umwelt
Environmental & Social Consultants

lightsource bp

GOULBURN RIVER SOLAR FARM

Public Road and Culvert Upgrade
Biodiversity Development Assessment Report

FINAL

May 2023

Goulburn River Solar Farm

Public Road and Culvert Upgrade
Biodiversity Development Assessment Report

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Lightsource bp

Project Director: Malinda Facey
Project Manager: Jessica Henderson-Wilson
Technical Director: Rachel Musgrave
Technical Manager: Jacob Manners
Report No. 21507/R20
Date: May 2023

This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
V0 Draft	Alison Riley	15 December 2022	Alison Riley	15 December 2022
V1 Final	Rachel Musgrave	24 April 2023	Rachel Musgrave	24 April 2023

Executive Summary

Umwelt (Australia) Pty Ltd (Umwelt) has been engaged by Lightsource Development Services Australia Pty Ltd (Lightsource bp), the Proponent, to prepare this Biodiversity Development Assessment Report (BDAR) to support the Environmental Impact Statement (EIS) for the proposed public road and culvert upgrade works (the proposed works) associated with the Goulburn River Solar Farm (the Project). A separate BDAR has been prepared for the Solar Farm component of the Project.

This BDAR has been prepared by Umwelt in accordance with the Biodiversity Assessment Method (BAM).

Surveys identified one Plant Community Type (PCT) which will be impacted by the proposed works assessed within this Report:

- PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley.

A total of 4.84 hectares (ha) of PCT 483 would be impacted as part of the proposed work, comprised of the following:

- 0.09 ha of PCT 483 – Condition Zone 1: Remnant Woodland.
- 4.75 ha of PCT 483 – Condition Zone 2: Exotic dominated grassland.

No threatened flora or fauna species were identified within the road upgrade footprint.

Following the application of avoidance and mitigation measures, the following biodiversity credits are required to offset the impacts of the proposed road upgrade works:

Entity	Credits Required
PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	3 Credits

Declarations

i. Certification under clause 6.15 Biodiversity Conservation Act 2016

I certify that this report has been prepared, to the best of my knowledge, based on the requirements of, and information provided under, the Biodiversity Assessment Method (2020) and clause 6.15 of the *Biodiversity Conservation Act 2016* (BC Act).

Name: Jacob Manners

Signature: 

Date: 3 May 2023

BAM Assessor Accreditation no: BAAS17099

Glossary

Term	Definition
Assessment Area	Includes the Development Footprint and the area of land within the 1500 m buffer zone surrounding the Development Footprint (or 500 m buffer zone for linear proposals) that is determined as per Subsection 3.1.2 of the BAM.
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BCD	Biodiversity and Conservation Division of NSW Department of Planning and Environment
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offsets Scheme
CEEC	critically endangered ecological community
CEMP	Construction Environmental Management Plan
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment, and Water
Development Footprint	The area of land that is directly impacted by a proposed development.
Development Site	An area of land that is subject to a proposed development under the EP&A Act, including areas which will be retained and impacted by the proposal (synonymous with Development Footprint).
DBH	diameter at breast height over bark
DPE	NSW Department of Planning and Environment
DPIE	NSW Department of Planning, Industry, and Environment (superseded)
EC	ecological community listed under the EPBC Act
EIS	Environmental Impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EEC	endangered ecological community
FM Act	*Fisheries Management Act 1994* (NSW)
GIS	Geographic Information System
GPS	Global Positioning System
HTW	high threat weed
IBRA	Interim Biogeographic Regionalisation for Australia
km	kilometres

Term	Definition
LGA	Local Government Area
LLS Act	*Local Land Services Act 2013* (NSW)
m	metres
mm	millimetres
MNES	Matters of National Environmental Significance
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NSW	New South Wales
NVR Map	Native Vegetation Regulatory Map
OEH	NSW Office of Environment and Heritage (superseded)
PCT	plant community type
PMST	Protected Matters Search Tool
Project Area	The full width of the road corridor including the gap between the Development Footprint.
SAII	serious and irreversible impact
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
TBDC	Threatened Biodiversity Data Collection
TEC	threatened ecological community
The Project	The proposed Goulburn River Solar Farm. The Project includes the construction, operation and decommissioning of a solar farm with capacity of up to 550 MW, a 280 MWp and 570 MWh BESS, associated infrastructure and road upgrades.
VEC	vulnerable ecological community

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1.0 Introduction

1.1 Overview

Umwelt (Australia) Pty Ltd (Umwelt) have been engaged by Lightsource Development Services Australia Pty Ltd (Lightsource bp) to undertake biodiversity surveys and impact assessments for the proposed Goulburn River Solar Farm (the Project) within the locality of Merriwa, NSW.

The Project includes the following two main components for the purposes of assessment under the Biodiversity Assessment Method (BAM) (NSW DPIE 2020a):

- A Solar Farm.
- Public Road and Culvert Upgrade Works.

Two separate BDARs have been prepared as the Solar Farm requires a site-based assessment and the public road and culvert upgrade works require a linear-based assessment under the BAM. This BDAR assesses the impacts associated with the proposed Public Road and Culvert Upgrade Works.

1.2 Purpose and Scope of this Report

This BDAR has been prepared in accordance with the NSW *Biodiversity Conservation Act 2016* and the BAM. The Project is a State Significant Development (SSD) under Division 4.7 of Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

This BDAR has been prepared as part of the Environmental Impact Statement (EIS) documentation for the Project to address the Secretary's Environmental Assessment Requirements (SEARs) in relation to biodiversity for the proposed public road and culvert upgrade works (**Table 1.1**). Umwelt has prepared a separate BDAR for the solar farm component of the Project (see **Appendix 6** of the EIS).

The Project requires approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It should be noted that the road and culvert upgrades assessed within this report do not form part of the controlled action determination as the impacts associated with this component of the Project are not considered to be significant.

The BAM has been endorsed as the assessment method for Matters of National Environmental Significance (MNES) under a Bilateral Agreement made under the EPBC Act. The Australian Government is the decision-maker for whether the Project will be approved under the EPBC Act. Nationally listed threatened species, threatened ecological communities (TECs) and migratory species have been considered and assessed as part of this BDAR.

Table 1.1 SEARs Relevant to the Biodiversity Assessment

Key Issues	Secretary's Environment Assessment Requirements	Where Addressed
SEARs		
Biodiversity	An assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the *Biodiversity Conservation Act 2016* (NSW), the Biodiversity Assessment Method (BAM) 2020 and documented in a Biodiversity Development Assessment Report (BDAR), unless BCS and DPIE determine the proposed development is not likely to have any significant impacts on biodiversity values	The BDAR itself
	The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM	**Section 7.0** and **Section 8.0** of this BDAR
	An assessment of the likely impacts on listed aquatic threatened species, populations or ecological communities, scheduled under the *Fisheries Management Act 1994*, and a description of the measures to minimise and rehabilitate impacts, and	**Appendix A** of this BDAR
	If an offset is required, details of the measures proposed to address the offset obligations.	**Section 12.0** of this BDAR
Biodiversity Conservation Division (BCD) Submission		
Biodiversity	1. Biodiversity impacts related to the proposed development (SSD-33951458) are to be assessed in accordance with the Biodiversity Assessment Method 2020 and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the *Biodiversity Conservation Act 2016* (s6.12), Biodiversity Conservation Regulation 2017 (s6.8) and Biodiversity Assessment Method 2020.	The BDAR itself
	2. The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method 2020.	**Section 7.0** and **Section 8.0** of this BDAR
	2. 3. The BDAR must include details of the measures proposed to address the offset obligation as follows;	**Section 12.0** of this BDAR

Key Issues	Secretary's Environment Assessment Requirements	Where Addressed
	• The total number and classes of biodiversity credits required to be retired for the development/project; • The number and classes of like-for-like biodiversity credits proposed to be retired; • The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules; • Any proposal to fund a biodiversity conservation action; • Any proposal to conduct ecological rehabilitation (if a mining project); • Any proposal to make a payment to the Biodiversity Conservation Fund. 3. If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.	
	4. 4. The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under s6.10 of the *Biodiversity Conservation Act 2016.*	**Section 1.3** of this BDAR
EPBC Act Assessment Requirements – supplementary SEARs		
General requirements – Relevant regulations	5. The Environmental Impact Statement (EIS) must address all matters outlined in Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth) and all matters outlined below in relation to the controlling provisions.	This BDAR itself. **Section 11.0** of this BDAR
General requirements – Project description	6. The title of the action, background to the action and current status.	**Section 1.4** of this BDAR
	7. The precise location and description of all works to be undertaken (including associated offsite works and infrastructure), structures to be built or elements of the action that may have impacts on MNES.	
	8. How the action relates to any other actions that have been, or are being taken in the region affected by the action.	
	9. How the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts on MNES.	

Key Issues	Secretary's Environment Assessment Requirements	Where Addressed
General requirements – Impacts	10. The EIS must include an assessment of the relevant impacts of the action on the matters protected by the controlling provisions, including: i. a description and detailed assessment of the nature and extent of the likely direct, indirect and consequential impacts, including short term and long term relevant impacts; i. a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible; ii. analysis of the significance of the relevant impacts; and iii. any technical data and other information used or needed to make a detailed assessment of the relevant impacts.	**Section 11.6** of this BDAR
General requirements – Avoidance, mitigation, and offsetting	11. For each of the relevant matters protected that are likely to be significantly impacted by the action, the EIS must provide information on proposed avoidance and mitigation measures to manage the relevant impacts of the action including: i. a description, and an assessment of the expected or predicted effectiveness of the mitigation measures, iv. any statutory policy basis for the mitigation measures; v. the cost of the mitigation measures; vi. an outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing; vii. the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program.	**Section 11.5** of this BDAR
	12. Where a significant residual adverse impact to a relevant protected matter is considered likely, the EIS must provide information on the proposed offset strategy, including discussion of the conservation benefit associated with the proposed offset strategy.	**Section 11.7** of this BDAR
	13. For each of the relevant matters likely to be impacted by the action the EIS must provide reference to, and consideration of, relevant Commonwealth guidelines and policy statements including any conservation advice or recovery plan for the species or community	**Section 11.6.1** of this BDAR

Key Issues	Secretary's Environment Assessment Requirements	Where Addressed
	viii. relevant threat abatement plan for the species or community ix. wildlife conservation plan for the species x. any strategic assessment. **Note:** the relevant guidelines and policy statements for each species and community are available from the Department of the Environment Species Profiles and Threats Database. (http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl)	
	14. In addition to the general requirements described above, specific information is required with respect to each of the determined controlling provisions. These requirements are outlined in paragraphs 15–17.	**Section 4.0** of this BDAR **Section 2.0** of this BDAR **Section 7.0** of this BDAR **Section 11.6** of this BDAR **Section 12.0** of this BDAR
Biodiversity (threatened species and communities and migratory species)	15. The EIS must identify each EPBC Act listed threatened species and community and migratory species likely to be impacted by the action. For any species and communities that are likely to be impacted, the proponent must provide a description of the nature, quantum and consequences of the impacts. For species and communities potentially located in the project area or in the vicinity that are not likely to be impacted, provide evidence why they are not likely to be impacted.	**Section 11.6** of this BDAR
	16. For each of the EPBC Act listed threatened species and communities and migratory species likely to be impacted by the action the EIS must provide a separate: a. 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 plans; b. 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;	**Section 4.0** of this BDAR **Section 2.0** of this BDAR **Section 7.0** of this BDAR **Section 11.6** of this BDAR **Section 12.0** of this BDAR

Key Issues	Secretary's Environment Assessment Requirements	Where Addressed
	c. description of the relevant impacts of the action having regard to the full national extent of the species or community's range; and d. description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action; e. identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account; f. a description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established. g. 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; and h. 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. **Note:** For the purposes of approval under the EPBC Act, it is a requirement that offsets directly contribute to the ongoing viability of the specific protected matter impacted by a proposed action and deliver an overall conservation outcome that improves or maintains the viability of the MNES i.e. 'like for like'. In applying the BAM, residual impacts on EPBC Act listed TECs must be offset with Plant Community Type(s) (PCT) that are ascribed to the specific EPBC listed ecological community. PCTs from a different vegetation class will not generally be acceptable as offsets for EPBC listed communities.	
	17. Any significant residual impacts not addressed by the BAM may need to be addressed in accordance with the EPBC Act 1999 Environmental Offset Policy. (http://www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy.)	**Section 11.7** of this BDAR
Appendix A Protected matters relevant to the	Based on the information in the referral documentation, the location of the action, species records and likely habitat present in the area, there are likely to be significant impacts to:	**Section 11.0** of this BDAR

Key Issues	Secretary's Environment Assessment Requirements	Where Addressed
Goulburn River Solar Farm (EPBC 2021/9102) project	• White Box-Yellow Box-Blakley's Red Gum Grassy Woodland and Derived Native Grassland – Critically Endangered. • Regent Honeyeater (*Anthochaera phrygia*) – Critically Endangered. Additionally, there is some risk that there may be significant impacts on the following matters and further assessment to determine if the communities and species listed below are present in the proposed action area and, if so, the extent to which they may be impacted by the proposed action, is required: • Central Hunter Valley Eucalypt Forest and Woodland – Critically Endangered. • Swift Parrot (*Lathamus discolor*) – Critically Endangered. • Painted Honeyeater (*Grantiella picta*) – Vulnerable. • Large-eared Pied Bat (*Chalinolobus dwyeri*) – Vulnerable. • Corben's Long-eared Bat (*Nyctophilus corbeni*) – Vulnerable. • Pink tailed Worm-lizard (*Aprasia parapulchella*) – Vulnerable. • Bluegrass (*Dichanthium setosum*) – Vulnerable. • *Homoranthus darwinioides* – Vulnerable. Several threatened species and ecological communities have been identified as priority management species following the 2019-20 bushfires. This includes the White Box-Yellow Box-Blakley's Red Gum Grassy Woodland and Derived Native Grassland threatened ecological community and the Regent Honeyeater (as discussed above), and the following listed species that may be impacted by the proposed action: • Koala (*Phascolarctos cinereus*) (Combined Population of QLD, NSW and the ACT) – Vulnerable. • Greater Glider (*Petauroides volans*) – Vulnerable. • Brush tailed Rock wallaby (*Petrogale penicillata*) – Vulnerable. • Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (*Dasyurus maculatus maculatus* (South-east mainland population)) – Endangered.	

Key Issues	Secretary's Environment Assessment Requirements	Where Addressed
	• New Holland Mouse, Pookila (*Pseudomys novaehollandiae*) – Vulnerable. • Grey-headed Flying-fox (*Pteropus poliocephalus*) – Vulnerable. Further analysis of the impacts of the fires on those species and communities identified above should be undertaken during the assessment. **Note:** uncertainty around the extent and number of protected matters that may be impacted will need to be resolved through the assessment process once final alignment and construction plans have been completed. **Note:** this may not be a complete list and it is the responsibility of the proponent to ensure any protected matters under these controlling provisions are assessed for the Commonwealth decision-maker's consideration.	

1.3 Report Preparation

This BDAR was prepared by Jacob Manners (Senior Ecologist) with review and technical direction from Rachel Musgrave (NSW Ecology Manager – Sydney / Principal Ecologist) and Allison Riley (Ecology Manager South East Australia / Principal Ecologist). The BDAR was prepared in accordance with the BAM, following the specific requirements detailed within in Appendix K of the BAM (see **Appendix B**).

Table 1.2 outlines the details of the Accredited BAM Assessors involved in the survey, calculations and reporting for the Project.

Table 1.2 Accredited BAM Assessors and their role on this Project

Name	Experience / Qualifications	BAM Accreditation Number	Contribution to project
Jacob Manners	BSC, MWldMgt, GC Arbcult	BAAS17099	Project management Report preparation Biodiversity credit calculation Surveys
Allison Riley	BSC	BAAS17042	Document Review / Project Director
Rachel Musgrave	BSC (Hons) Ecology	BAAS18032	Document Review
Ryan Parsons	BEnvScMgt (Hons)	BAAS17048	Surveys
Travis Williamson	BAGIS	-	GIS Analysis and Mapping
Gayle Joyce	BSC (Forestry)	-	GIS Analysis and Mapping

1.4 Proposed Development

1.4.1 Development Overview

The Project involves the construction, operation, maintenance and decommissioning of the proposed Goulburn River Solar Farm, including public road and culvert upgrades on Ringwood Road between and including Bow River and Killoe Creek. This BDAR specifically assesses the proposed public road and culvert upgrade works required for the Project.

1.4.2 Location and Subject Land Description

The Goulburn River Solar Farm is located approximately 28 kilometres (km) southwest of the township of Merriwa and is surrounded by the Goulburn River National Park. The Goulburn River Solar Farm and the associated public road and culvert upgrade works are located within the Upper Hunter Local Government Area (LGA) of New South Wales (NSW).

The proposed upgrade works assessed within this report are limited to the existing alignment of the road reserve of Ringwood Road, approximately between Bow River and Killoe Creek. The location of the works assessed within this report is shown on the Site Map provided as **Figure 1.1** and the Location Map, provided as **Figure 1.2**.

1.4.3 Proposed Development Description

The works assessed within this report includes road and culvert upgrades, the development footprint of the proposed works is mapped in **Figure 1.3**.

