0.1	10	SG			0.1						
Solanum parvifolium subsp. parvifolium	0.1	50	SG			0.1						
Gonocarpus elatus	0.1	100	FG					0.1				
Einadia hastata	0.1	10	FG					0.1				
Sonchus oleraceus	0.1	20	EX								0.1	
Pomax umbellata	0.1	20	FG					0.1				
Glycine clandestina	0.1	10	OG							0.1		
Cyperus gracilis	0.2	100	GG				0.2					
Arthropodium milleflorum	0.1	30	FG					0.1				
Senecio phelleus	0.1	50	FG					0.1				
Daucus glochidiatus	0.1	200	FG					0.1				
Vernonia cinerea var. cinerea	0.1	30	FG					0.1				
Phyllanthus virgatus	0.1	20	FG					0.1				
Opuntia stricta	0.1	3	HT									0.1

Easting	225161
Northing	6612239
Orientation	51
Plot size	20 X 20 X 50
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	1
30-49	12
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Regen	Yes
Hollows	2
Length logs (m)	51
BAM Attributes 1x1 plot (%)	52

D16 Bog_NE_15

Date	22/08/2024		Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Plot Name	Bog-NE-15		# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
PCT	592		42	37	4	10	4	16	0	3	4	1
			Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	Cover	Abundance	51.6	51	28	13.7	4.5	4.5	0	0.3	0.5	0.1
Eucalyptus crebra	20	7	TG		20							
Acacia cheelii	3	4	TG		3							
Geijera parviflora	2	1	SG			2						
Notelaea microcarpa	3	10	TG		3							
Beyeria viscosa	4	15	SG			4						
Alphitonia excelsa	2	1	TG		2							
Pittosporum angustifolium	0.5	1	SG			0.5				FG		
Dodonaea viscosa subsp. angustifolia	3	40	SG			3						
Olearia elliptica	2	30	SG			2						
Pimelea neo-anglica	1	30	SG			1						
Oxytes brachypoda	1	300	FG					1				
Swainsona galegifolia	0.5	20	FG					0.5				
Sonchus oleraceus	0.1	10	EX								0.1	
Breynia oblongifolia	0.5	30	SG			0.5						
Dichondra sp. Inglewood	1	1000	FG					1				
Einadia hastata	0.2	30	FG					0.2				
Cyperus gracilis	1	500	GG				1					
Aristida personata	2	300	GG				2					
Senecio phelleus	0.1	30	FG					0.1				
Glycine clandestina	0.1	20	OG							0.1		
Ajuga australis	0.2	30	FG					0.2				
Rhagodia parabolica	0.3	1	SG			0.3						
Clematis microphylla	0.1	5	OG							0.1		
Rytidosperma racemosum	0.5	100	GG				0.5					
Geranium solanderi	0.2	200	FG					0.2				
Eremophila debilis	0.1	10	SG			0.1						
Gonocarpus elatus	0.2	200	FG					0.2				
Parsonsia eucalyptophylla	0.1	1	OG							0.1		
Scutellaria humilis	0.1	100	FG					0.1				
Solanum parvifolium subsp. parvifolium	0.3	100	SG			0.3						
Parietaria debilis	0.1	10	FG					0.1				
Pterostylis spp.	0.1	10	FG					0.1				
Opuntia stricta	0.1	1	HT									0.1
Oxalis perennans	0.1	20	FG					0.1				
Poa sieberiana	1	200	GG				1					
Gomphocarpus fruticosus	0.1	2	EX								0.1	
Hypochaeris glabra	0.2	50	EX								0.2	
Daucus glochidiatus	0.3	200	FG					0.3				
Lysimachia arvensis	0.1	20	EX								0.1	
Arthropodium milleflorum	0.2	200	FG					0.2				
Sigesbeckia australiensis	0.1	20	FG					0.1				
Vernonia cinerea var. cinerea	0.1	3	FG					0.1				

Easting	225793
Northing	6612656
Orientation	220
Plot size	20 X 20 X 50
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	2
30-49	7
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Regen	Yes
Hollows	3
Length logs (m)	65
BAM Attributes 1x1 plot (%)	45

D17 Bog_NE_16

Date	22/08/2024		Covers	Native	Trees	Shrubs	Grass	Forb	Fern	Other	Exotic	HighThreat
Plot Name	Bog-NE-16		# spp	Count	Count	Count	Count	Count	Count	Count	Count	Count
PCT	592		42	39	6	10	5	12	2	4	2	1
			Sum cover	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species	Cover	Abundance	65.3	65	28.2	13.5	17.8	4.3	0.3	0.9	0.2	0.1
Eucalyptus crebra	15	8	TG		15							
Eucalyptus albens	3	1	TG		3							
Callitris glaucophylla	4	2	TG		4							
Acacia cheelii	1	1	TG		1							
Geijera parviflora	5	3	SG			5						
Notelaea microcarpa	5	40	TG		5							
Dodonaea viscosa subsp. angustifolia	3	30	SG			3				FG		
Brachychiton populneus	0.2	1	TG		0.2							
Beyeria viscosa	3	5	SG			3						
Pimelea neo-anglica	0.5	15	SG			0.5						
Oxytes brachypoda	1	50	FG					1				
Dichondra sp. Inglewood	1	1000	FG					1				
Olearia elliptica	1	15	SG			1						
Aristida ramosa	15	500	GG				15					
Sida cunninghamii	0.1	20	FG					0.1				
Hypochaeris glabra	0.1	50	EX								0.1	
Pterostylis spp.	0.5	200	FG					0.5				
Brunoniella australis	0.1	30	FG					0.1				
Daucus glochidiatus	0.3	200	FG					0.3				
Glycine tabacina	0.2	50	OG							0.2		
Lomandra multiflora subsp. multiflora	0.3	10	GG				0.3					
Geranium solanderi	0.1	150	FG					0.1				
Solanum parvifolium subsp. parvifolium	0.3	50	SG			0.3						
Cyperus gracilis	0.5	100	GG				0.5					
Pomaderris spp.	0.1	1	SG			0.1						
Gonocarpus elatus	0.1	100	FG					0.1				
Scutellaria humilis	0.3	500	FG					0.3				
Parietaria debilis	0.2	200	FG					0.2				
Breynia oblongifolia	0.3	20	SG			0.3						
Murdannia graminea	0.5	80	FG					0.5				
Grona varians	0.5	100	OG							0.5		
Swainsona galegifolia	0.1	10	FG					0.1				
Cheilanthes sieberi	0.2	100	EG						0.2			
Glycine clandestina	0.1	20	OG							0.1		
Cheilanthes distans	0.1	20	EG						0.1			
Persoonia sericea	0.1	2	SG			0.1						
Poa sieberiana	1	200	GG				1					
Austrostipa scabra	1	200	GG				1					
Hypochaeris radicata	0.1	1	EX								0.1	
Rhagodia parabolica	0.2	1	SG			0.2						
Clematis microphylla	0.1	10	OG							0.1		
Opuntia stricta	0.1	1	HT									0.1

Easting	225920
Northing	6612808
Orientation	266
Plot size	20 X 20 X 50
BAM Attributes 20x50m plot	
Stem classes	
80+	0
50-79	5
30-49	7
20-29	Yes
10-19	Yes
5-9	Yes
<5	Yes
Regen	Yes
Hollows	5
Length logs (m)	51
BAM Attributes 1x1 plot (%)	62

Appendix E

Fauna survey results

E1 Fauna survey results

Table E.1 Fauna species list

Survey Method	Common name	Scientific name
Anabat (passive)	Chocolate Wattle Bat	*Chalinolobus morio*
	Eastern Cave Bat	***Vespadelus troughtoni*** [TS]
	Yellow-bellied Sheathtail-bat	***Saccolaimus flaviventris*** [TS]
	Peter's Freetail Bat	*Ozimops petersi*
	Gould's Wattle Bat	*Chalinolobus gouldii*
	Ride's Freetail Bat	*Ozimops ridei*
	Inland Broad-nosed Bat	*Scotorepens balstoni*
	Little Broad-nosed Bat	*Scotorepens greyii*
	Southern Freetail Bat	*Ozimops planiceps*
	Large Bent-wing Bat	***Miniopterus orianae oceanensis*** [TS]
	Large Forest Bat	*Vespadelus darlingtoni*
	Little Forest Bat	*Vespadelus vulturnus*
	White-striped Freetail-bat	*Austronomus australis*
	Long-eared Bat	*Nyctophilus species*
Auditory survey/ stag watching	Australian Owlet-nightjar	*Aegotheles cristatus*
	Broad-palmed Rocket Frog	*Litoria latopalmata*
	Eastern Koel	*Eudynamys orientalis*
	Eastern Yellow Robin	*Eopsaltria australis*
	Green Tree Frog	*Litoria caerulea*
	Krefft's Glider	*Petaurus notatus*
	Little Red Tree Frog	*Litoria rubella*
	Spotted Marsh Frog	*Limnodynastes tasmaniensis*
	Southern Boobook	*Ninox boobook*
	Tawny Frogmouth	*Podargus strigoides*
	White-throated Nightjar	*Eurostopodus mystacalis*
Diurnal bird survey	Australian King-Parrot	*Alisterus scapularis*
	Australian Owlet-nightjar	*Aegotheles cristatus*
	Australian Raven	*Corvus coronoides*
	Bar-shouldered Dove	*Geopelia humeralis*