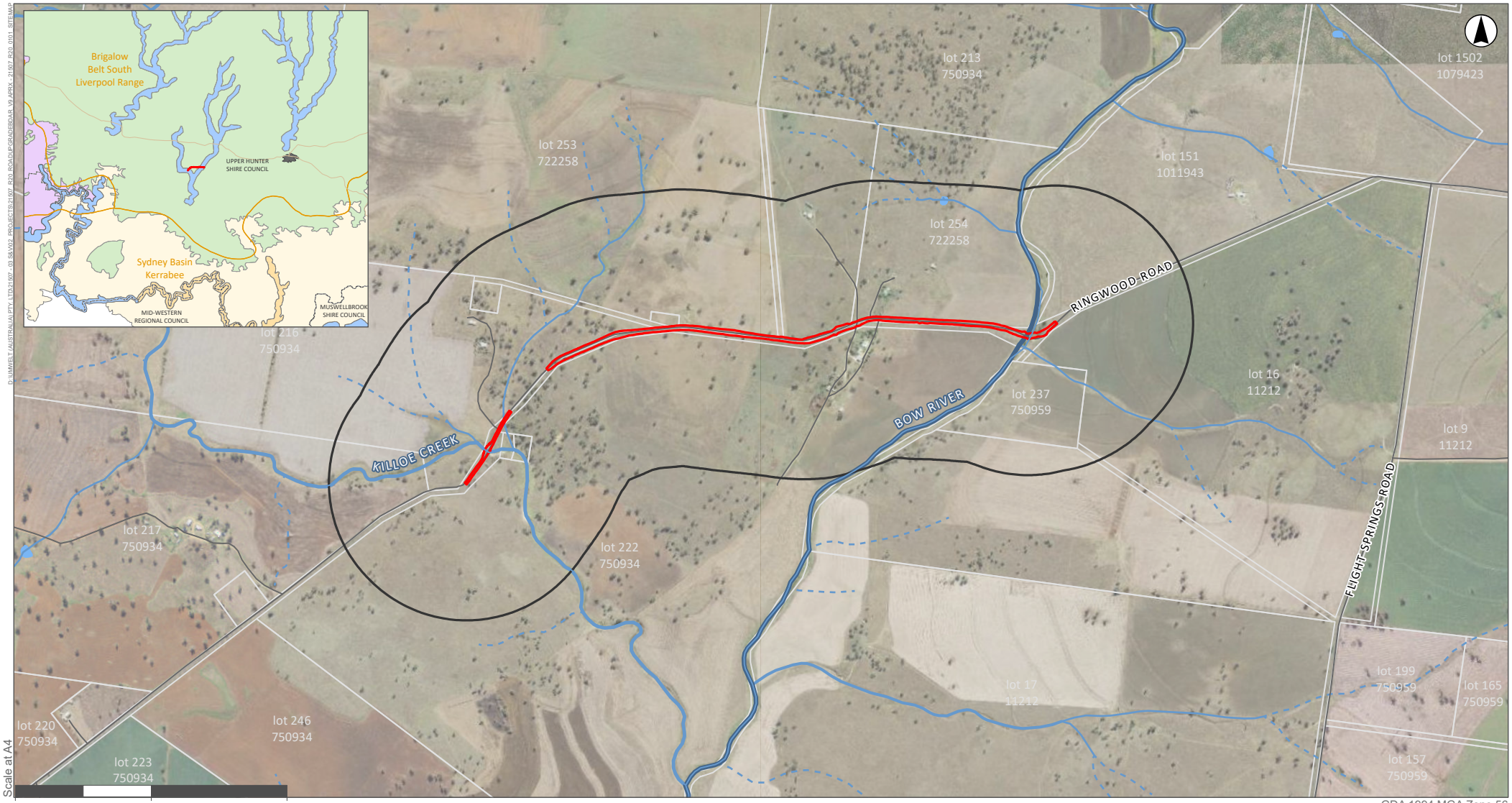
In total, 1.8 km of road will be widened and resealed between Bow River and Killoe Creek. These repairs will include 8 metre (m) bitumen-sealed formation with a minimum of 500 millimetre (mm) unsealed shoulders. The horizontal and vertical alignment of the proposed road will ensure safe sight distance, safe movement of longer vehicles, and an improved road network for the users.

The culvert upgrades are at two locations where Ringwood Road intersects the Bow River and Killoe Creek. The culvert upgrades will include:

- Installing culverts designed to accommodate two-way heavy vehicles, including B doubles and various farm machinery.
- Culvert width 7 m (3.5 m lane width) sealed carriageway with suitable guardrail and signage and associated drainage works.
- Stockpile site to be located on disturbed land within the road reserve in consultation with Upper Hunter Shire Council.
- Temporary side track at both locations to facilitate access during construction.
- All works are contained to the road reserve including any temporary access, stockpiling or compounds.

1.4.4 Other Documentation

Other information sources relied upon are referenced in the text and are listed in the References Section of this report.



Legend

- Road
- Watercourse
- Property Boundaries
- Development Footprint
- Assessment Area
- Waterbodies

Stream Order

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream or Higher

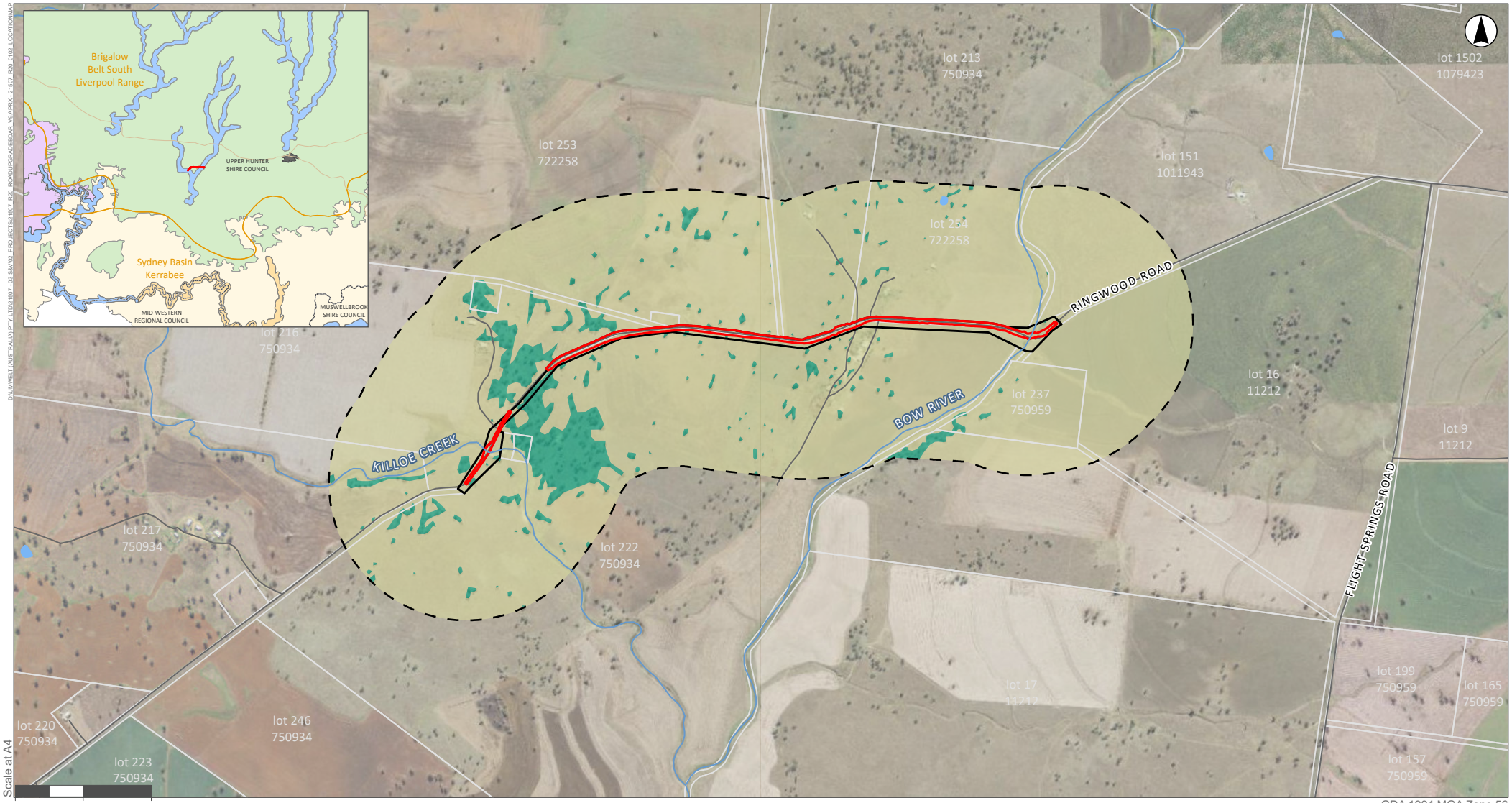
- IBRA Region/Subregion

Mitchell Landscapes

- Cassilis Slopes
- Goulburn River Channels and Floodplains
- Goulburn River Gorges
- Lees Pinch Foothills
- Liverpool Range Valleys and Footslopes

FIGURE 1.1
Site Map

Image Source: ESRI Basemap (2022) **Data source:** NSW LPI (2022), NSW DSFI (2022); NPWS Estate (2022)



Legend

- Road
- Watercourse
- Assessment Area
- Property Boundaries
- Development Footprint
- Project Area
- Waterbodies
- IBRA Region/Subregion

Mitchell Landscapes

- Cassilis Slopes
- Goulburn River Channels and Floodplains
- Goulburn River Gorges
- Lees Pinch Foothills
- Liverpool Range Valleys and Footslopes

Vegetation Type within Assessment Area

- Native Vegetation (21.12 ha)
- Cleared Land (308.14 ha)

FIGURE 1.2
Location Map

Image Source: ESRI Basemap (2022) **Data source:** NSW LPI (2022), NSW DSFI (2022); NPWS Estate (2022)

FIGURE 1.3

Road Widening and Culvert Upgrades

Image Source: ESRI Basemap (2022) **Data source:** NSW LPI (2022), NSW DSFI (2022); NPWS Estate (2022)

1.5 Statutory Considerations

Commonwealth and State legislation relevant to this BDAR is described in **Table 1.3**.

Table 1.3 Legislation Relevant to the Project

Relevant Legislation	Governing Agency	Summary
Commonwealth Legislation		
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Department of Climate Change, Energy, the Environment and Water (DCCEEW)	The EPBC Act is the Commonwealth Government's primary piece of environmental legislation and is administered by the Australian Government DCCEEW. It is designed to protect national environmental assets, known as MNES, which include threatened species of flora and fauna, endangered ecological communities, and migratory species, as well as other protected matters. It defines the categories of threat for threatened flora and fauna, identifies key threatening processes and provides for the preparation of recovery plans for threatened flora, fauna, and communities. Preliminary investigations identified that the Solar Farm component of the Project would likely have a significant impact on biodiversity protected under the EPBC Act. A referral was subsequently prepared and submitted, with the Proposal being determined to be a controlled action (ref 2021/9102) under the EPBC Act on 2 February 2022. The controlled action included the requirement for the Project to be assessed by an accredited assessment under the EP&A Act. It should be noted that the referral and Controlled Action declaration only applies to the Solar Farm component of the Project and not the Public Road and Culvert Upgrade component of the Project. An Assessment of Significance in accordance with the *Matters of National Significance: Significant Impact Guidelines 1.1* (DEC 2013) found that the Public Road and Culvert Upgrade works would not have a significant impact on MNES. As such, the referral and controlled action declaration was not amended to include this component of the Project. An assessment of the Project of MNES is found within **Section 11.0** of this BDAR.
NSW Legislation		
Environmental Planning and Assessment Act 1979 (EP&A Act)	Department of Planning and Environment (DPE)	The EP&A Act is the overarching planning legislation in NSW that provides for the creation of planning instruments that guide land use. The EP&A Act also provides for the protection of the environment, including the protection and conservation of native animals and plants. This includes threatened species, populations and ecological communities, and their habitats of biodiversity values, as listed in the NSW BC Act and NSW *Fisheries Management Act 1994* (FM Act). Section 4.36 of the EP&A Act provides for the declaration of a project as SSD. Under the EP&A Act, the declaration of a project as SSD can be made by meeting the requirements of a State Environmental Planning Policy (SEPP) or by the Minister for Planning and Homes.

Relevant Legislation	Governing Agency	Summary
		Clause 20 of Schedule 1 of Planning Systems SEPP prescribes that development for the purpose of 'electricity generating works' that has a capital investment value of more than $30 million is SSD. The Project has a capital investment value of greater than $30 million. As SSD, the Project would be assessed under Part 4 Division 4.7 section 4.36 of the EP&A Act. The Minister for Planning and Homes is the consent authority for SSD. The Minister (or the Minister's delegate) is required to take into consideration the matters listed under section 4.15 of the EP&A Act when determining the development application (DA). Under Division 4.4 section 4.39 an EIS is required to accompany a DA that has been determined as SSD. The proponent is required to consult with the Secretary of DPE with regard to the matters to be addressed in the EIS. These are referred to as the SEARs. The SEARs for the Project were issued by DPE on 1 February 2021. Broadly, the SEARs require biodiversity impacts related to all stages of a proposal to be assessed in accordance with section 7.9 of the BC Act and documented in a BDAR. The SEARs and where this BDAR addresses each requirement pertaining to biodiversity are summarised in **Table 1.1**.
Biodiversity Conservation Act 2016 (BC Act)	DPE	The BC Act and its supporting regulations commenced on 25 August 2017. The BC Act sets out the environmental impact assessment framework for threatened species, TECs and Areas of Outstanding Biodiversity Value (formerly critical habitat) for Major Projects, Part 5 activities, and local development. The BC Act provides a framework to avoid, minimise and offset the impacts of proposed development and established a methodology for assessing the likely impacts on biodiversity values and calculating measure to offset those impacts (the BAM). Section 7.9 of the BC Act requires that SSD under Part 4 of the EP&A Act that triggers the Biodiversity Offset Scheme (BOS) must be accompanied by a BDAR prepared by an accredited assessor in accordance with the BAM.
Biodiversity Conservation Regulation 2017 (BC Regulation)	DPE	The BC Regulation commenced on 25 August 2017. The object of the BC Regulation is to make provision for matters that are required or authorised to be prescribed as a consequence of the enactment of the BC Act. The BC Regulation provides the thresholds which trigger the BOS, the principles for consideration of serious and irreversible biodiversity impacts, rules for meeting a biodiversity offset obligation, biodiversity certification criteria, additional biodiversity impacts to which the scheme applies and compliance provisions for unauthorised clearing and accredited assessors. This BDAR has been prepared in accordance with the provisions of the BC Regulation.
National Parks and Wildlife Act 1974 (NPW Act)	DPE	The NPW Act provides for the protection of Aboriginal sites and designated conservation areas as well as the flora and fauna within conservation areas. The objective of the NPW Act is to consolidate and amend the law relating to the establishment, preservation and management of national parks, historic sites, certain other areas, and the protection of certain fauna, native plants and Aboriginal objects. There are no conservation areas listed under the NPW Act within or adjacent to the Development Footprint.

Relevant Legislation	Governing Agency	Summary
Fisheries Management Act 1994 (FM Act)	Department of Primary Industries (DPI)	The objectives of the FM Act are to conserve, develop and share the fishery resources of NSW for the benefit of present and future generations. More detailed objectives relevant to the Project include: • to conserve fish stocks and key fish habitats • to conserve threatened species, populations and ecological communities of fish and marine vegetation • to promote ecologically sustainable development, including the conservation of biological diversity. An Aquatic Assessment which includes an assessment of the likely impacts on listed aquatic threatened species, populations and ecological communities under the FM Act is provided in **Appendix A** of this BDAR.
Biosecurity Act 2015	DPI	The Biosecurity Act replaced the Noxious Weeds Act 1993 on 1 July 2017. The Biosecurity Act is a wide-ranging legislation that outlines the requirements of government, councils, private landholders, and public authorities in the management of biosecurity matters. Priority weeds are regulated under the Biosecurity Act with a general biosecurity duty to prevent, eliminate or minimize any biosecurity risk they may pose. Some priority weeds have additional management obligations which may apply generally, or under specific circumstances. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised as is reasonably practicable.
Local Land Services Act 2013 (LLS Act)	Local Land Services (LLS)	The LLS Act, supported by the Local Land Services Regulation 2014 (LLS Regulation), established 11 regional Local Land Services organisations to provide biosecurity, natural resources management and agricultural advisory services. Under Part 5A of the LLS Act and the supporting regulation, a Native Vegetation Regulation (NVR) map showing the extent of categorised land in NSW is to be published by the Environment Agency Head. The NVR map underpins the legislative framework for native vegetation clearing in rural areas by categorising land in NSW. However, the map applies only to the following zones (if they are not in an excluded LGA): Zone RU1 Primary Production, Zone RU2 Rural Landscape, Zone RU5 Primary Production Small Lots and Zone RU6 Transition. Currently, various map categories have been released under staged transitional arrangements. The online NVR map viewer currently displays Excluded Land, Category 2 – Vulnerable Land and Category 2 – Sensitive Land. Category 1 – Exempt Land and Category 2 – Regulated Land maps have not yet been released. During the transition period landholders must determine if their land is Category 1 or Category 2 under the LLS Act. The BAM does not need to be applied to land mapped as Category 1 – Exempt Land. The Development Footprint is zoned RU1, however has not been mapped as Category 1 – Exempt Land for the purposes of this BDAR.

Relevant Legislation	Governing Agency	Summary
State Environmental Planning Policy (Biodiversity and Conservation) 2021	DPE	SEPP (Biodiversity and Conservation) 2021 commenced in March 2022 and includes a number of previous planning policies including Koala Habitat Protection 2019 and Koala Habitat Protection 2021, Chapter 3 and 4, respectively. Schedule 2 identifies that the provisions of chapters 3 and 4 apply in the Upper Hunter LGA. For all RU1 (Primary Production), RU2 (Rural Landscape) or RU3 (Forestry) zoned land outside of the Sydney Metropolitan Area and Central Coast, Chapter 3 Koala Habitat Protection 2020 applies. Chapter 3 aims to encourage the proper conservation and management of areas of natural vegetation that may provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline. This is to be achieved through identifying areas of core Koala habitat, including these areas in environment protection zones and where required managing development consent in relation to areas of core Koala habitat. An assessment of impacts to Koalas under the SEPP (Biodiversity and Conservation) is provided in **Section 5.6**.

1.6 Biodiversity Offsets Scheme Entry

The Biodiversity Offset Scheme (BOS) applies to all SSD Projects and the SEARS require a BDAR to be prepared for the Project in accordance with Section 7.9 of the BC Act. The Development Footprint also includes mapped Biodiversity Values areas on the Biodiversity Values Map, as shown in **Figure 1.4**.

1.7 Excluded Impacts / Category 1 Land

The BC Act (at Clause 6.8(3)), 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 NSW *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)).

The NSW Government has undertaken a transitional approach and period to the release of the Native Vegetation Regulatory (NVR) Map. The transitional NVR Map currently does not include Category 1 Exempt Land.

The assessment of Category 1 Land under the BAM during this transitional period has been dealt with in BAM Assessor Updates (No. 22 6 September 2019 and No. 3 6 August 2018). The guidance provided identified that accredited assessors were responsible for determining areas of Category 1 Land for developments affecting rural land. These areas were identified as not requiring impact assessment offset calculations relating to vegetation integrity and habitat suitability.

For the purposes of this assessment, no areas of excluded impacts / Category 1 Land have been assessed for the proposed road and culvert upgrades.

1.8 Matters of National Environmental Significance

Preliminary investigations identified that the Solar Farm component of the Project would likely have a significant impact on biodiversity protected under the EPBC Act. A referral was subsequently prepared and submitted, with the Proposal being determined to be a controlled action (ref 2021/9102) under the EPBC Act on 2 February 2022. The controlled action included the requirement for the Project to be assessed by an accredited assessment under the EP&A Act. It should be noted that the referral and Controlled Action declaration only applies to the Solar Farm component of the Project and not the Public Road and Culvert Upgrade component of the Project. An Assessment of Significance in accordance with the *Matters of National Significance: Significant Impact Guidelines 1.1* (DEC 2013) found that the Public Road and Culvert Upgrade works would not have a significant impact on MNES. As such, the referral and controlled action declaration was not amended to include this component of the Project.

The BAM has been endorsed as the assessment method for MNES under a Bilateral Agreement made under the EPBC Act. The Australian Government is the decision-maker for whether the Project will be approved under the EPBC Act. Nationally listed threatened species, TECs and migratory species have been considered and assessed within **Section 11.0** of this BDAR.

1.9 Information Sources

The following guidance documents and resources relevant to the preparation of this BDAR were reviewed:

- Biodiversity Assessment Method (NSW DPIE 2020a).
- Biodiversity Assessment Method Operational Manual – Stage 1 (NSW DPIE 2020b).
- Biodiversity Assessment Method Operational Manual – Stage 2 (NSW DPIE 2019).
- Biodiversity Assessment Method (BAM) Calculator User Guide (NSW OEH 2017).
- NSW BioNet including the BioNet Atlas, BioNet Vegetation Database and Threatened Species Data Collection (NSW DPE 2022a).
- Guidance for the Biodiversity Development Assessment Report Template (including the template) (NSW DPE 2022b).
- Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment method (NSW DPIE 2020c).
- Flora Species with Specific Survey Requirements List Version 1 (NSW DPIE 2020d).
- 'Species Credits' threatened bats and their habitats (NSW OEH 2018b).
- NSW Survey Guide for Threatened Frogs (NSW DPIE 2020e).
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (NSW DEC 2004).

Other information sources relied upon are referenced in the text and are listed in the References Section of this report.

FIGURE 1.4
Biodiversity Values Map

Image Source: ESRI Basemap (2022) **Data source:** NSW LPI (2022), NSW DSFI (2022); NPWS Estate (2022)

2.0 Methods

2.1 Site Context Methods

2.1.1 Landscape Features

As detailed in Section 3 of the BAM (DPIE 2020a), a landscape assessment for the Project is required, which was initially conducted as a desktop assessment and confirmed during the field surveys. The following landscape and site context features were identified for the Assessment Area (1500 m buffer) in accordance with Section 3 of the BAM (DPIE, 2020a) from analysis and reference to available spatial information:

- Interim Biogeographic Regionalisation for Australia (IBRA) bioregion
- IBRA subregions
- Native vegetation extent
- Cleared areas
- Rivers, streams and wetlands
- Connectivity features
- Patch size.

2.2 Native Vegetation, Threatened Ecological Communities and Vegetation Integrity Methods

2.2.1 Existing Information

The following existing information was reviewed to inform the identification of plant community types (PCTs) (**Section 4.2**) and TECs (**Section 4.3**):

- NSW State Vegetation Type Map: Upper Hunter Version 1.0 (NSW OEH, 2019).
- Notice and Reason for the Final Determination for the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland critically endangered ecological community (NSW Threatened Species Scientific Committee 2020a).
- Conservation Assessment of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (NSW Threatened Species Scientific Committee 2020a).
- EPBC Act Policy Statement 3.5 – White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands (AGDEH 2006a).
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Ecological Community Species List (AGDEH 2006b).
- Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (AGDEH 2006c).

2.2.2 Mapping Native Vegetation Extent and Plant Community Types

The native vegetation extent (**Section 4.1**) within the Development Footprint was determined during site surveys, through Geographic Information System (GIS) Mapping and aerial photograph interpretation using recent aerial imagery. Native vegetation and PCT mapping were undertaken using best-practice techniques to delineate vegetation communities across the Development Footprint. Vegetation mapping involved the following key steps:

- review of aerial imagery to assess vegetation distribution patterns as dictated by change in canopy texture, tone, and colour, as well as topography
- review of the modelled distribution of vegetation communities within broader scale regional based vegetation mapping
- preparation of a draft plant community type map based on interpretation of digital aerial imagery
- field-based ground-truthing of the draft plant community type.
- confirmation of vegetation community floristic delineations based on plot data.

Vegetation communities were delineated through the identification of repeating patterns of plant species assemblages in each of the identified strata. Slight variations in species composition are typical across the extent of a community and are often associated with microhabitats or ecotones with adjoining plant communities.

The extent of native ground-cover vegetation within offsite areas where a canopy of native species is absent has mostly been estimated based on the visual interpretation of aerial imagery, taking into account areas of cultivation and fenced boundaries. The offsite mapping of native vegetation extent is broad-scale and was prepared specifically for the estimation of native vegetation cover under the BAM (DPIE, 2020a).

2.2.3 Plot-Based Vegetation Survey

A stratified plot-based floristic vegetation survey of the proposed Development Footprint was undertaken in accordance with Table 3 and Section 4.2.1 of the BAM. Plot-based vegetation surveys were completed to assess the condition of the Project Area, including the Development Footprint, sample areas of expected environmental variation and verify the results of previous mapping and available site information.

A total of four BAM plots were sampled by Umwelt ecologists on 5 December 2022. Each BAM Plot consisted of a 20x20 m floristic plot nested within each 20x50 m vegetation integrity plot. Plot locations were recorded with a hand-held Global Positioning System (GPS) device and are shown in **Figure 2.1**. All vascular plants recorded within floristic plots were identified using keys and nomenclature in Plantnet NSW Flora Online Identification Keys (The Royal Botanic Gardens and Domain Trust 2022).

Table 2.1 Plant Community Type Survey Plot Stratification Details

PCT ID	PCT Name	Vegetation Condition Zone	Area (ha)	Quantity of Plots Required (BAM 2020 Table 3)	Plots Completed in 2022/23
483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Condition Zone 1: Remnant Woodland	0.06	1	1
		Condition Zone 2: Exotic dominated derived native grassland	2.07	2	3

Floristic survey data collected was in accordance with Table 1 of the BAM and the plot survey effort was completed to ensure compliance with the stratification requirements of Table 3 of the BAM. Plot locations were selected to ensure that they captured attributes relevant to each vegetation condition zone, to provide a representative assessment of the vegetation integrity of the vegetation zone, accounting for the level of variation in the broad condition state of the vegetation zone. Subsequent amendments to the Development Footprint during the design process to avoid impacts to biodiversity values have resulted in plots now falling outside of the Development Footprint.

At each plot, roughly 45 to 60 minutes was spent searching for all vascular flora species present within the 20 x 20 m floristic plot. Searches were generally undertaken through parallel transects from one side of the plot to another. Most efforts were spent examining the groundcover, which consistently supported well over half of the species present. An effort was made to search the tree canopy and tree trunks for mistletoes, vines, and epiphytes where present.

2.2.4 Vegetation Integrity Survey

As part of the plot-based vegetation survey, native vegetation composition, structure and function attributes identified in Section 4.3.4 of the BAM was assessed for each BAM plot. The locations of the plots sampled are mapped to scale and shown as BAM Plots in **Figure 2.1**.

FIGURE 2.1 A

BAM Plot Locations and Plant Community Types

Image Source: ESRI Basemap (2022) **Data source:** NSW LPI (2022), NSW DSFI (2022); NPWS Estate (2022)

FIGURE 2.1 B

BAM Plot Locations and Plant Community Types

Image Source: ESRI Basemap (2022) **Data source:** NSW LPI (2022), NSW DSFI (2022); NPWS Estate (2022)

2.3 Threatened Flora Survey Methods

2.3.1 Review of Existing Information

The following existing information was reviewed to inform the threatened flora species surveys and assessment of habitat constraints and microhabitats:

- NSW Government Biodiversity Assessment Method Calculator (BAM-C).
- Threatened flora records held on the NSW BioNet Atlas of NSW Wildlife within the Assessment Area (NSW DPE 2022a).
- Vegetation associations reports for the relevant IBRA bioregion and IBRA sub-region for each PCT present, to determine threatened fauna species PCT associations.
- Habitat constraints listed in the Threatened Biodiversity Data Collection (TBDC) (DPE 2022c).
- BAM Flora species with specific survey requirements spreadsheet (DPIE 2020d).

2.3.2 Habitat Constraints Assessment

The following field-based surveys were undertaken to assess the habitat constraints for the candidate threatened flora species:

- Field searches for habitat constraints identified from the desktop review of the TBDC.
- Direct observation of the quality and suitability of micro-habitats present.
- Collection of site photographs to assess the condition of habitats present.

The results of the site-based habitat constraints assessment were utilised to inform the assessment of the confirmed candidate threatened species assessment in the BAM-C. Where species presence could not be ruled out in accordance with Section 5.2 of the BAM, surveys were conducted.

2.3.3 Field Surveys

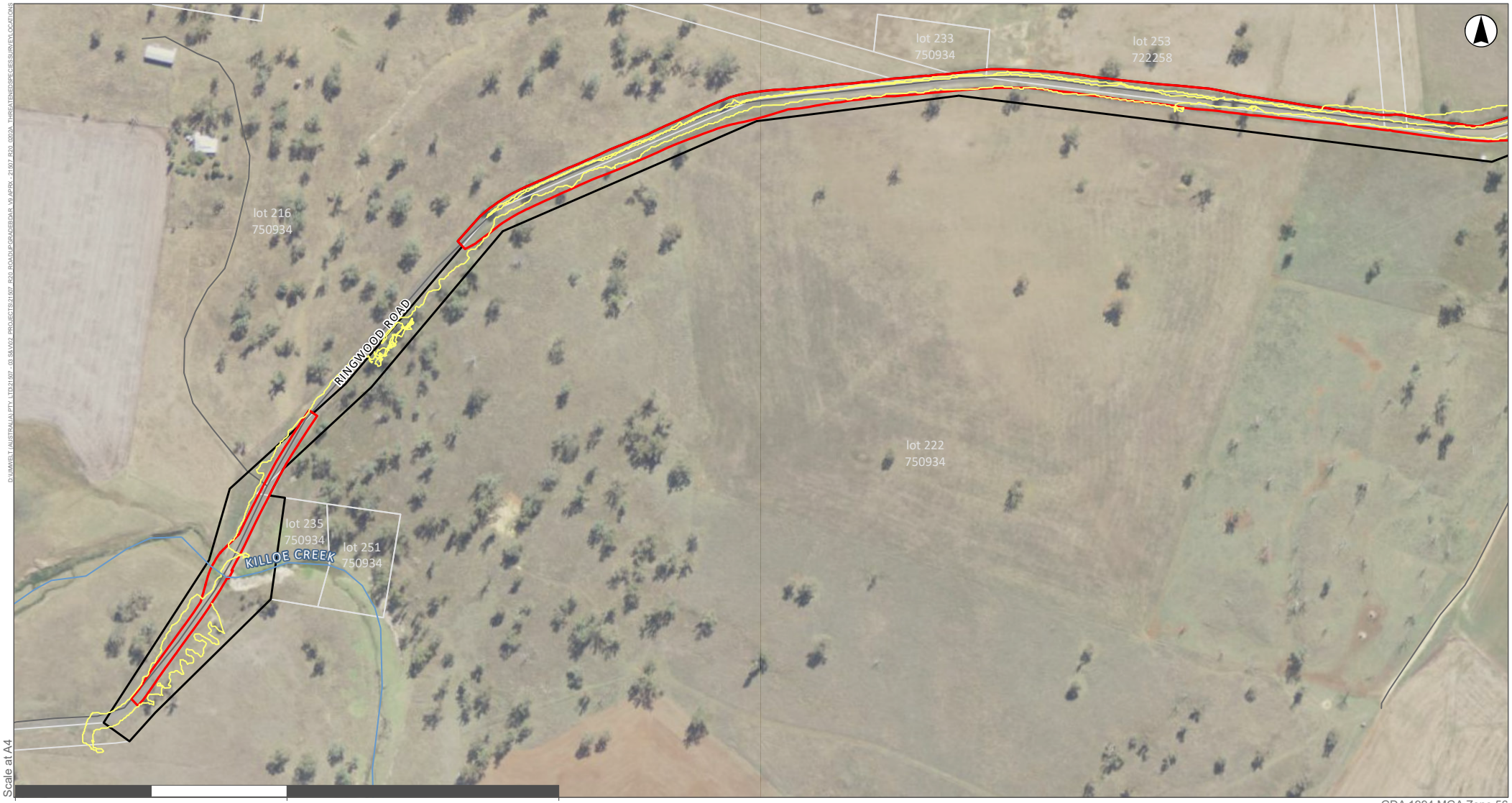
Searches for threatened flora species were completed in accordance with the NSW Survey Guide, '*Surveying threatened plants and their habitats'* (DPIE 2020c) and any relevant species requirements listed in the TBDC (NSW DPE 2022c). Details of the field survey methods used and species targeted are listed in **Table 2.2** and the locations of the surveys completed are mapped in **Figure 2.2**.

The flora species credit species predicted to occur on the development footprint are identified in **Table 5.2** in **Section 5.1.2.1** below. Only one species is predicted to occur and it has not been excluded from further assessment. Surveys for threatened flora were completed within the following PCTs:

- PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley.

Table 2.2 Candidate Threatened Flora Species Targeted and Field Survey Methods Used

Target Species	Species Survey Period	Survey Dates	Survey Method
Dichanthium setosum	November to May	5 December 2022	Parallel traverse



1:5,000
Scale at A4

0 0.25 0.5 Kilometres

GDA 1994 MGA Zone 56

Legend

- Road
- Watercourse
- Threatened Species Search Locations (5th December 2022)
- Property Boundaries
- Development Footprint
- Project Area

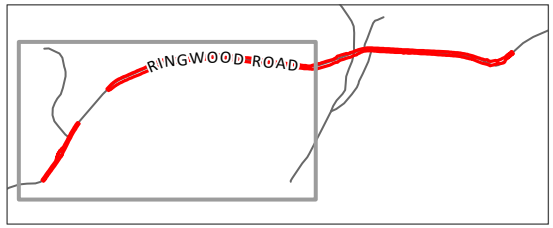


FIGURE 2.2 A

Threatened Species Survey Locations

Image Source: ESRI Basemap (2022) **Data source:** NSW LPI (2022), NSW DSFI (2022); NPWS Estate (2022)

FIGURE 2.2 B

Threatened Species Survey Locations

Image Source: ESRI Basemap (2022) **Data source:** NSW LPI (2022), NSW DSFI (2022); NPWS Estate (2022)

2.4 Threatened Fauna Survey Methods

2.4.1 Review of Existing Information

The following existing information was reviewed to inform the threatened fauna species surveys and assessment of habitat constraints and microhabitats:

- BAM-C.
- Threatened fauna records held on the NSW BioNet Atlas of NSW Wildlife within the Assessment Area (NSW DPE 2022a).
- Vegetation associations reports for the relevant IBRA bioregion and IBRAs-region for each PCT present to determine threatened fauna species PCT associations.
- Habitat constraints listed in the TBDC (DPE 2022c).