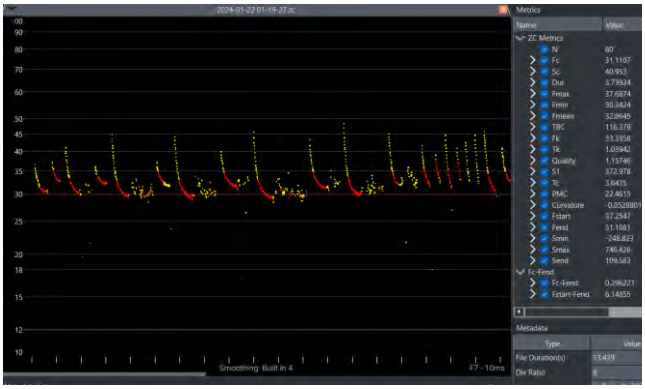
Survey Method	Common name	Scientific name
	Black-faced Cuckoo-shrike	*Coracina novaehollandiae*
	Brown Quail	*Coturnix ypsilophora*
	Brown-headed Honeyeater	*Melithreptus brevirostris*
	Buff-rumped Thornbill	*Acanthiza reguloides*
	Chestnut-rumped Thornbill	*Acanthiza uropygialis*
	Common Bronzewing	*Phaps chalcoptera*
	Double-barred Finch	*Taeniopygia bichenovii*
	Dollarbird	*Eurystomus orientalis*
	Dusky Woodswallow	***Artamus cyanopterus cyanopterus*** [TS]
	Eastern Koel	*Eudynamys orientalis*
	Eastern Rosella	*Platycercus eximius*
	Eastern Yellow Robin	*Eopsaltria australis*
	Fan-tailed Cuckoo	*Cacomantis flabelliformis*
	Fuscous Honeyeater	*Lichenostomus fuscus*
	Galah	*Eolophus roseicapilla*
	Golden Whistler	*Pachycephala pectoralis*
	Grey Butcherbird	*Cracticus torquatus*
	Grey Fantail	*Rhipidura albiscapa*
	Grey Shrike-thrush	*Colluricincla harmonica*
	Inland Thornbill	*Acanthiza apicalis*
	Laughing Kookaburra	*Dacelo novaeguineae*
	Leaden Flycatcher	*Myiagra rubecula*
	Little Eagle	***Hieraaetus morphnoides*** [TS]
	Little Friarbird	*Philemon citreogularis*
	Little Lorikeet	***Glossopsitta pusilla*** [TS]
	Masked Woodswallow	*Artamus personatus*
	Mistletoebird	*Dicaeum hirundinaceum*
	Musk Lorikeet	*Glossopsitta concinna*
	Noisy Friarbird	*Philemon corniculatus*
	Olive-backed Oriole	*Oriolus sagittatus*
	Painted Button-quail	*Turnix varius*
	Pied Currawong	*Strepera graculina*
	Rainbow Bee-eater	*Merops ornatus*

Survey Method	Common name	Scientific name
	Red-capped Robin	*Petroica goodenovii*
	Restless Flycatcher	*Myiagra inquieta*
	Rufous Whistler	*Pachycephala rufiventris*
	Sacred Kingfisher	*Todiramphus sanctus*
	Shining Bronze-Cuckoo	*Chrysococcyx lucidus*
	Silvereye	*Zosterops lateralis*
	Speckled Warbler	***Pyrrholaemus sagittatus*** [TS]
	Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*
	Southern Boobook	*Ninox boobook*
	Spotted Pardalote	*Pardalotus punctatus*
	Striated Pardalote	*Pardalotus striatus*
	Striped Honeyeater	*Plectorhyncha lanceolata*
	Superb Fairy-wren	*Malurus cyaneus*
	Tawny Frogmouth	*Podargus strigoides*
	Turquoise Parrot	***Neophema pulchella*** [TS]
	Varied Sittella	***Daphoenositta chrysoptera*** [TS]
	Variegated Fairy-wren	*Malurus lamberti*
	Wedge-tailed Eagle	*Aquila audax*
	Weebill	*Smicrornis brevirostris*
	Western Gerygone	*Gerygone fusca*
	White-bellied Cuckoo-shrike	*Coracina papuensis*
	White-browed Babbler	*Pomatostomus superciliosus*
	White-browed Scrubwren	*Sericornis frontalis*
	White-browed Woodswallow	*Artamus superciliosus*
	White-eared Honeyeater	*Lichenostomus leucotis*
	White-plumed Honeyeater	*Lichenostomus penicillatus*
	White-throated Gerygone	*Gerygone albogularis*
	White-throated Nightjar	*Eurostopodus mystacalis*
	White-throated Treecreeper	*Cormobates leucophaea*
	White-winged Triller	*Lalage sueurii*
	Willie Wagtail	*Rhipidura leucophrys*
	Yellow Thornbill	*Acanthiza nana*

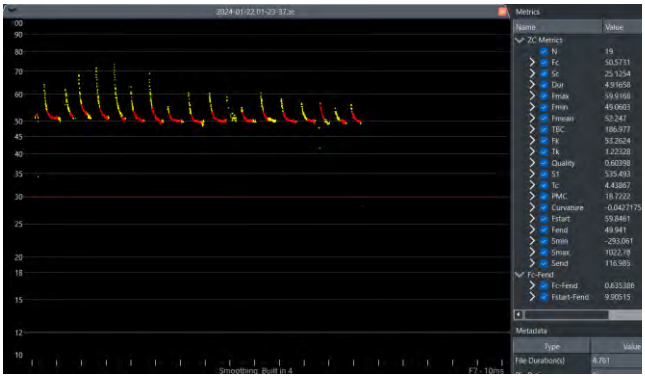
Survey Method	Common name	Scientific name
Camera trap	Black Rat	*Rattus rattus*
	Common Brushtail Possum	*Trichosurus vulpecula*
	Common Wallaroo	*Osphranter robustus*
	Eastern Grey Kangaroo	*Macropus giganteus*
	Eastern Yellow Robin	*Eopsaltria australis*
	Goat	*Capra hircus*
	Grey Shrike-thrush	*Colluricincla harmonica*
	Krefft's Glider	*Petaurus notatus*
	Lace Monitor	*Varanus varius*
	Pig	*Sus scrofa*
	Wall Skink	*Cryptoblepharus* sp.
	White-throated Treecreeper	*Cormobates leucophaea*
Harp trap	**Corben's Long-eared Bat**	***Nyctophilus corbeni*** ^{TS}
	Gould's Long-eared Bat	*Nyctophilus gouldii*
	Gould's Wattled Bat	*Chalinolobus gouldii*
	Inland Broad-nosed Bat	*Scotorepens balstoni*
	Lesser Long-eared Bat	*Nyctophilus geoffroyi*
	Little Broad-nosed Bat	*Scotorepens greyii*
	Little Forest Bat	*Vespadelus vulturnus*
Opportunistic survey	Common Wallaroo	*Osphranter robustus*
	Eastern Grey Kangaroo	*Macropus giganteus*
	Fox	*Vulpes vulpes*
	Goat	*Capra hircus*
	Pig	*Sus scrofa*
	Red-necked Wallaby	*Notamacropus rufogriseus*
	Swamp Wallaby	*Wallabia bicolor bicolor*
Reptile survey	Bougainville's Slider	*Lerista bougainvillii*
	Boulenger's Morethia	*Morethia boulengeri*
	Burns' Dragon	*Amphibolurus burnsi*
	Bynoe's Gecko	*Heteronotia binoei*
	Tree-base Litter Skink	*Lygisaurus foliorum*
	Yellow-faced Whipsnake	*Demansia psammophis*

Survey Method	Common name	Scientific name
Spotlighting	Australian Owlet-nightjar	*Aegotheles cristatus*
	Bynoe's Gecko	*Heteronotia binoei*
	Common Brushtail possum	*Trichosurus vulpecula*
	Dubious Dtella	*Gehyra dubia*
	Eastern Yellow Robin	*Eopsaltria australis*
	Krefft's Glider	*Petaurus notatus*
	Pied Currawong	*Strepera graculina*
	Red-necked Wallaby	*Notamacropus rufogriseus*
	Robust Velvet Gecko	*Amalosia robusta*
	Sacred Kingfisher	*Todiramphus sanctus*
	Short-beaked Echidna	*Tachyglossus aculeatus*
	Southern Boobook	*Ninox boobook*
	Spotted Black Snake	*Pseudechis guttatus*
	Tawny Frogmouth	*Podargus strigoides*
	Thick-tailed Gecko	*Underwoodisaurus milii*
	Tree Skink	*Egernia striolata*
	Tree-base Litter-skink	*Lygisaurus foliorum*
	Variable Dtella	*Gehyra versicolor*
	White-striped Freetail-bat	*Austronomus australis*
	White-throated Nightjar	*Eurostopodus mystacalis*
	Willie Wagtail	*Rhipidura leucophrys*
	Yellow-footed Antechinus	*Antechinus flavipes*

E2 Echolocation call sequences



An example of Gould's Wattled Bat (*Chalinolobus gouldii*) recorded in the subject land



An example of Chocolate Wattled Bat (*Chalinolobus morio*) recorded in the subject land



An example of Eastern Bent-winged Bat (*Miniopterus orianae oceanensis*) recorded in the subject land



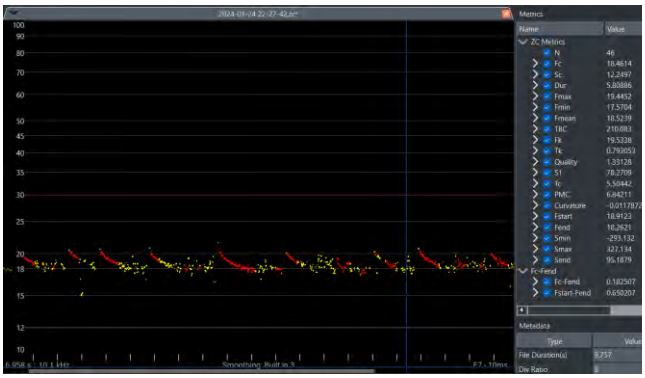
An example of Inland Free-tailed Bat (*Ozimops petersi*) recorded in the subject land



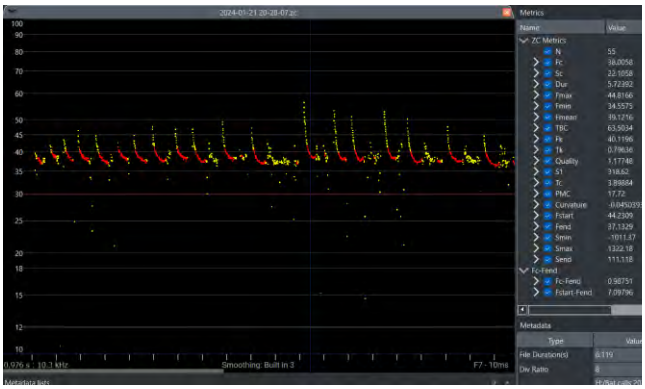
An example of South-eastern Free-tailed Bat (*Ozimops planiceps*) recorded in the subject land



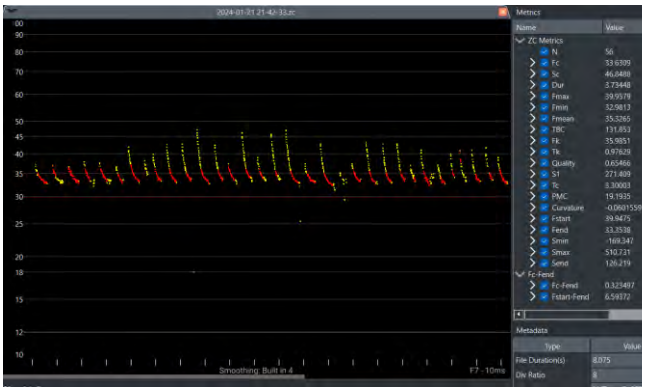
An example of Ride's Free-tailed Bat (*Ozimops ridei*) recorded in the subject land