2.4.2 Habitat Constraints Assessment

Field-based searches were undertaken to assess the habitat constraints for the candidate threatened fauna species, these searches included observation of habitat constraints identified from the desktop review of the TBDC and recording of the presence, quality and/or suitability of micro-habitats present including:

- hollow bearing trees, particularly those of suitable size for threatened cockatoo and owl breeding habitat
- Koalas use trees
- aquatic habitats suitable for amphibians
- rocky habitats suitable for reptiles
- outcrops, caves, tunnels and old buildings suitable for threatened microbat species.

The results of the site-based habitat constraints assessment were utilised to inform the assessment of the confirmed candidate threatened species assessment in the BAM-C. Where species presence could not be ruled out in accordance with Section 5.2 of the BAM, surveys were conducted. The fauna species credit species predicted to occur on the Development Footprint and justifications for ruling species out from further survey and assessment are identified in **Table 5.3** in **Section 5.1.2.2** below.

2.4.3 Field Surveys

Targeted surveys for candidate threatened fauna species were completed with reference to the TBDC (DPE 2022c) and following guidelines:

- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities, NSW Department of Environment and Conservation (DEC 2004).
- Survey guidelines for Australia's threatened reptiles: Guidelines for detecting reptiles listed as threatened under the EPBC Act, Department of Sustainability, Environment, Water, Population and Communities (DSEWPC 2011).

- Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the EPBC Act, Department of Sustainability, Environment, Water, Population and Communities (DEWHA 2010a).
- Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act, Department of Sustainability, Environment, Water, Population and Communities (DEWHA 2010b).

2.4.3.1 Diurnal Fauna Surveys

The following methods were utilised for targeted diurnal fauna surveys:

- Diurnal reptile habitat search.
- Nest site searches.
- Searches for hollow-bearing trees.
- Searches for microbat roots.
- Opportunistic observation.
- The details of diurnal fauna surveys completed are provided in **Table 2.3**.

Table 2.3 Details of Diurnal Threatened Fauna Surveys Completed

Survey Date	Survey Methods	Species Targeted	Weather conditions	Survey Effort / Time
05/12/2022	Diurnal census and habitat search	Habitat Search and assessment for: • Pink-tailed Legless Lizard. • Striped Legless Lizard. • Koala.	32°C, light WNW breeze, fine	4.5hrs x 2 people (1030–1500)

2.4.3.2 Nocturnal Fauna Surveys

No nocturnal fauna surveys were completed due to the highly disturbed condition of the areas to be impacted, lack of habitats present for the target species and safety considerations associated with working within a road corridor.

2.5 Threatened Fungi

No threatened fungi species were identified as predicted or candidate threatened species.

2.6 Weather Conditions

The surveys undertaken were completed during suitable weather conditions. The weather conditions during fauna surveys are listed in **Table 2.3**.

2.7 Limitations

The surveys completed were undertaken during the appropriate seasons specified within the TBDC to maximise the probability of detection. BAM Plot surveys were also completed during summer to ensure that both perennial and annual species were sampled within grassland plots.

3.0 Site Context

3.1 Assessment Area and Type

The Assessment Area, including the Development Footprint and the area of land within the 1500 m buffer zone surrounding the Development Footprint are shown on the Location Map in **Figure 1.2**. The proposal has been assessed as a linear-shaped proposal.

3.2 Landscape Features

Landscape features identified within the Development Footprint are shown on the Site Map provided as **Figure 1.1** and landscape features in the assessment area are shown on the Location Map provided as **Figure 1.2**. Further information on landscape features is provided in **Section 3.2.1** to **Section 3.2.7**.

3.2.1 IBRA Bioregions and IBRA Subregions

The Development Footprint is located within the Liverpool Range IBRA bioregion and within the Brigalow Belt South IBRA subregion.

3.2.2 Rivers, Streams, Estuaries and Wetlands

The locations of the streams within the Development Footprint are shown on the Site Map, provided as **Figure 1.1** and the locations of streams and rivers within the Assessment Area are shown on the Location Map, provided as **Figure 1.2**.

The culvert upgrade areas intersect Killoe Creek which is a 4th order watercourse and Bow River which is a 5th order watercourse. These watercourses are both part of the Goulburn River catchment. There are no estuaries or wetlands located within the Development Footprint.

3.2.3 Habitat Connectivity

The proposed road upgrade areas predominantly adjoin degraded agricultural areas. There is some remnant scattered canopy tree vegetation on the northern side of Killoe Creek which provides a potential habitat connectivity point. This area has already been fragmented by the existing road corridor.

3.2.4 Karst, Caves, Crevices, Cliffs, Rocks or Other Geological Features of Significance

No karst, caves, crevices, cliffs, rocks or other geological features of significance were observed within the Development Footprint. Review of aerial imagery has identified the presence of rock areas and small cliffs outside of the Development Footprint, within the Assessment Area.

3.2.5 Areas of Outstanding Biodiversity Value

The Development Footprint and Assessment Area do not contain any areas of outstanding biodiversity value, as identified under the BC Act.

3.2.6 NSW (Mitchell) Landscapes

The Development Footprint is located within the Goulburn River Channels and Floodplains and the Liverpool Range Valleys and Footslopes NSW (Mitchell) Landscape. The Liverpool Range Valleys and Footslopes is considered to most accurately reflect the impact areas which currently contain native vegetation and was selected for this assessment. The Goulburn River Channels landscape is associated with Killoe Creek and Bow River, it is predominantly cleared of native vegetation and forms only a minor part of the overall impact area.

3.2.7 Additional Landscape Features Identified in the SEARS

There are no specific additional landscape features identified for assessment in the SEARs.

3.3 Native Vegetation Cover

The native vegetation cover within the Assessment Area was determined through site surveys of the Development Footprint and aerial photograph interpretation using ArcMap software and Six Maps aerial imagery dated 14 April 2011.

Table 3.1 summarises the extent of native vegetation cover within the assessment area and **Figure 1.2** shows the extent of native vegetation cover within the assessment area.

Table 3.1 Native Vegetation Cover in the Assessment Circle

Native Vegetation Cover	
Class (0-10, >10–30, >30–70 or >70 %)	0–10%

4.0 Native Vegetation, Threatened Ecological Communities and Vegetation Integrity

4.1 Native Vegetation Extent

The parts of the Development Footprint assessed as native vegetation for the purposes of the vegetation integrity surveys are shown in **Figure 4.1**.

4.1.1 Changes to the Mapped Native Vegetation Extent

No changes were observed during surveys to the mapped native vegetation extent visible on the aerial imagery utilised for this assessment.

4.1.2 Areas That Are Not Native Vegetation

Areas of non-native vegetation were interspersed with low levels of native species and were assessed as native vegetation, using the most likely PCT.

FIGURE 4.1

Native Vegetation Extent

Image Source: ESRI Basemap (2022) **Data source:** NSW LPI (2022), NSW DSFI (2022); NPWS Estate (2022)

4.2 Plant Community Types

4.2.1 Overview

The PCTs identified in this assessment are based on the PCTs available prior to the release of the revised PCTs for eastern NSW and associated update to the BAM Calculator which occurred in February 2023. In-progress BAM-C assessments and projects with substantially progressed surveys are able to undertake this approach, in accordance with the transitional arrangements.

Vegetation within the Development Footprint has been assessed as aligning with the BioNet Vegetation Classification PCTs identified within **Table 4.1** and their extent is shown in **Figure 4.2**. Detailed descriptions of each PCT are provided in the following subsections.

Table 4.1 Plant Community Types Identified within the Development Footprint

PCT ID	PCT name	Vegetation Class	Vegetation Formation	NSW VIS Percentage Cleared Estimate	Development Footprint Vegetation Condition Zone	Plots Completed	Condition Zone Area (ha)	Total PCT Area (ha)
483	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Western Slopes Grassy Woodlands	Grassy Woodlands	90 %	Condition Zone 1: Remnant Woodland	1	0.06	2.13
					Condition Zone 2: Exotic dominated derived native grassland	3	2.07	

FIGURE 4.2 A

Plant Community Types

Image Source: ESRI Basemap (2022) **Data source:** NSW LPI (2022), NSW DSFI (2022); NPWS Estate (2022)

1:5,000
Scale at A4

0 0.25 0.5 Kilometres

GDA 1994 MGA Zone 56

Legend

- Road
- Watercourse
- Property Boundaries
- Development Footprint
- Project Area

Plant Community Types

- PCT 483 Condition Zone 1 Remnant Woodland (0.055 ha)
- PCT 483 Condition Zone 2 Exotic Dominated Grassland (2.069 ha)
- Cleared Land (1.464 ha)

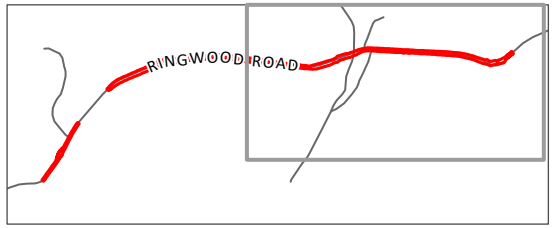


FIGURE 4.2 B

Plant Community Types

Image Source: ESRI Basemap (2022) **Data source:** NSW LPI (2022), NSW DSFI (2022); NPWS Estate (2022)

4.2.2 PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley

This PCT characterises the remnant vegetation present within the footprint of the proposed works. The characteristics of this PCT are described in **Table 4.2**.

Table 4.2 Description of PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley

PCT Name	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
BAM C PCT Number	PCT 483
Condition Zones	Condition Zone 1: Remnant Woodland 0.06 ha Condition Zone 2: Exotic dominated derived grassland 2.07 ha
Total Area (ha)	2.13 ha
Plots Completed	Condition Zone 1: 1 Plot (Plot 2) Condition Zone 2: 3 Plots (Plot 1, Plot 3, Plot 4)
Formation	Grassy Woodlands
Class	Western Slopes Grassy Woodlands
Photo	
Location	The Remnant Woodland condition zone occurs as a patch to the north of Killoe Creek and as scattered occasional trees throughout the Development Footprint. The exotic dominated derived grassland condition zone has been assessed as the residual areas where derived grassland vegetation is present.

PCT Name	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
Canopy Description	The canopy of the remnant woodland condition zone is characterised by *Eucalyptus melliodora* with scattered occurrences of *Eucalyptus albens x moluccana* and *Angophora floribunda.*
Mid-storey Description	The mid-storey is very sparse or absent and consisted of *Eremophila debilis* and *Pimelea latifolia.*
Ground Cover Description	The groundcover is dominated by native and exotic grasses including the native *Aristida ramosa* and the exotic grasses *Hyparrhenia hirta, Bromus catharticus* and *Avena sativa*. There are low densities of native herbs and forbs, particularly in the remnant woodland condition zone areas. Species of native herbs and forbs observed include *Calotis lappulacea, Dichondra repens, Einadia hastata* and *Geranium solanderi*.
Introduced Species	Exotic cover was very high in the ground layer of this PCT for all condition zones. Dominant species included *Sonchus oleraceus, Hyparrhenia hirta, Bromus catharticus* and *Avena sativa*.
PCT Allocation Justification	**General:** PCT 483 is described in the VIS as being a mid-high to tall open woodland or woodland dominated by a Grey Box (*Eucalyptus moluccana*) x White Box (*Eucalyptus albens*) hybrid. Few other tree species are described as occurring, with Rough-barked Apple (*Angophora floribunda*) and Yellow Box (*Eucalyptus melliodora*) identified as occurring on footslopes and valley flats. These three tree species were all observed within the remnant woodland condition zone. **Location:** This PCT is described in the VIS as occurring on brown to black earth, chocolate loam to clay soils derived from basalt on hillslopes, hillcrests, footslopes and valley flats on rolling hills and low hills on the Merriwa Plain and lower southern slopes of the Liverpool Range in the upper Hunter Valley in the far south-eastern corner of the Brigalow Belt South Bioregion. The Development Footprint is located on the Merriwa Plain in the south-easter corner of the Brigalow Belt South Bioregion. **Community structure:** PCT 483 is described in the VIS as a grassy woodland. This description corresponds with the areas assigned to this PCT, although the highly disturbed areas which are described as the exotic dominated derived grassland condition zone are missing the canopy and shrub layers. **Species assemblage:** Characteristic canopy species for this PCT were observed, including Grey Box (*Eucalyptus moluccana*) x White Box (*Eucalyptus albens*) hybrid, Rough-barked Apple (*Angophora floribunda*) and Yellow Box (*Eucalyptus melliodora*). No non-characteristic species were recorded. The characteristic shrub species including *Eremophila debilis* were observed. Characteristic groundcovers observed include *Austrostipa aristiglumis, Cynodon dactylon, Calotis lappulacea, Einadia nutans* and *Geranium solanderi*.

PCT Name	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley
	Other PCTs considered: The following other PCTs mapped in the State Vegetation Type Mapping within the locality which were also considered included: PCT 1693 Yellow Box - Rough-barked Apple grassy woodland of the upper Hunter and Liverpool Plains, PCT 1695 Yellow Box grassy woodland on basalt soils of the upper Hunter and PCT 1696 Blakely's Red Gum - Rough-barked Apple shrubby woodland of central and upper Hunter. PCTS 1693 and 1695 were excluded as they do not contain *Eucalyptus moluccana*, *Eucalyptus albens* or the hybrid between these species. These species were not observed in the remnant woodland condition zone plot sampled, however are present as scattered trees within the Development Footprint. PCT 1693 is described as typically occurring on unconsolidated sediments which are not strongly associated with the areas of remnant woodland vegetation observed. PCT 1696 was excluded due to the lack of *Eucalyptus blakelyi* and *Eucalyptus crebra*. **PCT Description from the VIS:** PCT 483 is identified in the VIS as a mid-high to tall open woodland or woodland dominated by a Grey Box (*Eucalyptus moluccana*) x White Box (*Eucalyptus albens*) hybrid. Few other tree species occur with Rough-barked Apple (*Angophora floribunda*) and Yellow Box (*Eucalyptus melliodora*) occurring on footslopes and valley flats. Shrubs are absent or very sparse and include *Sclerolaena muricata, Sida trichopoda* and *Pimelea curviflora*. The ground cover is dense after rain but mid-dense to sparse in dry times. Grass species include *Austrostipa bigeniculata, Bothriochloa macra, Austrostipa aristiglumis, Elymus scaber* var. *scaber, Cynodon dactylon* and *Panicum queenslandicum* var. *queenslandicum*. The sedge *Cyperus gracilis* may be present. Forb species include *Boerhavia dominii, Oxalis perennans, Chamaesyce drummondii, Hibiscus trionum, Einadia nutans* subsp. *nutans, Asperula conferta, Rumex brownii, Mentha diemenica, Geranium solanderi* var. *solanderi* and *Calotis lappulacea*. This PCT is described as occurring on brown to black earth, chocolate loam to clay soils derived from basalt. Topographically this PCT occurs on hillslopes, hillcrests, footslopes and valley flats on rolling hills and low hills on the Merriwa Plain and lower southern slopes of the Liverpool Range in the upper Hunter Valley in the far south-eastern corner of the Brigalow Belt South Bioregion. It has been mainly cleared for agriculture and is threatened by fragmentation, weed invasion, tree dieback and intensive agricultural development of ground cover.
BC Act Status	Condition Zone 1 of this PCT corresponds with the 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 CEEC. Condition Zone 2 is typically dominated by exotic grasses and does not comprise a derived native grassland.
EPBC Act Status	One patch of this PCT within Condition Zone 1 corresponds to this TEC. This patch has 12 native species (excluding grasses) including one listed important species. The other areas of this PCT mapped do not have a predominantly native understorey. This patch of CEEC has been avoided and no longer falls within Development Footprint, as shown in **Figure 4.3**.