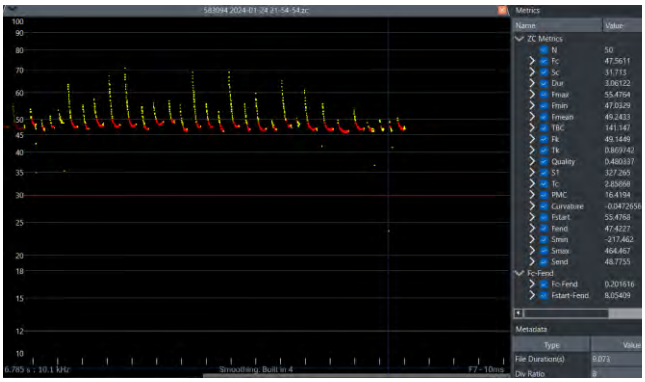
An example of Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) recorded in the subject land



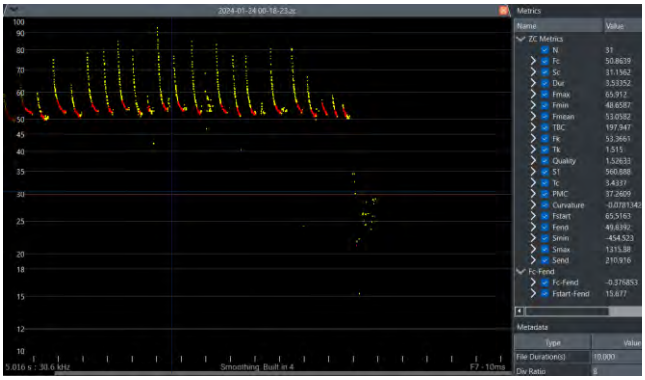
An example of Little Broad-nosed Bat (*Scotorepens greyii*) recorded in the subject land



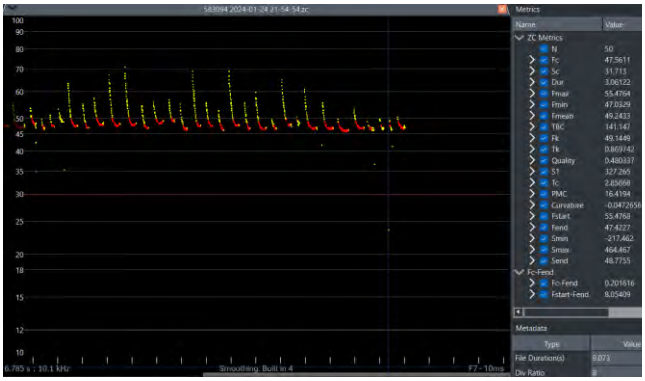
An example of Inland Broad-nosed Bat (*Scotorepens balstoni*) recorded in the subject land



An example of Large Forest Bat (*Vespadelus darlingtoni*) recorded in the subject land



An example of Eastern Cave Bat (*Vespadelus troughtoni*) recorded in the subject land



An example of Little Forest Bat (*Vespadelus vulturnus*) recorded in the subject land

Appendix F

Credit reports



BAM Credit Summary Report

Proposal Details

Assessment Id
00045469/BAAS18187/25/00057819

Proposal Name
Boggabri Mod 10

BAM data last updated *
28/10/2024

Assessor Name
Deborah Landenberger

Report Created
29/05/2025

BAM Data version *
Current classification (live - default) (80)

Assessor Number
BAAS18187

BAM Case Status
Finalised

Date Finalised
29/05/2025

Assessment Revision
1

Assessment Type
Major Projects

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

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

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

Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion												
1	462_High	Not a TEC	64.3	64.3	16.4	PCT Cleared - 40%	High Sensitivity to Gain			1.50		394
											Subtotal	**394**
Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion												
5	531_High	Not a TEC	62.7	62.7	7.3	PCT Cleared - 20%	High Sensitivity to Gain			1.50		172
											Subtotal	**172**
Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion												
3	592_High	Not a TEC	78.1	78.1	51.5	PCT Cleared - 52%	Low Sensitivity to Gain			1.25		1258
											Subtotal	**1258**
Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion												
4	594_High	Not a TEC	59.3	59.3	5.7	PCT Cleared - 53%	High Sensitivity to Gain			1.75		148
											Subtotal	**148**

White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion												
2	588_High	Not a TEC	63.1	63.1	3.6	PCT Cleared - 67%	Low Sensitivity to Gain			1.25		71
											Subtotal	**71**
											Total	**2043**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Hoplocephalus bitorquatus / Pale-headed Snake (Fauna)									
462_High	64.3	64.3	16.4	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	525
588_High	63.1	63.1	3.6	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	113
592_High	78.1	78.1	51.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	2012

594_High	59.3	59.3	5.7	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	169
531_High	62.7	62.7	7.3	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	229
								Subtotal	**3048**
Petaurus norfolcensis / Squirrel Glider (Fauna)									
462_High	64.3	64.3	16.4	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	525
588_High	63.1	63.1	3.6	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	113
592_High	78.1	78.1	51.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	2012
594_High	59.3	59.3	5.7	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	169