4.3 Threatened Ecological Communities

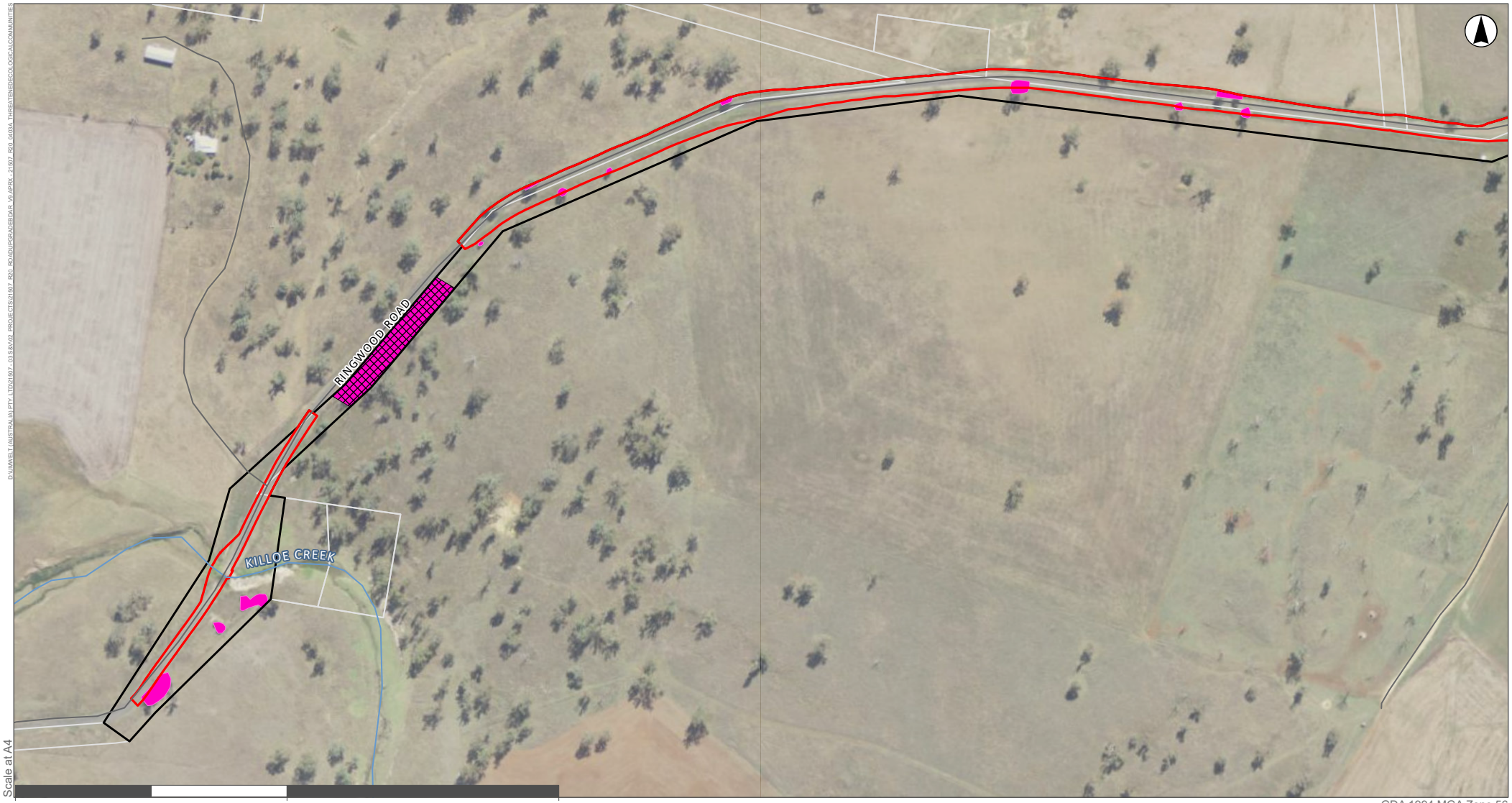
Two threatened ecological communities were observed within the Development Footprint during surveys:

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

Further details for these threatened ecological communities are provided in **Table 4.3** and their extent is mapped in **Figure 4.3**. The alignment of this TEC with the PCTs observed is further discussed in **Section 4.2** of this Report.

Table 4.3 TECs within the Development Footprint

TEC name	Profile ID (from TBDC)	Act and Listing Status	Associated PCTs and vegetation condition zones within the development footprint	Area (ha)
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	10837	Critically Endangered Ecological Community Listed under the BC Act	PCT 482 Condition Zone 1	0.06 ha
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	20392	Critically Endangered Ecological Community Listed under the EPBC Act	PCT 482 Condition Zone 1	0.00 ha



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Scale at A4

0 0.25 0.5 Kilometres

GDA 1994 MGA Zone 56

Legend

- Road
- Watercourse
- Property Boundaries
- Development Footprint
- Project Area
- EPBC Act TEC - White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands CEEC
- BC Act TEC - White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC

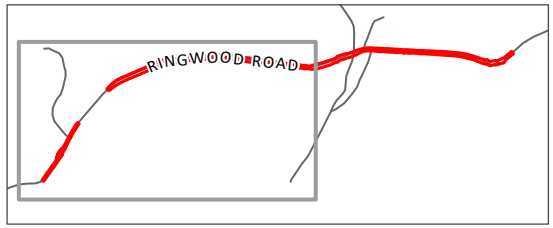


FIGURE 4.3 A

Threatened Ecological Communities

Image Source: ESRI Basemap (2022) **Data source:** NSW LPI (2022), NSW DSFI (2022); NPWS Estate (2022)

1:5,000
Scale at A4

0 0.25 0.5 Kilometres

GDA 1994 MGA Zone 56

Legend

- Road
- Watercourse
- Property Boundaries
- Development Footprint
- Project Area
- BC Act TEC - White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC

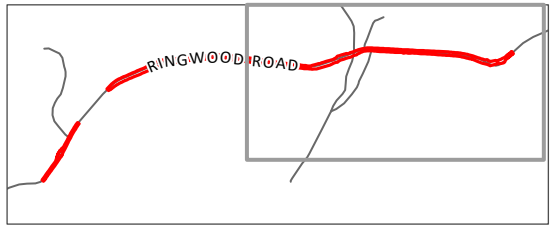


FIGURE 4.3 B

Threatened Ecological Communities

Image Source: ESRI Basemap (2022) **Data source:** NSW LPI (2022), NSW DSFI (2022); NPWS Estate (2022)

4.4 Vegetation Zones

A description of each vegetation Condition Zone within the Development Footprint is provided in **Section 4.2** of this Report. A map of the vegetation condition zones is provided in **Figure 4.2** and the details of each Condition Zone including area, patch size class and the BAM survey plots required and completed are provided in **Table 4.4**. Plot surveys for the Remnant Woodland condition zone of PCT 483 were not able to be practically completed within the Development Footprint due to the small extent of the impacted areas and the narrow width of the road reserve. One plot located outside of the Development Footprint was utilised to survey and assess the Remnant Woodland Condition Zone of PCT 483, the vegetation sampled was of the same PCT and was visually assessed as likely having a similar or higher vegetation integrity compared to the vegetation to be impacted within the Development Footprint.

Table 4.4 Vegetation Condition Zones and patch sizes

Vegetation Condition Zone ID	PCT ID number and name	Condition / other defining feature	Area (ha)	Patch size class (select multiple if areas of native vegetation are discontinuous)	No. vegetation integrity plots required	No. vegetation integrity plots completed	No. vegetation integrity plots used in assessment	Plot IDs of vegetation integrity plots used in assessment
1	483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Remnant Woodland	0.06	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	1	1	1	Plot 2 (note a 10x40 m plot was used for floristics and a 10x50 m plot was used for vegetation function values with the results multiplied by 2)
2	483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Exotic Dominated Grassland	2.07	☐ <5 ha ☐ 5–24 ha ☐ 25–100 ha ☒ >100 ha	2	3	3	Plot 1 Plot 3 Plot 4

4.5 Vegetation Integrity (Vegetation Condition)

4.5.1 Vegetation Integrity Survey Plots

Details on the number of BAM plots (floristic and vegetation integrity survey plots) required and completed for each vegetation condition zone, in accordance with Table 3 of the BAM, are provided in **Table 4.5**. The vegetation integrity plot survey locations are shown in **Figure 2.1** and the vegetation integrity plot survey data is provided in **Appendix C**.

4.5.2 Scores

The vegetation integrity condition scores for the BAM Plots completed are provided in **Table 4.5**. This table represents the combined scores from all plots completed for each vegetation condition zone, including the vegetation integrity score and the presence of hollow bearing trees.

Table 4.5 Vegetation Integrity Condition Scores

Vegetation zone No.	Vegetation zone description	Composition condition score	Structure condition score	Function condition score	Vegetation integrity score	Hollow bearing trees present?
1	PCT 483 Remnant Woodland	70.7	92.5	85	82.2	Yes
2	PCT 483 Exotic Dominated Grassland	11.4	4.8	15	9.3	No

4.5.3 Use of Benchmark Data

The V1.1 Benchmarks (https://www.lmbc.nsw.gov.au/bamcalc/app/assets/version1.1-benchmarks.csv) were utilised for this assessment in accordance with the current transitional arrangements for BAM C Cases in progress on 31 January 2023 (case opened 10/05/2022). Screenshots of the benchmark values used are provided in **Appendix E**.

5.0 Habitat Suitability for Threatened Species

5.1 Identification of Threatened Species for Assessment

5.1.1 Ecosystem Credit Species

The ecosystem credit species predicted to occur on or use the Development Footprint are identified in **Table 5.1**. Justification is provided for any species from the BAM-C automatically populated list excluded from assessment.

Table 5.1 Predicted Ecosystem Credit Species

Common Name	Scientific Name	Listing Status		Dual Credit Species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification for any Exclusions	Associated PCT and Condition Zone species retained within		Sensitivity to gain class
		BC Act	EPBC Act						PCT 483 Zone 1	PCT 483 Zone 2	
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	Yes	BAM-C	-	Yes	-	Y	Y	High
Little Lorikeet	*Glossopsitta pusilla*	V	-	No	BAM-C	-	Yes	-	Y	Y	High
Painted Honeyeater	*Grantiella picta*	V	V	No	BAM-C	Mistletoes present at a density of greater than five mistletoes per hectare	No	Habitat constraints not met	N	N	Moderate
White-throated Needletail	*Hirundapus caudacutus*	-	V	No	BAM-C	-	Yes	-	Y	Y	High
Turquoise Parrot	*Neophema pulchella*	V	-	No	BAM-C	-	Yes	-	Y	Y	High
Barking Owl	*Ninox connivens*	V	-	Yes	BAM-C	-	Yes	-	Y	Y	High

5.1.2 Species Credit Species

5.1.2.1 Predicted Flora Species Credit Entities

The flora species credit species predicted to occur on the Development Footprint are identified in **Table 5.2**. Only one species is predicted to occur and it has not been excluded from further assessment.

Table 5.2 Predicted Flora Species Credit Species

Scientific Name	Common Name	Listing Status		Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification if excluded from further assessment	PCT and Vegetation Condition Zone species associated with (Retained = Y/ Excluded = N)	
		BC Act	EPBC Act					PCT 483 Zone 1	PCT 483 Zone 2
Dichanthium setosum	Bluegrass	V	V	BAM - C	N/A	Yes	N/A	Y	Y

5.1.2.2 Predicted Fauna Species Credit Species

The fauna species credit species predicted to occur on the Development Footprint are identified in **Table 5.3**.

Justification is provided for any species from the BAM-C automatically populated list excluded from assessment. Geographic limitations, vagrant species, habitat constraints, degradation or lack of suitable microhabitats are the permitted reasons for excluding species credit species.

Table 5.3 Predicted threatened fauna species credit species

Scientific Name	Common Name	Listing Status		Dual Credit Species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification if excluded from further assessment	PCT and Vegetation Condition Zone species associated with (Retained = Y/ Excluded = N / Blank = not associated with PCT)	
		BC Act	EPBC Act						PCT 483 Zone 1	PCT 483 Zone 2
Anthochaera phrygia	Regent Honeyeater	CE	CE	Yes	BAM-C	As per mapped areas	No	Development Footprint is not located within mapped area	N	N
Aprasia parapulchella	Pink-tailed Legless Lizard	V	V	No	BAM-C	Rocky areas or within 50 m of rocky areas	No	Habitat constraints not met.	N	N
Delma impar	Striped Legless Lizard	V	V	No	BAM-C	-	No	Development Footprint is located outside of species natural distribution. Species is no longer recognised as occurring within the region.	N	N

Scientific Name	Common Name	Listing Status		Dual Credit Species	Sources	Habitat Constraints / Geographic Limitations	Species retained for further assessment?	Justification if excluded from further assessment	PCT and Vegetation Condition Zone species associated with (Retained = Y/ Excluded = N / Blank = not associated with PCT)	
		BC Act	EPBC Act						PCT 483 Zone 1	PCT 483 Zone 2
Ninox connivens	Barking Owl	V	-	Yes	BAM-C	Hollow bearing trees; Living or dead trees with hollows greater than 20 cm diameter and greater than 4 m above the ground.	No	No suitably sized hollow trees present and Development Footprint is too degraded	N	N
Phascolarctos cinereus	Koala	E	E	No	BAM-C		No	Development Footprint and surrounding landscape is too degraded to support this species due to the extent of historical clearing and extent of surrounding cultivated areas.	N	N

5.2 Presence of Candidate Species Credit Species

5.2.1 Threatened Flora Species

No threatened flora species were observed during surveys or are likely to occur within the Development Footprint.

A summary of the methods used and determination of presence for candidate threatened flora species credit species is provided in **Table 5.4**.

Table 5.4 Determining the Presence of Candidate Flora Species Credit species on the Development Footprint

Scientific Name	Common Name	Listing status		Method used to determine presence	Present?	Further assessment required?
		BC Act	EPBC Act			
Dichanthium setosum	Blue Grass	V	V	Targeted threatened species survey	No	No

5.2.2 Threatened Fauna Species

No threatened fauna species were observed during surveys or are likely to occur within the Development Footprint. All threatened fauna species have been excluded from a requirement for survey and further assessment.

5.3 Threatened Species Surveys

A summary of the targeted surveys completed for candidate threatened species is provided in **Table 5.5**, further details of the threatened species surveys completed, and guidelines applied are provided in **Section 2.3** and **Section 2.4** of this Report.

Table 5.5 Summary of Species Credit Surveys Completed

Scientific Name	Common Name	Threatened Flora Species Surveys			Present?	Further assessment required
		Survey Method	Timing of survey within recommender period?	Survey Effort		
Dichanthium setosum	Blue Grass	Parallel field traverses	☒ Yes December 2022	4.5 person hrs completed over 1 day by 1 person	No	No

5.4 Expert Reports and Use of More Appropriate Local Data

No expert reports were utilised in place of targeted surveys for the purposes of this assessment. This assessment has also not relied upon alternative data (more appropriate local data) to assess habitat suitability.

5.5 Area or Count, and Location of Suitable Habitat for a Species Credit Species (a Species Polygon)

5.5.1 Results for BC Act Listed Species Credit Entities

No threatened species listed within the BC Act were observed during surveys.

5.5.2 Results for BC Act Listed Ecosystem Credit Species

No ecosystem credit species listed within the BC Act were observed during surveys.

5.5.3 Results for EPBC Act Listed Species

No threatened or migratory species listed within the EPBC Act were observed during surveys.

5.6 SEPP (Biodiversity and Conservation) 2021

Chapters 3 and 4 of State Environmental Planning Policy (SEPP) (Biodiversity and Conservation) 2021 (the SEPP) contain provisions for assessing impacts to the Koala for Local Council assessed development applications.. This SEPP is not directly relevant to State Significant Development. Chapter 3 of the SEPP has been considered in the identification of potential Koala habitat and breeding habitat to support further assessment under State and Commonwealth legislation.

For RU1 Primary Production zoned land, Chapter 3 Koala Habitat Protection 2020 describes:

- Potential habitat as areas of native vegetation where trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.
- Core Koala habitat as area of land with a resident population of Koalas, evidenced by attributes such as breeding females, being females with young, and recent sightings of and historical records of a population.

This assessment of Koala habitat has used the Koala feed tree schedule itemised in both Schedule 1 and Schedule 3 of SEPP (Biodiversity and Conservation) 2021 as the latter provides a comprehensive list of preferred feed trees based on recent studies (OEH 2018a).

Three of the tree species listed in Schedule 3 of the SEPP have been recorded within the Project Area. These tree species represent 15% or greater of the total number of trees within any PCT in the Project Area and, as such, all PCTs across the Project Area represent potential Koala habitat. **Table 5.6** lists the Koala feed trees present within the Project Area.

Table 5.6 Koala Feed Tree Present within Project Area

Scientific Name	Common Name
Angophora floribunda	Rough-barked Apple
Eucalyptus albens*	White Box
Eucalyptus melliodora	Yellow Box

** A Eucalyptus albens x moluccana hybrid is likely present within the Project Area.*

Despite the Project Area containing suitable Koala use and feed tree species, due to the highly agricultural nature of land use general paucity of canopy within the surrounding area, the Project Area was considered too degraded to comprise suitable potential Koala habitat. In addition, a review of the BioNet Atlas of NSW Wildlife reveals no records of this species within 5 km of the Project Area, with one record within 20 km of the Project Area. This record is from 2002. As a result, the Project Area does not represent core Koala habitat as Koala was not recorded in the Project Area and Koalas have not been recorded nearby (within 5 km) within the last 18 years. No further provisions of Koala habitat protection in SEPP (Biodiversity and Conservation) 2021 apply.

6.0 Identifying Prescribed Impacts

Prescribed impacts are those that may affect biodiversity values in addition to, or instead of, impacts from clearing native vegetation. Clause 6.1 of the Biodiversity Conservation Regulation defines *Prescribed Impacts* as impacts of development on the following habitat of threatened species or ecological communities:

- karst, caves, crevices, cliffs and other geological features of significance
- rocks
- human made structures
- non-native vegetation
- the impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range
- the impacts of development on movement of threatened species that maintains their lifecycle
- the impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development)
- the impacts of wind turbine strikes on protected animals
- the impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.

An assessment which identifies the prescribed impacts which are likely to occur as a result of the proposed development are assessed in **Table 6.1**.

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.
Karst, caves, crevices, cliffs, rocks or other geological features of significance	☐Yes / ☒ No	There are no karst, caves, crevices, cliffs, rocks or other geological features of significance within the Development Footprint.	None identified.
Human-made structures	☒ Yes / ☐No	There are existing pipes for water flow under the existing road crossings. These pipes have a relatively small diameter, are typically under water and are considered to be not suitable for threatened species such as microbats.	None identified / do not provide suitable habitat.

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature.
Non-native vegetation	☒Yes / ☐No	Areas dominated by exotic vegetation, but assessed as native vegetation are present within the Development Footprint. These habitats are highly degraded.	None identified / do not provide suitable habitat.
Habitat connectivity	☒ Yes / ☐ No	The proposed road upgrade areas predominantly adjoin degraded agricultural areas. There is some remnant scattered canopy tree vegetation on the northern side of Killoe Creek which provides a potential habitat connectivity point. This area has already been fragmented by the existing road corridor.	None identified / unlikely to provide suitable habitat.
Waterbodies, water quality and hydrological processes	☒ Yes / ☐No	The culvert upgrade areas intersect Killoe Creek which is a 4th order watercourse and Bow River which is a 5th order watercourse. These watercourses are both part of the Goulburn River catchment. There are no estuaries or wetlands located within the Development Footprint.	None identified.
Wind turbine strikes (wind farm development only)	☐Yes / ☒ No	This assessment is not a wind farm development.	Not applicable.
Vehicle strikes	☐No / ☒ Yes	The Development Footprint is within an existing road easement and the works are likely to improve road safety and reduce the potential for vehicle strikes. There is a low potential for increased vehicle strikes to fauna, particularly during the construction phase.	Non identified.

7.0 Avoid and Minimise Impacts

7.1 Avoid and Minimise Direct and Indirect Impacts

7.1.1 Project Location

7.1.1.1 Location of Surface Works in Areas with No or Low Biodiversity Values

There is an approximately 1.8 km section of Ringwood Road to be widened and resealed between Bow River and Killoe Creek. These repairs will include 8m bitumen-sealed formation with a minimum of 500 mm unsealed shoulders. The horizontal and vertical alignment of the proposed road will ensure safe sight distance, safe movement of longer vehicles, and an improved road network for the users.

Two locations on Ringwood Road have been identified for upgrade to the water crossings at Bow River and Killoe Creek. The culvert upgrades will include:

- Installing culverts designed to accommodate two-way heavy vehicles, including B doubles and various farm machinery.
- Culvert width 7 m (3.5 m lane width) sealed carriageway with suitable guardrail and signage and associated drainage works.
- Stockpile site to be located on disturbed land within the road reserve in consultation with Upper Hunter Council.
- Temporary side track at both locations to facilitate access during construction.

All works are contained to the road reserve.

The works are location specific and are related to improvements of the existing road. The areas to be impacted are considered to have predominantly low biodiversity values and areas of higher biodiversity values including a larger patch of remnant woodland vegetation mapped as PCT 483 has been avoided as shown in **Figure 7.1a** and **Figure 7.1b**.

7.1.1.2 Location of Sub-Surface Works in Areas with No or Low Biodiversity Values

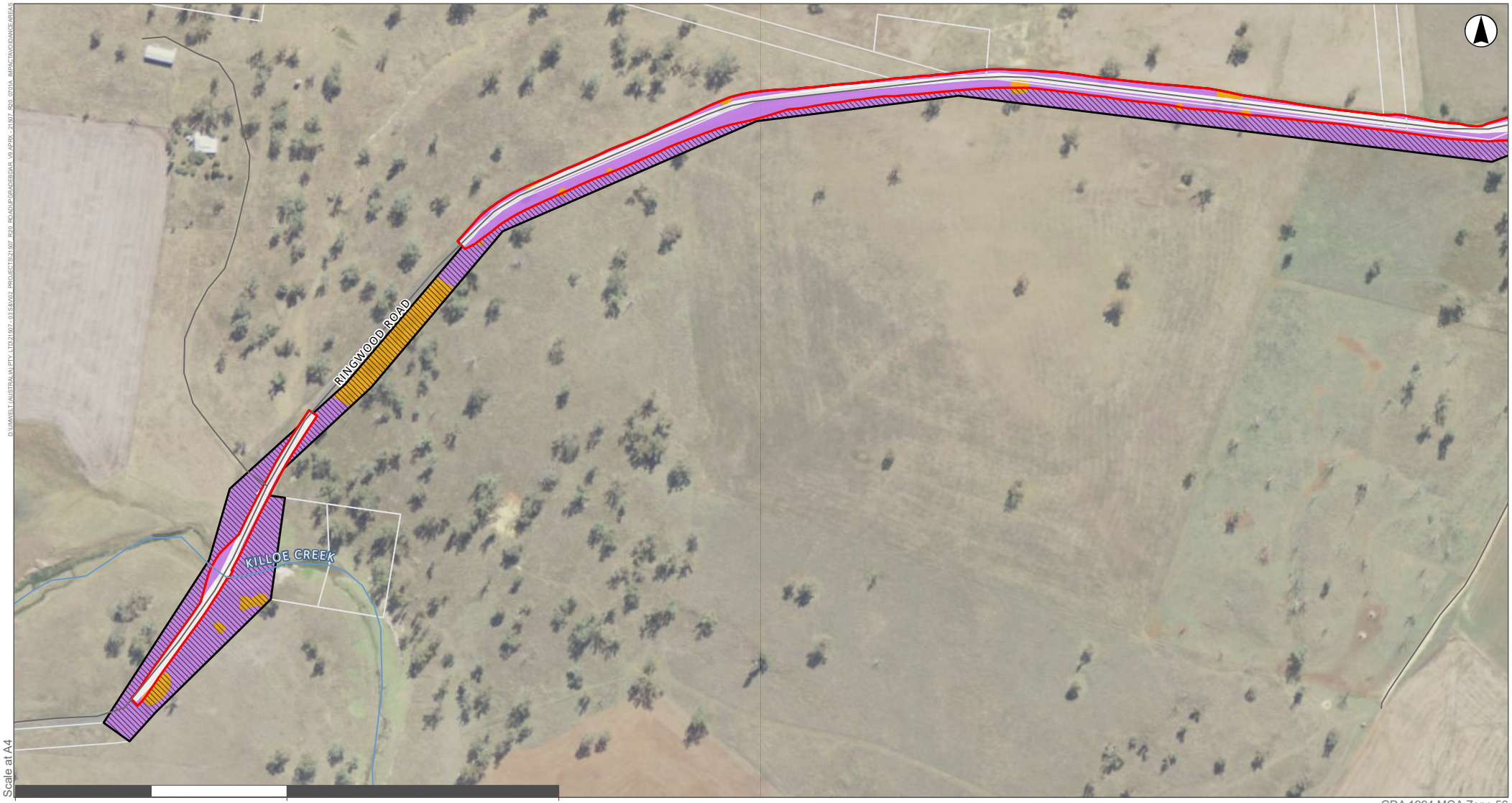
No sub-surface works are proposed.

7.1.1.3 Avoidance of Wildlife Corridors

The proposed road upgrade areas predominantly adjoin degraded agricultural areas. There is some remnant scattered canopy tree vegetation on the northern side of Killoe Creek which provides a potential habitat connectivity point, however this area has already been fragmented by the existing road and the works are unlikely to impact substantially on the existing connectivity values.

7.1.1.4 Location of Works to Minimise Interactions with Threatened Entities

No threatened species were observed during surveys.



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Scale at A4

0 0.25 0.5 Kilometres

GDA 1994 MGA Zone 56

Legend

- Road
- Watercourse
- Property Boundaries
- Development Footprint
- Project Area
- Impact Avoidance Areas

Plant Communities

- PCT 483 Condition Zone 1 Remnant Woodland
- PCT 483 Condition Zone 2 Exotic Dominated Grassland
- Cleared Land

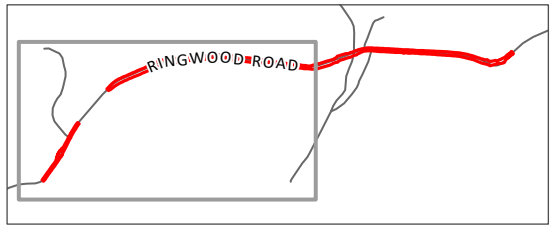

FIGURE 7.1 A

Extent of Box Gum Woodland

Image Source: ESRI Basemap (2022) **Data source:** NSW LPI (2022), NSW DSFI (2022); NPWS Estate (2022)

1:5,000
Scale at A4

0 0.25 0.5 Kilometres

GDA 1994 MGA Zone 56

Legend

- Road
- Watercourse
- Property Boundaries
- Development Footprint
- Project Area
- Impact Avoidance Areas

Plant Communities

- PCT 483 Condition Zone 1 Remnant Woodland
- PCT 483 Condition Zone 2 Exotic Dominated Grassland
- Cleared Land

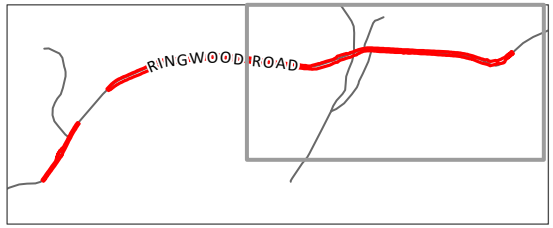

FIGURE 7.1 B

Extent of Box Gum Woodland

Image Source: ESRI Basemap (2022) **Data source:** NSW LPI (2022), NSW DSFI (2022); NPWS Estate (2022)

7.1.1.5 Location of Works to Avoid Impacts on Waterbodies and Hydrological Processes

The culvert upgrades have potential to disturb habitats within Killoe Creek and Bow River, however appropriate environmental controls will be implemented to mitigate potential adverse impacts. The location of the works to avoid watercourses is not feasible.

7.1.1.6 Alternative Routes Considered

There are no feasible alternative routes available for the heavy vehicle transport route. The proposed Goulburn River Solar Farm could be accessed by heavy vehicles from the south=-western side of the Goulburn River National Park via Wollara Road, however this would likely require more works than currently proposed for the access from the east.

7.1.1.7 Alternative Sites within the Subject Land Considered

There are no alternative sites which would further reduce impacts to biodiversity features as the current works are aligned or located directly adjacent to the existing road.

7.1.1.8 Alternative Project Locations

Alternative Project locations for the Goulburn River Solar Farm have been discussed in a separate BDAR (Umwelt 2023).

7.1.2 Project Design and Planning

7.1.2.1 Alterations to the Development Footprint

The footprint of the proposed works reflects a need to increase the road width and provide necessary upgrades to the existing culverts for road safety. Further refinements can be investigated post approval during the detailed design phase.

7.1.2.2 Design Measures

The proposed works have been designed within the alignment of the existing road corridor and will minimise impacts through the confinement of the works to within this footprint.

7.1.2.3 Location of Ancillary Facilities in Areas with No Biodiversity Values, or in Areas of Poorest Habitat

Stockpiles and other ancillary facilities associated with the construction phase of the proposed works will be located within existing disturbed areas. These locations would be determined via consultation with Upper Hunter Shire Council as the road asset owner/landowner.

7.1.2.4 Location of Ancillary Facilities to Avoid Habitat of Threatened Entities

Stockpiles and other ancillary facilities associated with the construction phase of the proposed works will be located within existing disturbed areas to avoid habitat of threatened entities.

7.1.2.5 Actions that Provide for Ecological Rehabilitation, Restoration and/or Maintenance or Retained Areas

Any retained areas would be within an existing road reserve and ecological rehabilitation of these areas is not likely to occur. Ecological rehabilitation will be limited to the replanting of disturbed areas, where appropriate.

7.1.2.6 Alternative Modes or Technologies Considered

Alternative modes or technologies are not of relevance to the proposed development.

7.1.2.7 Project Design Constraints

The project design is primarily constrained by the location of the existing road reserve.

7.2 Avoid and Minimise Prescribed Impacts

Prescribed Impacts are additional impacts which require assessment; however, they are not impacts which require consideration when calculating the number and classes of biodiversity credits required. Prescribed impacts for this Project are identified in **Section 6.0** of this Report. The main prescribed impacts with potential to result from the Project include:

- Impacts to habitat connectivity.
- Impacts to waterbodies, water quality and hydrological processes.
- Vehicle strikes.

A consideration of impact avoidance and minimisation for prescribed impacts is provided as follows.

7.2.1 Project Location

7.2.1.1 Habitat Connectivity

The proposed road upgrade areas predominantly adjoin degraded agricultural areas. There is some remnant scattered canopy tree vegetation on the northern side of Killoe Creek which provides a potential habitat connectivity point, however this area has already been fragmented by the existing road and the works are unlikely to impact substantially on the existing connectivity values. The Project location cannot be feasibly altered to further avoid prescribed impacts associated with habitat connectivity.

7.2.1.2 Hydrological Impacts

The project location cannot be feasibly altered in response to potential prescribed impacts associated with hydrology.

7.2.1.3 Vehicle Strikes

The Development Footprint is within an existing road easement and the works are likely to improve road safety and reduce the potential for vehicle strikes. The project location cannot be feasibly altered to further avoid prescribed impacts associated with vehicle strikes.

7.2.2 Project Design

7.2.2.1 Habitat Connectivity

The proposed road upgrade areas predominantly adjoin degraded agricultural areas. There is some remnant scattered canopy tree vegetation on the northern side of Killoe Creek which provides a potential habitat connectivity point, however this area has already been fragmented by the existing road and the works are unlikely to impact substantially on the existing connectivity values. The project design cannot be feasibly altered to further avoid prescribed impacts associated with habitat connectivity.

7.2.2.2 Hydrological Impacts

The road upgrades would be designed with the following design criteria to avoid and minimise impacts associated with alteration to hydrological processes:

- All waterway crossings would be designed and constructed in compliance with the Department of Primary Industries, Office of Water, Guidelines for riparian corridors on waterfront land and Guidelines for watercourse crossings on waterfront land.
- Appropriate scour protection would be designed for the road repairs and culvert upgrades.
- The road and culvert upgrades would be designed to minimise afflux to an acceptable level.
- The culverts would be designed to accommodate a 5% AEP event.
- Culverts to be constructed at existing invert levels or similar to maintain existing low flow conveyance in channel.

If the upgrades are designed to minimise impacts/afflux to acceptable levels and the design of appropriate erosion and scour protection is undertaken, it is expected that any hydrological impacts as a result of the upgrades works would be negligible. Furthermore, with the implementation of appropriate mitigation measures during construction and operation hydrological impacts as a result of the upgrades works would be negligible. These are further addressed within the EIS.

7.2.2.3 Vehicle Strikes

The Development Footprint is within an existing road easement and the works are likely to improve road safety and reduce the potential for vehicle strikes. The project design cannot be feasibly altered to further avoid prescribed impacts associated with vehicle strikes. Vehicle

7.3 Other Measures Considered

The proposed works are considered to be a mandatory requirement for the project to proceed and there are no other feasible options. The community will be able to utilise and benefit from the improvement to road safety.

Another option considered within this report is obtaining access for heavy vehicles from south-west of the proposed Goulburn River Solar Farm, however this would likely result in a longer travel time and require far more extensive upgrades to the existing road infrastructure and as such is not a preferred option.

7.4 Summary of Measures to Avoid and Minimise Impacts

A summary of the measures proposed to avoid and minimise direct, indirect and prescribed impacts associated with the proposal is provided in **Table 7.1**.

Table 7.1 Avoidance and Minimisation Measures for Direct, Indirect and Prescribed Impacts

Action	Outcome	Timing	Responsibility
Location and design of works in existing disturbed areas where possible	The proposed works have been aligned to existing disturbed areas where possible and are within the existing road reserve.	Project design	Project Ecologist, Planning Team and Proponent
Workforce education and training	Environmental awareness for workforce.	Pre-construction and during construction and operation	Site Manager
Implement Construction Environmental Management Plan (CEMP)	Management and minimisation of potential environmental impacts.	Project construction	Site Manager
Implementation of vegetation protection zones for areas to be retained	Protect retained habitats.	During construction phase	Project Ecologist and Site Manager
Ecologist pre-clearance surveys and supervision of works	Minimisation of impacts to local fauna and their habitats through identification of fauna present and management to minimise harm.	Construction / site clearing phase	Project Ecologist and Site Manager
Fencing and access control	Site access controls and temporary fencing or similar would be implemented to prevent unauthorised site access and disturbance.	Construction	Site Manager
Erosion and sedimentation control	Minimise erosion and sedimentation within the site and downstream habitats through installation and maintenance of erosion and sediment controls and water quality infrastructure.	Construction	Site Manager
Weed management	Prevent weed incursions and spread.	During construction	Site Manager

8.0 Impact Assessment

8.1 Direct Impacts

8.1.1 Residual Direct Impacts

The development footprint which would be impacted by the proposal is mapped in **Figure 8.1**. **Table 8.1** summarises the extent of proposed residual direct impacts to plant community types and threatened entities observed or assumed to be present.

Table 8.1 Summary of Residual Direct Impacts

Direct impact	BC Act status	EPBC Act status	Potential SAII entity	Project phase/timing of impact	Extent (ha)
PCT 483 Condition Zone 1 Remnant Woodland	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community	Extents of PCT 483 within the Development Footprint do not meet the necessary condition requirements to be considered CEEC under the EPBC Act	Yes	Site clearing	0.06
PCT 483 Condition Zone 2 Exotic Dominated Grassland	This condition zone contains exotic dominated grassland areas which are likely to have historically supported the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC, however are considered to too degraded to be identifiable as part of this CEEC.	Not listed	No	Site clearing	2.07

1:5,000
Scale at A4

0 0.25 0.5 Kilometres

GDA 1994 MGA Zone 56

Legend
- Road
- Watercourse
- Property Boundaries
- Final Impact Area
- Project Area
- Areas Requiring an Offset

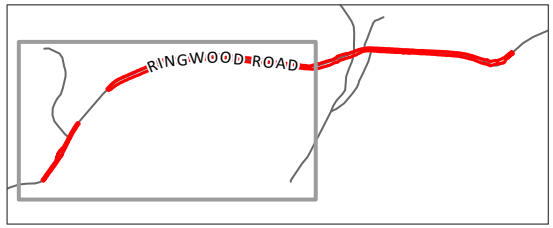

FIGURE 8.1 A
Final Impact Areas

Image Source: ESRI Basemap (2022) **Data source:** NSW LPI (2022), NSW DSFI (2022); NPWS Estate (2022)

1:5,000
Scale at A4

0 0.25 0.5 Kilometres

GDA 1994 MGA Zone 56

Legend
- Road
- Watercourse
- Property Boundaries
- Final Impact Area
- Project Area
- Areas Requiring an Offset

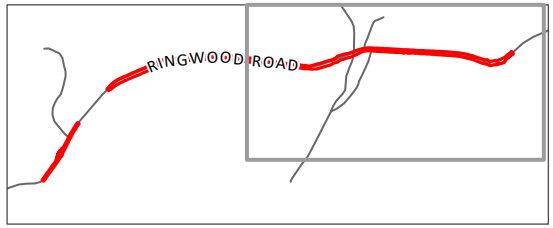

FIGURE 8.1 B
Final Impact Areas

Image Source: ESRI Basemap (2022) **Data source:** NSW LPI (2022), NSW DSFI (2022); NPWS Estate (2022)

8.1.2 Change in Vegetation Integrity Score

For each vegetation zone the change in vegetation integrity is based on the development impacting to zero during construction. There are no vegetation integrity scores above zero after development and there would be no management actions required to maintain any remaining vegetation as it has been assumed that impact would occur to all vegetation within the vegetation zones.