531_High	62.7	62.7	7.3	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	229
								Subtotal	**3048**
Phascolarctos cinereus / Koala (Fauna)									
462_High	64.3	64.3	16.4	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	525
588_High	63.1	63.1	3.6	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	113
592_High	78.1	78.1	51.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	2012
594_High	59.3	59.3	5.7	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	169

531_High	62.7	62.7	7.3	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	229
								Subtotal	**3048**
Pomaderris queenslandica / Scant Pomaderris (Flora)									
592_High	78.1	78.1	0.5	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Endangered	Not Listed	False	20
								Subtotal	**20**
Tylophora linearis / Tylophora linearis (Flora)									
592_High	78.1	78.1	0.61	Biodiversity Conservation Act listing status	Quantity class of viable seeds produced	Vulnerable	Endangered	False	24
531_High	62.7	62.7	0.68	Biodiversity Conservation Act listing status	Quantity class of viable seeds produced	Vulnerable	Endangered	False	21
								Subtotal	**45**

BAM Candidate Species Report

Proposal Details

Assessment Id 00045469/BAAS18187/25/00057819	Proposal Name Boggabri Mod 10	BAM data last updated * 28/10/2024
Assessor Name Deborah Landenberger	Report Created 29/05/2025	BAM Data version * Current classification (live - default) (80)
Assessor Number BAAS18187	Assessment Type Major Projects	BAM Case Status Finalised
Assessment Revision 1		Date Finalised 29/05/2025

* 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.

List of Species Requiring Survey

Name	Presence	Survey Months
Aepyprymnus rufescens Rufous Bettong	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Aprasia parapulchella Pink-tailed Legless Lizard	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Cercartetus nanus Eastern Pygmy-possum	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Cyperus conicus Cyperus conicus	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Dichanthium setosum Bluegrass	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Diuris tricolor Pine Donkey Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Haliaeetus leucogaster White-bellied Sea-Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Hieraaetus morphnoides Little Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☑ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Hoplocephalus bitorquatus Pale-headed Snake	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Lophoictinia isura Square-tailed Kite	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Monotaxis macrophylla Large-leafed Monotaxis	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Ninox connivens Barking Owl	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Petaurus norfolcensis Squirrel Glider	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Polygala linariifolia Native Milkwort	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Pomaderris queenslandica Scant Pomaderris	Yes (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Thesium australe Austral Toadflax	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tylophora linearis Tylophora linearis	Yes (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tyto novaehollandiae Masked Owl	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Uvidicolus sphyrurus Border Thick-tailed Gecko	No (surveyed)	☑ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

BAM Candidate Species Report

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Brush-tailed Rock-wallaby	Petrogale penicillata	Habitat constraints
Eastern Cave Bat	Vespadelus troughtoni	Habitat constraints
Grey-headed Flying-fox	Pteropus poliocephalus	Habitat constraints
Large-eared Pied Bat	Chalinolobus dwyeri	Habitat constraints
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Swift Parrot	Lathamus discolor	Habitat constraints

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00045469/BAAS18187/25/00057819	Boggabri Mod 10	28/10/2024
Assessor Name	**Report Created**	**BAM Data version ***
Deborah Landenberger	29/05/2025	Current classification (live - default) (80)
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS18187	Major Projects	Finalised
Assessment Revision		**Date Finalised**
1		29/05/2025

* 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.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Black Falcon	Falco subniger	592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Black-striped Wallaby	Macropus dorsalis	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion

Black-striped Wallaby	Macropus dorsalis	531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Corben's Long-eared Bat	Nyctophilus corbeni	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Diamond Firetail	Stagonopleura guttata	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion

Diamond Firetail	Stagonopleura guttata	594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Flame Robin	Petroica phoenicea	592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Grey-headed Flying-fox	Pteropus poliocephalus	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion

Little Eagle	Hieraaetus morphnoides	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Little Lorikeet	Glossopsitta pusilla	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Little Pied Bat	Chalinolobus picatus	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion

Little Pied Bat	Chalinolobus picatus	531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Painted Honeyeater	Grantiella picta	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Pilliga Mouse	Pseudomys pilligaensis	592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
Regent Honeyeater	Anthochaera phrygia	588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
Scarlet Robin	Petroica boodang	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion

Scarlet Robin	Petroica boodang	594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
South-eastern Hooded Robin	Melanodryas cucullata cucullata	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Southern Whiteface	Aphelocephala leucopsis	588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
Speckled Warbler	Chthonicola sagittata	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Spotted Harrier	Circus assimilis	588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion

Spotted Harrier	Circus assimilis	592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Square-tailed Kite	Lophoictinia isura	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Swift Parrot	Lathamus discolor	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion

Swift Parrot	Lathamus discolor	588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Turquoise Parrot	Neophema pulchella	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Varied Sittella	Daphoenositta chrysoptera	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
White-bellied Sea-Eagle	Haliaeetus leucogaster	588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion

White-bellied Sea-Eagle	Haliaeetus leucogaster	592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
White-throated Needletail	Hirundapus caudacutus	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion

Threatened species Manually Added

None added

BAM Predicted Species Report

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
South-eastern Glossy Black-Cockatoo	Calyptorhynchus lathami lathami	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
		531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion
Yellow-bellied Glider	Petaurus australis	462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion
		588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion
		592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion
		594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
South-eastern Glossy Black-Cockatoo	Calyptorhynchus lathami lathami	Habitat constraints
Yellow-bellied Glider	Petaurus australis	Refer to BAR