Table 8.2 Impacts to Vegetation Integrity

PCT and Vegetation Condition Zone	Management zone	Area (ha)	Before development				After development				Change in VI score
			Composition	Structure	Function	VI score	Composition	Structure	Function	VI score	
PCT 483 Condition Zone 1 Remnant Woodland	Impact Footprint	0.06	70.7	92.5	85	82.2	0	0	0	0	-82.2
PCT 483 Condition Zone 2 Exotic Dominated Grassland	Impact Footprint	2.07	11.4	4.8	15	9.3	0	0	0	0	-9.3

8.2 Indirect Impacts

Table 8.3 summarises the extent of the proposed residual indirect impacts to plant community types and threatened entities observed or assumed to be present within the development footprint.

Table 8.3 Summary of Residual Indirect Impacts

Indirect impact	Threatened Entity Impacted	Project Impact Intensity	Frequency / Duration	Project phase/ timing of impact	Likelihood and consequences
Connectivity and corridors	Ecosystem credit species retained for assessment in **Table 5.1**.	Low	One-off / Ongoing	Ongoing	No substantial impact or consequence likely.
Light spill impacts	Ecosystem credit species retained for assessment in **Table 5.1**.	Nil	N/A	N/A	Road upgrade to occur during standard construction hours. No night work is required.
Noise and vibration impacts	Ecosystem credit species retained for assessment in **Table 5.1**.	Low	Frequent / short term	During construction works	Likely to occur during works, may reduce the suitability of the adjoining areas for fauna species temporarily.
Air quality impacts	Ecosystem credit species retained for assessment in **Table 5.1**.	Low	Infrequent / short term	During construction works	Likely to occur during works, may reduce the suitability of the adjoining areas for fauna species or reduce photosynthetic function of flora species due to dust during works.
Water impacts	Non identified.	Low	Infrequent / short term	During construction works	Road upgrades would be designed to avoid and minimise impacts associated with alterations to hydrological processes. Should road upgrade be appropriately designed, it is expected that any hydrological impacts as a result of the upgrades works would be negligible.
Weed invasion	Ecosystem credit species retained for assessment in **Table 5.1** and retained areas of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC.	Low	Infrequent / short term	During construction works	The works have a moderate potential to spread weeds during works. Consequences are likely to not be substantial as high weed cover is already present.

8.3 Prescribed Impacts

Prescribed impacts associated with the proposal are identified in **Section 6.0** of this report and are further documented below.

8.3.1 Human Made Structures

8.3.1.1 Nature and Extent

There are existing small diameter pipes under the Bow River and Killoe Creek road crossings and would be replaced during works. These pipes do not provide habitat for fauna species.

8.3.1.2 Duration

This is likely to be one-off, permanent impact.

8.3.1.3 Consequences

No threatened species are likely to utilise these habitats and no significant consequences are predicted to occur.

8.3.2 Non-Native Vegetation

8.3.2.1 Nature and Extent

Non-native vegetation has been assessed against PCT 483 as a low cover of native species is present. Areas dominated by exotic vegetation to be impacted include 4.75 ha within the Development Footprint.

8.3.2.2 Duration

This is likely to be one-off, permanent impact.

8.3.2.3 Consequences

No substantial impacts to threatened biodiversity is likely to occur.

8.3.3 Habitat Connectivity

8.3.3.1 Nature and Extent

The proposed road upgrade areas predominantly adjoin degraded agricultural areas. There is some remnant scattered canopy tree vegetation on the northern side of Killoe Creek which provides a potential habitat connectivity point, however this area has already been fragmented by the existing road and the works are unlikely to impact substantially on the existing connectivity values. The project location cannot be feasibly altered to further avoid prescribed impacts associated with habitat connectivity.

8.3.3.2 Duration

This is likely to be one-off, permanent impact.

8.3.3.3 Consequences

There are not likely to be any predictable or substantial consequences associated with impacts to existing habitat connectivity.

8.3.4 Waterbodies, Water Quality and Hydrological Processes

8.3.4.1 Nature and Extent

The road upgrades would be designed in accordance with design criteria to avoid and minimise impacts associated with alteration to hydrological processes as detailed in **Section 7.2.2.2** above. If the upgrades are designed to minimise impacts/afflux to acceptable levels and the design of appropriate erosion and scour protection is undertaken, it is expected that any hydrological impacts as a result of the upgrades works would be negligible.

8.3.4.2 Duration

Watercourse impacts would occur during construction and operation.

8.3.4.3 Consequences

If the upgrades are designed to minimise impacts/afflux to acceptable levels and the design of appropriate erosion and scour protection is undertaken, it is expected that any hydrological impacts as a result of the upgrades works would be negligible.

8.3.5 Vehicle Strikes

The number of vehicle movements would temporarily increase during the Project's construction period. This may temporarily increase vehicle strikes during this period. Vehicle movement during operational phase is not expected to increase, therefore, additional vehicle strikes are unlikely during this phase of the Project.

8.4 Mitigating Residual Impacts – Management Measures and Implementation

The following management measures are proposed to mitigate the residual impacts (direct, indirect and prescribed) associated with the Project. The impact mitigation measures proposed for residual impacts are also further summarised in **Table 8.4**, with implementation details provided in **Table 8.5**.

8.4.1 Workforce Education and Training

The ability of non-ecological personnel to identify key threatened species or key ecological threats can help to mitigate impacts on threatened species. The following mitigation actions would be implemented for the Project to develop a greater understanding and awareness of biodiversity issues in non-ecological trained personnel:

- Inductions for the workforce would be undertaken to make them aware of the key ecological issues present in the Development Footprint to aid in their understanding of their role and responsibilities in the protection and/or minimisation of impacts to all native biodiversity.

- Inductions would identify the location of sensitive flora and fauna, including any defined exclusion/no-go areas, and the policies being implemented to protect the biodiversity values of such areas.
- Responsibilities with respect to weed management and biosecurity.

8.4.2 Implementation of Vegetation Protection Zones for Areas to be Retained

During construction, temporary exclusion fencing or other form of suitable marking measure, would be used to demarcate vegetation in locations where necessary to avoid accidental damage to areas of vegetation to be retained. Access control is an important feature in protecting and demarcating areas outside the Development Footprint from vehicle access, human access, and accidental disturbance. Proposed measures include:

- appropriate temporary fencing (or other form of suitable marking measures) and signposting of areas to prevent the uncontrolled entry of people, accidental disturbance and to minimise vehicular and human traffic
- clear and visible signage is to be appropriately located to inform the workforce and others of the restricted access or otherwise of areas outside the Development Footprint
- worker education and awareness of exclusion areas, including as delivered through site induction information.

8.4.3 Ecologist Pre-Clearance Surveys and Supervision of Works

Pre-clearance surveys and tree felling supervision would be undertaken by an appropriately qualified and experienced ecologist to minimise potential impacts to fauna species, particularly hollow-dependent fauna. A detailed tree-felling supervision protocol is to be developed and documented as part of the CEMP for the works.

8.4.4 Erosion and Sedimentation Control

Erosion and sediment controls are to be implemented for the works and broadly include:

- minimising the area of disturbance (as far as practicable)
- diverting run-off water around disturbed areas
- installation and ongoing maintenance of temporary erosion and sediment controls (e.g., sediment fencing) throughout the duration of the works
- stabilisation (i.e., landscaping and revegetation) of all disturbed areas.

Additional mitigation measures relating to erosion and sediment control are detailed within the EIS.

8.4.5 Weed Management

Weed species could be introduced to the Development Footprint or surrounding habitats with imported materials, on vehicles and mobile plant, or could invade naturally through removal of native vegetation and the creation of a suitable growth medium. The presence of weed species has the potential to decrease the value of vegetation for native species, particularly threatened species.

Weed management controls would include:

- The survey and treatment of invasive weed species prior to the disturbance of topsoil within the development footprint to prevent exacerbation of the outbreak and / or the spread of the subject species to previously unaffected areas within the Development Footprint.
- Ongoing environmental inspections and treatment of outbreaks of invasive weed species as required within the Development Footprint during construction.
- All machinery and equipment would be cleaned thoroughly prior to entering the Development Footprint. Cleaning must include the removal of all mud and plant matter (inside and out), followed by washing with high pressure water.

8.4.6 Preparation and Implement of Construction Environmental Management Plan

A CEMP would be prepared for the Project to document the environmental impact mitigation, performance targets and monitoring requirements for the construction phase of the project.

Table 8.4 Summary of Proposed Mitigation and Management Measures for Residual Impacts (Direct, Indirect, and Prescribed)

Mitigation measure	Method/technique	Timing	Frequency	Responsibility	Likely efficacy
Workforce education and training	Environmental awareness for construction and operational site workers	Construction and operation	For all new contractors and employees as part of the general site induction	Site Manager	Measure is likely to achieve intended outcome
Implementation of vegetation protection zones for areas to be retained	Temporary delineation of retained vegetation.	Construction / site clearing	Prior to and during clearing and construction works	Site Manager and Project Ecologist	Measure is likely to achieve intended outcome
Ecologist pre-clearance surveys and supervision of works	Minimisation of impacts to local fauna and their habitats through identification of fauna present and management to minimise harm.	Minimisation of impacts to local fauna and their habitats through identification of fauna present and management to minimise harm	Prior to and during site clearing	Site Manager and Project Ecologist	Measure is likely to achieve intended outcome
Erosion and sedimentation control	Installation and maintenance of appropriate erosion and sediment controls and work practices.	Prior to and during works	Temporary erosion and sediment controls would be installed prior to commencement of construction and maintained for the duration of the works	Site Manager	Measure is likely to achieve intended outcome
Weed management	Targeted spraying to suppress new weed invasions	All stages of the development	As needed	Site Manager / Project Ecologist	Measure is likely to achieve intended outcome
Preparation and implementation of CEMP	Develop plan to document and coordinate environmental mitigation measures during construction works.	To be prepared prior to the commencement of works and implemented for all construction works	During works	Upper Hunter Shire Council	Measure is likely to achieve intended outcome

Implementation details for the proposed impact mitigation and management measures are provided in **Table 8.5.**

Table 8.5 Implementation Details for Proposed Impact Mitigation and Management Measures

Measure/action	Monitoring and evaluation strategy	Performance criteria	Adaptive management threshold	Adaptive management response
Workforce education and training	Completion and maintenance of a site induction register.	Induction of all construction workers.	Failure of Site manager to induct workers.	Suspension of the relevant works until construction workers are inducted.
Implementation of vegetation protection zones for areas to be retained	Monitoring to be undertaken by the Project Ecologist prior to commencement.	Protection of retained vegetation and habitats.	Breach of vegetation protection zones / damaged to retained habitats.	Suspension of the relevant works until appropriate protection measures are implemented and appropriate remedial actions to remedy any adverse impacts are commenced.
Ecologist pre-clearance surveys and supervision of works	Reporting on preclearance surveys and works supervision to be undertaken by Project Ecologist.	Completion of proposed works.	Completion of clearing works without project ecologist supervision.	Breaches to be reported in annual compliance reporting to DPE.
Erosion and sedimentation control	Monitoring to be undertaken in accordance with requirements of CEMP.	Temporary erosion and sediment controls to be installed prior to works.	Monitoring detects lack or failure of required temporary or permanent erosion and sediment controls.	Erosion and sediment control issues are to be rectified or altered to improve.
Weed management	Monitoring to be undertaken in accordance with requirements of CEMP.	Weed growth to be continually suppressed within the development footprint.	Monitoring detects increasing weed infestations which are not being suppressed.	Alternative methods or herbicides to be used to achieve success.
Preparation and implementation of CEMP	Implementation to be supervised by Project Ecologist or suitable environmental consultant with regular reporting to DPE during construction.	Completion of all proposed environmental protection works and monitoring inspections.	Monitoring detects breach or failure to implement CEMP.	Breach to be included in annual compliance reporting to DPE.

8.5 Adaptive Management Strategy for Uncertain Impacts (Where Relevant)

It is considered that the potential impacts associated with the proposal are predictable and known. Adaptive strategies for impact mitigation measures are provided in **Table 8.5**. Further adaptive management strategies would be provided in a future CEMP which would be prepared for the Project.

9.0 Serious and Irreversible Impacts

9.1 Assessment for Serious and Irreversible Impacts on Biodiversity Values

The determination of a serious and irreversible impact on biodiversity values is to be made by the decision maker in accordance with the principles set out in the BC Regulation 2017. Under Clause 6.7 (2) of the BC Regulation 2017, an impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct because of one of the following four principles:

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

The proposed works would impact on one serious and irreversible impact (SAII) entity, the critically endangered ecological community, 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. This CEEC is listed under Principle 1 and 2 above and is mapped in **Figure 4.3** of this Report.

9.1.1 Additional Impact Assessment Provisions for TECs at Risk of an SAII

9.1.1.1 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

The additional impact assessment provisions for threatened ecological communities at risk of an SAII have been addressed for the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community (Box Gum Woodland CEEC) in **Table 9.1**. The location of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC within the Development Footprint is shown in **Figure 4.3**. This ecological community is listed as critically endangered under the BC Act and the EPBC Act.

Table 9.1 SAII Impact Assessment – Box White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CECC

Response to BAM Section 9.1.1 Criteria
1. The action and measures taken to avoid the direct and indirect impact on the TEC at risk of an SAII (or reference to where these have been addressed in the relevant section of the BDAR).
The actions and measures proposed to avoid direct and indirect impacts are documented in **Section 7.0** of this Report.
2. The assessor must consult the TBDC and/or other sources to report on the current status of the TEC including: **a. Evidence of reduction in geographic distribution (Principle 1, clause 6.7(2)(a) BC Regulation) as the current total geographic extent of the TEC in NSW** **AND** **the estimated reduction in geographic extent of the TEC since 1970 (not including impacts of the proposal)** **b. The extent of reduction in ecological function for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes (Principle 2, clause 6.7(2)(b) BC Regulation) indicated by:** **i. Change in community structure** **ii. Change in species composition** **iii. Disruption of ecological processes** **iv. Invasion and establishment of exotic species** **v. Degradation of habitat** **vi. Fragmentation of habitat** **c. Evidence of restricted geographic distribution (Principle 3, clause 6.7(2)(c) BC Regulation), based on the TEC's geographic range in NSW according to the:** **i. extent of occurrence** **ii. area of occupancy** **iii. number of threat defined locations.** **d. Evidence that the TEC is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation).**

Response to BAM Section 9.1.1 Criteria
The TBDC has been reviewed in relation to the information available for the Box Gum Woodland CEEC. Additional sources relied upon are referenced within the text below. **a.** The current extent of the Box Gum Woodland CEEC and the estimated reduction in the geographic extent since 1970 is not available in the TBDC. <u>Threatened Species Scientific Committee</u> An assessment completed by TSSC (2006) and reproduced by Tozer and Simpson (2020) estimate that the pre-1750 area of the Box Gum Woodland CEEC was 3,717,366 ha, which has been reduced to a current extent in 2020 of 250,729 ha. This represents a 93% reduction since 1750 and represents the existing intact woodland components of the ecological community. A much larger extent of the derived native grassland component of the community is expected to remain. <u>State Vegetation Type Map</u> Umwelt has utilised the current available State Vegetation Type Mapping (SVTM) which identifies an estimate of the per 1750 and current extent of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland using the best currently available mapping. The SVTM pre-1750 area of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC is between 1,895,058 ha and 2,403,693 ha and the current SVTM extent of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland is between 1,267,603 ha and 1,639,571 ha. The variance in the SVTM upper estimate is due to some mapped PCTs being identified as only partly being associated with the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC. Based on the STVM there has been a 33.1-31.75 % reduction in White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland since 1750. <u>Annual Loss and Reduction in Extent Since 1970</u> Tozer and Simpson (2020) have identified that the loss of the woodland component of Box Gum Woodland CEEC between 2009 and 2019 was 6653 ha or 665.3 ha per annum distributed disproportionately between years. Using this figure, an estimate of the loss over the 1970 to 2020 period of 33,265 ha of the woodland component of the CEEC has been obtained. However, it is considered the rate of loss prior to 2009 is likely to have been much greater than 550 ha per annum due to a non-linear rate of clearing attributed to less legislative restrictions protecting Box Gum Woodland prior to its listing. **b.** The following information has been obtained from the Conservation Assessment of the Box Gum Woodland CEEC prepared by Tozer and Simpson (2020). <u>Changes in community structure</u> In relation to community structure there are essentially no remaining areas that are fully intact and most of the remaining extent has lost its understory, been invaded by exotic species, lost entire suites of species or lost its structure in terms of the loss of tree, shrub and/or ground layers.