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00045469/BAAS18187/25/00057819

Proposal Name
Boggabri Mod 10

BAM data last updated *
28/10/2024

Assessor Name
Deborah Landenberger

Assessor Number
BAAS18187

BAM Data version *
Current classification (live - default) (80)

Proponent Names

Report Created
29/05/2025

BAM Case Status
Finalised

Assessment Revision
1

Assessment Type
Major Projects

Date Finalised
29/05/2025

* 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
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami lathami / South-eastern Glossy Black-Cockatoo
Petaurus australis / Yellow-bellied Glider

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

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion	Not a TEC	16.4	394	0	394
588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion	Not a TEC	3.6	71	0	71
592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion	Not a TEC	51.5	1258	0	1258
594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion	Not a TEC	5.7	148	0	148
531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion	Not a TEC	7.3	172	0	172

462-Dwyer's Red Gum - White Cypress Pine - Motherumbah open forest / woodland on sandstone hillcrests in the Liverpool Plains region, Brigalow Belt South Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Western Slopes Dry Sclerophyll Forests This includes PCT's: 54, 110, 179, 217, 243, 255, 270, 273, 287, 291,	Western Slopes Dry Sclerophyll Forests <50%	462_High	Yes	394	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or

	309, 321, 322, 323, 324, 325, 327, 330, 331, 333, 341, 343, 346, 348, 354, 358, 379, 387, 396, 398, 399, 401, 402, 403, 404, 405, 406, 407, 408, 409, 414, 415, 417, 419, 420, 423, 425, 430, 431, 440, 443, 449, 455, 456, 457, 459, 462, 463, 467, 468, 469, 470, 471, 472, 473, 476, 477, 478, 479, 480, 482, 515, 531, 532, 576, 577, 581, 592, 610, 617, 671, 673, 676, 712, 713, 714, 746, 863, 889, 940, 956, 1133, 1176, 1277, 1278, 1279, 1307, 1313, 1314, 1316, 1381, 1610, 1654, 1655, 1656, 1660, 1661, 1663, 1668, 1669, 1671, 1672, 1674, 1676, 1679, 1709, 1711, 1770, 1771, 3753, 3754, 3756, 3757, 3758, 3759, 3760, 3761, 3762, 3763, 3766, 3767, 3768, 3769, 3770,					Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	3771, 3772, 3773, 3774, 3775, 3776, 3777, 3778, 3780, 3781, 3782, 3783, 3784, 3785, 3786, 4153					
531-Narrow-leaved Ironbark - Black Cypress Pine - Motherumbah woodland in the Kaputar area in the Nandewar Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Western Slopes Dry Sclerophyll Forests This includes PCT's: 54, 110, 179, 217, 243, 255, 270, 273, 287, 291, 309, 321, 322, 323, 324, 325, 327, 330, 331, 333, 341, 343, 346, 348, 354, 358, 379, 387, 396, 398, 399, 401, 402, 403, 404, 405, 406, 407, 408, 409, 414, 415, 417, 419, 420, 423, 425, 430, 431, 440, 443, 449, 455, 456, 457, 459, 462, 463, 467, 468, 469, 470, 471, 472, 473, 476, 477, 478, 479, 480,	Western Slopes Dry Sclerophyll Forests <50%	531_High	Yes	172	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	482, 515, 531, 532, 576, 577, 581, 592, 610, 617, 671, 673, 676, 712, 713, 714, 746, 863, 889, 940, 956, 1133, 1176, 1277, 1278, 1279, 1307, 1313, 1314, 1316, 1381, 1610, 1654, 1655, 1656, 1660, 1661, 1663, 1668, 1669, 1671, 1672, 1674, 1676, 1679, 1709, 1711, 1770, 1771, 3753, 3754, 3756, 3757, 3758, 3759, 3760, 3761, 3762, 3763, 3766, 3767, 3768, 3769, 3770, 3771, 3772, 3773, 3774, 3775, 3776, 3777, 3778, 3780, 3781, 3782, 3783, 3784, 3785, 3786, 4153					
588-White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	North-west Slopes Dry Sclerophyll Woodlands This includes PCT's: 228, 429, 435, 517, 527, 529, 564, 588, 594, 595, 597, 598, 856, 1165, 1306, 1308, 1317, 1387, 1586, 1607, 3511, 3512, 3514, 3515, 3517, 3518, 3521, 3522, 3523, 3525, 3528, 3530, 3532, 4148, 4149, 4150	North-west Slopes Dry Sclerophyll Woodlands >=50% and <70%	588_High	Yes	71	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
592-Narrow-leaved Ironbark - cypress pine - White Box shrubby open forestin the Brigalow Belt South Bioregion and Nandewar Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	Western Slopes Dry Sclerophyll Forests This includes PCT's: 54, 110, 217, 255, 273, 287, 330, 333, 341, 343, 346, 348, 358, 403, 455, 456, 472, 577, 581, 592, 617, 673, 676, 713, 940, 956, 1277, 1279, 1313, 1316, 1381, 1610, 1661, 1668, 1709, 3753, 3754, 3756, 3768, 3769, 4153	Western Slopes Dry Sclerophyll Forests >=50% and <70%	592_High	Yes	1258	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
594-Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	North-west Slopes Dry Sclerophyll Woodlands This includes PCT's: 228, 429, 435, 517, 527, 529, 564, 588, 594, 595, 597, 598, 856, 1165, 1306, 1308, 1317, 1387, 1586, 1607, 3511, 3512, 3514, 3515, 3517, 3518, 3521, 3522, 3523, 3525, 3528, 3530, 3532, 4148, 4149, 4150	North-west Slopes Dry Sclerophyll Woodlands >=50% and <70%	594_High	Yes	148	Liverpool Plains, Castlereagh-Barwon, Kaputar, Liverpool Range, Northern Basalts, Northern Outwash, Peel, Pilliga and Pilliga Outwash. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Hoplocephalus bitorquatus / Pale-headed Snake	**462_High, 588_High, 592_High, 594_High, 531_High**	84.5	3048.00
Petaurus norfolcensis / Squirrel Glider	**462_High, 588_High, 592_High, 594_High, 531_High**	84.5	3048.00

Phascolarctos cinereus / Koala	**462_High, 588_High, 592_High, 594_High, 531_High**	84.5	3048.00
Pomaderris queenslandica / Scant Pomaderris	**592_High**	0.5	20.00
Tylophora linearis / Tylophora linearis	**592_High, 531_High**	1.3	45.00

Credit Retirement Options

Like-for-like credit retirement options

Hoplocephalus bitorquatus / Pale-headed Snake	Spp	IBRA subregion
	Hoplocephalus bitorquatus / Pale-headed Snake	Any in NSW
Petaurus norfolcensis / Squirrel Glider	Spp	IBRA subregion
	Petaurus norfolcensis / Squirrel Glider	Any in NSW
Phascolarctos cinereus / Koala	Spp	IBRA subregion
	Phascolarctos cinereus / Koala	Any in NSW
Pomaderris queenslandica / Scant Pomaderris	Spp	IBRA subregion
	Pomaderris queenslandica / Scant Pomaderris	Any in NSW
Tylophora linearis / Tylophora linearis	Spp	IBRA subregion

	Tylophora linearis / Tylophora linearis	Any in NSW

Appendix G

Correspondence Royal Botanical Gardens

BOTANIC GARDENS OF SYDNEY

National Herbarium of New South Wales

Nicholas EVERITT
WSP
L3, 55 Bolton St
Newcastle, NSW 2300

BIS Enquiry No: 22757
Botanical.Is@botanicgardens.nsw.gov.au
Ph. No: (02) 4631 5135
Date: 18 December 2024

Dear Nicholas,

Re: specimen from Leard State Forest, Boggabri

Thank you for your enquiry of 13-Sep-24. We are happy to provide the following information:

Pomaderris queenslandica det. SF McCune 17 Dec 2024

In future please pack specimens between cardboard to provide protection. Your specimen was quite fragmented when it arrived. This material has not been retained for the Herbarium collection.

Thank you for your patience. We are currently dealing with a large backlog of enquiries.

Yours sincerely,



Seanna McCune
Identification Senior Technical Officer
Botanical Identification Service

Our ref: PS110297-ECO-LTR-001 RevA

18 April 2018

Barbara Wiecek
Royal Botanic Gardens
Mrs Macquarie Road
SYDNEY NSW 2001

Dear Barbara,

Identification of plant samples

If you could kindly identify the following enclosed plant sample:

Query *Tylophora linearis*? (-30°35'29.61"S 150°07'40.54"E)

- – Occurred in Leard State Forest within Narrow-leaved Ironbark – Cypress Pine – White Box Shrubby open forest in association with the following species: *Eucalyptus crebra, Eucalyptus dweryi, Callitris glaucophylla, Beyeria viscosa, Notelaea microcarpa var. microcarpa, Solanum parvifolium, Dodonaea viscosa subsp. angustifolia, Olearia eliptica, Austrostipa scabra, Rytidosperma racemosum var. obtusatum* and *Desmodium brachypodium*.
- Occurred as a small herbaceous plant either short and erect (to 20 cm tall) or medium in height (to 1 m) with a climbing nature attached to live/dead shrubs.
- Occurred on loamy soils derived from volcanic substrates on midslopes generally facing a south easterly direction.
- No fertile material was available at time of collecting the sample.

Yours sincerely



Tanta Bangel
Senior Ecologist

Level 3, 51-55 Bolton St
Newcastle NSW 2300
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Newcastle NSW 2300

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Fax: +61 2 4929 8382
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The Royal
BOTANIC GARDENS
& Domain Trust

National Herbarium of New South Wales

Tanya BANGEL
WSP
PO Box 1162
Newcastle, NSW 2300

Enquiry No: 20771
Botanical.Is@rbgsyd.nsw.gov.au
Fax No: (02) 9251 1952
Ph. No: (02) 9231 8111
Date: 10 October 2018

Dear Tanya BANGEL,

Thank you for your enquiry of 10-Oct-18. We are happy to provide the following information:

Tylophora linearis conf. B.M. Wiecek 10 Oct 2018, thank you for trying for fertile material. I know it is hard at the moment.

An invoice for $45.50 (incl. GST) will be forwarded to you separately by our finance section to cover cost of identification.

Thank you for your enquiry.

Yours sincerely

Barbara Wiecek
Identification Botanist
Botanical Information Service

About Us

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