Response to BAM Section 9.1.1 Criteria
Changes in species composition Species composition has been adversely affected by degradation and fragmentation which has caused the loss of suites of species such as understorey components or faunal components such as reptiles, mammals and/or woodland birds. The species lost are sometimes replaced by more common species such as aggressive noisy miners, exotic flora or monocultures of native grasses. Disruption of ecological processes The ecological community has undergone or is likely to undergo within a time frame appropriate to the life cycle of the habitat characteristics of its component species a very large disruption of biotic processes or interactions. The changes have been such that reestablishment of the ecological processes, species composition and community structure of the original ecological community is not likely to be possible on a broad scale. Invasion and establishment of exotic species Weeds have invaded most of the remaining areas of the original pre-1750 extent of this ecological community and result in continuing detrimental change. Extensive areas have experienced elevated soil nitrogen as a result of the application of chemical fertilisers, which is associated with the invasion of weeds and eventual conversion of native to exotic pasture. Degradation of habitat The ecological community continues to be degraded at both the patch and landscape scale. This ongoing modification, while not necessarily leading to the destruction of all elements of the ecological community, threatens it with extinction. Cumulatively, the disruption of biotic processes and interactions caused by the implementation of management for agricultural production is very severe and less than 10% of the original distribution of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland is likely to have avoided the long-term impacts of pastoralism. Fragmentation of habitat The ecological community has been extensively cleared throughout its range and intact remnants are typically small, isolated, highly fragmented and occur in predominantly cleared landscapes and exhibit highly modified understoreys. **c.** The extent of occurrence of Box Gum Woodland throughout its entire range in Australia is identified by Tozer and Simpson (2020) as 702,800 km^2, this is likely to predominantly include areas with an intact tree layer. The extent of occurrence within NSW is not identified in the TBDC or separately assessed by Tozer and Simpson (2020).

Response to BAM Section 9.1.1 Criteria
The current geographic extent of this CEEC across its range is estimated by Tozer and Simpson (2020) (reproduced from TSSC 2006) as 576,654 ha, which includes an area of occupancy of 250,729 ha within NSW. This estimate does not include the derived native grassland component of the ecological community. It is also considered that the current extent of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland provided by Tozer and Simpson (2020) is an underestimate based on the current SVTM mapping which maps between 1,267,603 ha and 1,639,571 ha within NSW. The variance in the SVTM estimate is due to the upper limit including some PCTs which are described as only partly being associated with the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC. No threat defined locations are specifically identified in the TBDC profile, however the ecological community is listed under the BC Act as critically endangered across its distribution. **d.** This principle is not applicable to the Box Gum Woodland CEEC. The ecological community does respond to management, some successful management measures are outlined in the document titled 'A Guide to Managing Box Gum Grassy Woodlands' (Rawlings, Freudenberger and Carr 2010). While not directly relevant to the Project the following management actions are also listed within the TBDC: • Undertake control of rabbits, hares, foxes, pigs and goats (using methods that do not disturb the native plants and animals of the remnant). • Manage stock to reduce grazing pressure in high quality remnants (i.e., those with high flora diversity or fauna habitat). • Do not harvest firewood from remnants (this includes living or standing dead trees and fallen material). • Leave fallen timber on the ground. • Erect on-site markers to alert maintenance staff to the presence of a high-quality remnant or population of a threatened species. • Encourage regeneration by fencing remnants, controlling stock grazing and undertaking supplementary planting, if necessary. • Undertake weed control (taking care to spray or dig out only target species). • Protect all sites from further clearing and disturbance. • Ensure remnants remain connected or linked to each other; in cases where remnants have lost connective links, re-establish them by revegetating sites to act as steppingstones for fauna, and flora (pollen and seed dispersal). • Mark remnants onto maps (of the farm, shire, region, etc) and use to plan activities (e.g., remnant protection, rehabilitation or road, rail and infrastructure maintenance work). On-site markers can alert maintenance staff to the presence of a threatened species.

Response to BAM Section 9.1.1 Criteria
3. Where the TBDC indicates that data is 'unknown' or 'data deficient' for a TEC for a criterion listed in Section 9.1.1(2), the assessor must record this in the BDAR.
The NSW Box Gum Woodland CEEC is not identified as 'unknown' or 'data deficient' in the TBDC, although the full extent and condition of the derived native grassland component of the ecological community has not been determined across its distribution.
4. The following questions are addressed in relation to the impacts from the proposal of the TEC. **a. The impact on the geographic extent of the TEC (Principles 1 and 3) by estimating the total area of the TEC to be impacted by the proposal:** **i. in hectares** **ii. as a percentage of the current geographical extent of the TEC in NSW** **b. the extent that the proposed impacts are likely to contribute to further environmental degradation or the disruption of biotic processes (Principle 2) of the TEC by:** **i. estimating the size of any remaining, but now isolated, areas of the TEC; including areas of the TEC within 500 m of the development footprint or equivalent area for other types of proposals** **ii. describing the impacts on connectivity and fragmentation of the remaining areas of TEC measured by:** - **distance between isolated areas of the TEC, presented as the average** - **distance if the remnant is retained AND the average distance if the remnant is removed as proposed, and** - **estimated maximum dispersal distance for native flora species characteristic of the TEC, and** - **other information relevant to describing the impact on connectivity and fragmentation, such as the area to perimeter ratio for remaining areas of the TEC as a result of the development** iii. Describing the condition of the TEC according to the vegetation integrity score for the relevant vegetation zone (s) (**Section 4.3**). The assessor must also include the relevant composition, structure and function condition scores for each vegetation zone.

Response to BAM Section 9.1.1 Criteria
a. The proposed works assessed within this Report would impact approximately 0.06 ha of this CEEC. Tozer and Simpson (2020) have identified that not all the areas occupied by White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland are covered by maps of appropriate scale and accuracy. Therefore, the values for extent of occurrence and area of occupancy quoted underestimate the true values. This is further exacerbated by the lack of comprehensive mapping for the derived native grasslands component of the ecological community. Tozer and Simpson (2020) have identified that not all the areas occupied by White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland are covered by maps of appropriate scale and accuracy. Therefore, the values for extent of occurrence and area of occupancy quoted may underestimate the true values. The best available information on the current geographic extent of this CEEC across its range is estimated from the SVTM as between 1,267,603 ha and 1,639,571 ha within NSW. It is considered that this is likely to be an underestimate given there are many areas of derived native grasslands corresponding to this CEEC which are not mapped as part of the SVTM. The Project will impact between 0.05% and 0.04% of the geographic extent of this CEEC mapped in the SVTM. It is considered that the actual proportional impact is likely to be much lower due to the presence of large areas of highly degraded derived native vegetation which are not captured in the STVM. **b.** The Project would not isolate any areas of the Box Gum Woodland CEEC as the works are located within an existing road reserve. The proposed road widening works have the potential to increase the isolation distance between one patch by approximately 15 m from approximately 12 m to 27 m across Ringwood Road, on the northern side of Killoe Creek. The increase in isolation distance is considered unlikely to have notable impact on connectivity. The main dispersal mechanisms for flora species associated with the Box Gum Woodland CEEC are inferred to be by one or a combination of dispersal mechanisms, including animals, wind, water runoff, and gravity. Eucalypts within the Box Gum Woodland CEEC are likely to rely on animal assisted dispersal by highly mobile vertebrate pollinators (birds and bats) which disperse pollen over large areas when foraging (Southerton et al. 2004). The maximum dispersal distance for native flora species characteristic of the Box Gum Woodland ecological community is estimated to be at least 1,000 m and potentially much further. The Project is not likely to increase the area to perimeter ratio of the remaining areas of this TEC, as the Project area is situated within an existing linear road reserve. Within the Development Footprint, areas of the Box Gum Woodland CEEC correspond to PCT 483 Condition Zone 1. These areas adjoin existing agricultural land and have been impacted by weed invasion. PCT 483 Condition Zone 1 occupies an area of 0.06 ha within the Development Footprint. The vegetation integrity score for PCT 483 Condition Zone 1 is 82.2.

Response to BAM Section 9.1.1 Criteria
The composition score for PCT 483 Condition Zone 1 is 70.7. The structure score for PCT 483 Condition Zone 1 is 92.5. The function score for PCT 483 Condition Zone 1 is 85. Areas of exotic dominated grassland have also been assessed against PCT 483 which occupy an area of 2.07 ha within the Development Footprint. These areas have a vegetation integrity score of 9.3 and are considered to not represent this CEEC.
5. The assessor may also provide new information that demonstrates that the principle identifying that the TEC is at risk of an SAII is not accurate.
It is considered that there is no other information of relevance identifying that the Box Gum Woodland CEEC is not at risk of an SAII.

10.0 Impact Summary

10.1 Determining an Offset Requirement for Impacts

10.1.1 Impacts on Native Vegetation and TECs (Ecosystem Credits)

The PCTs and associated condition zones which do not require an offset (as per BAM Subsection 9.2.1(3.)), are listed in **Table 10.1**.

Table 10.1 Impacts That Do Not Require Offset – Ecosystem Credits

Vegetation zone	PCT name	TEC	Impact area (ha)	TEC Association	Entity at risk of an SAII?	Current VI score
Condition Zone 2 PCT 483 – Exotic Dominated Grassland	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	No	2.07	No	No	9.3

PCTs which require ecosystem credits are listed in **Table 10.2**.

Table 10.2 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
Condition Zone 1 PCT 483 – Remnant Woodland	Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Yes	0.06	82.2	0	-82.2	2.5	3
							Total Ecosystem Credits	**3**

10.1.2 Impacts on Threatened Species and Their Habitat (Species Credits)

No threatened species which require species credits were recorded.

10.1.3 Indirect and Prescribed Impacts

No offsets are required or proposed for indirect and prescribed impacts.

10.2 Impacts That Do Not Need Further Assessment

Areas within the development footprint that do not contain native vegetation do not need to be assessed for ecosystem credits (as per BAM Section 9.3(1–2.)). These areas are mapped as Cleared Land in **Figure 4.2** and consist of the existing road footprint and watercourse areas which do not contain native vegetation.

11.0 Matters of National Environmental Significance

11.1 Overview

As discussed in **Section 1.0** of this report, the Project requires approval under the EPBC Act. Preliminary investigations identified that the Project would likely have a significant impact on biodiversity protected under the EPBC Act. A referral was subsequently prepared and submitted, with the Proposal being determined to be a controlled action (ref 2021/9102) under the EPBC Act on 2 February 2022. The Commonwealth Assessment Requirements and where this BDAR addresses each requirement are summarised in **Table 1.1**.

An EPBC Act Protected Matters Report was generated using the Protected Matters Search Tool (PMST) (DCCEEW, 2023) on the 3 April 2023 to identify MNES that are known or have the potential to occur within 10 km of the Study Area. A copy of PMST is provided in **Appendix D**. The result of the PMST is summarised in **Table 11.1**.

Table 11.1 Matters of National Environmental Significance

MNES	Relevance to Development
World Heritage Properties	None
National Heritage Properties	None
Wetlands of International Importance (Ramsar)	1 The Hunter estuary intersects with the 10 km buffer applied to the Subject Land. The Project is unlikely to impact the Hunter estuary wetlands as it is located approximately 100–150 km upstream.
Threatened Ecological Communities	9
Threatened Species	37
Migratory Species	11
State and Territory Reserves	1 (Goulburn River National Park)
Commonwealth Marine Area	None
Commonwealth Land	1
The Great Barrier Reef Marine Park	None

11.2 Threatened Ecological Communities

Nine TECs were identified in the Protected Matters Report as potentially occurring within the Project Area. Of these, White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland was identified controlled action determination that the Project would likely have a significant impact on the CEEC.

Surveys of the Project Area identified White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland. The CEEC occurs as a single patch of PCT 482 Condition Zone 1 within the Project Area. Refinements to project design have avoided this patch, therefore no extents of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland would impacted by the public road and culvert works.

Table 11.2 Threatened Ecological Communities listed under the EPBC Act present within the Project Area

Threatened Ecological Community	PCT	Vegetation Zone	Area (ha) within Project Area	Area (ha) within Development Footprint
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	PCT 483: Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	Condition Zone 1	0.02	0.00

11.3 Threatened Species

No EPBC Act flora or fauna species were observed during surveys, no further survey and assessment has been conducted for the public works and culvert upgrade portion of the Project.

Thirty-seven TECs were identified in the Protected Matters Report as potentially occurring within the Project Area. Of these, White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland was identified controlled action determination that the Project would likely have a significant impact on the CEEC.

Table 11.3 Summary of Threatened Species Identified within the Protected Matter Search

MNES	Class	Results	Likelihood of Occurrence
Listed Threatened species	Bird	17	17 threatened bird species were identified as known or likely to occur within the Study Area of these the following 11 species are known or likely to occur in the Study Area: • Regent Honeyeater (*Anthochaera phrygia*). • Southern Whiteface (*Aphelocephala leucopsis*). • South-eastern Glossy Black-Cockatoo (*Calyptorhyncgus lathami lathami*). • Brown Treecreeper (*Climacteris picumnis victoriae*). • Grey Falcon (*Falco hypoleucos*). • Painted Honeyeater (*Grantiella picta*). • White-throated Needletail (*Hirundapus caudacutus*). • Swift Parrot (*Lathamus discolor*). • South-eastern Hooded Robin (*Melandryas cuculata cucullata*). • Australian Painted Snipe (*Rostratula australis*). • Diamond Firetail (*Stagonopleura guttata*). The controlled action determination identified that the Solar Farm component of the Project is likely to have a significant impact on Regent Honeyeater and may have a significant impact on Swift Parrot and Painted Honeyeater. The Project Area supports limited vegetation predominately consisting of scattered remnant canopy tress or small patches of remnant vegetation. The Development Footprint predominately adjoins degraded agricultural areas, with some remnant scattered canopy tree vegetation. Limited suitable foraging habitat for Regent Honeyeater, Swift Parrot, Painted Honeyeater as well as other EPBC listed bird species is present within the Development Footprint such that these species may occur on occasion.
	Frog	2	There is no suitable habitat within the Study Area for Giant Burrowing Frog (*Heleioporus australiacus*) or Booroolong Frog (*Litoria booroolongensis*). The likelihood of these two frog species in the Project Area is low, as such no further surveys or studies were conducted.
	Mammal	7	Seven threatened mammal species were identified in the Protected Matters Search of these the following five species are known or likely to occur in the Study Area: • Large-eared Pied Bat (*Chalinolobus dwyeri*). • Spot-tailed Quoll (*Dasyurus maculatus*).

MNES	Class	Results	Likelihood of Occurrence
			• Corben's Long-eared Bat (*Nyctophilus corbeni*). • Koala (*Phascolarctos cinereus*). • New Holland Mouse (*Pseudomys novaehollandiae*). Very limited to no suitable habitat to support any mammal species in the Development Footprint. No further surveys or studies have been undertaken for these species; it is considered unlikely that any would occur in the Development Footprint.
	Plant	9	9 threatened plant species were identified in the Protected Matters Search, of these the following four flora species are known or likely to occur in the Study Area: • *Androcalva procumbens.* • *Homoranthus darwinioides.* • Austral Toadflax (*Thesium asutrale*). • Bluegrass (*Dichanthium setosum*). The controlled action identified that the Solar Farm component if the Project may have a significant impact on Bluegrass and *Homoranthus darwinoides*. Bluegrass is the only flora species that has the potential to occur within the Development Footprint. This species has been assessed in more detail in **Section 2.3.3** and **Section 5.2.1** above**.** It is considered unlikely that *Androcalva procumbens, Homoranthus darwinioides* and Austral Toadflax (*Thesium asutrale*) would occur within the Development Footprint.
	Reptile	2	The controlled action determination identified that the Solar Farm component of the Project may have a significant impact on Pink-tailed Worm-lizard. There is no suitable Pink-tailed Worm-lizard and Striped Legless Lizard habitat within the Development Footprint. The likelihood of these two reptile species in the Project Area is low, as such no further surveys or studies were conducted.

11.4 Migratory Species

Eighteen migratory species were identified in the PMST, of these four were known of likely to occur within the Study Area:

- Fork-tailed Swift (*Apus pacificus*).
- White-throated Needletail (*Hirundapus caudacutus*).
- Satin Flycatcher (*Myiagra cyanoleuca*).
- Rufus Fantail (Rhipidura rufifrons).

The Development consists of limited remnant scattered canopy trees which are connected and are often adjacent to degraded agricultural land throughout the Development Footprint. There is limited suitable habitat for any migratory species within the Study Area as such it is considered low or unlikely that any of these migratory species would occur.

No EPBC Act listed migratory birds were observed during surveys, no further survey or assessment has been conducted.

11.5 Avoidance and Mitigation

All works across the Development Footprint will be contained within the road reserves. The Project design has been refined to avoid impacts to biodiversity, as such the patch of EPBC-listed White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland has been avoided and will be retained within the wider Project Area.

Areas impacted by the proposed works are considered to have low biodiversity values, retention of individual trees will be considered in the detailed design phase.

A detailed breakdown of the measures taken to avoid and minimise impacts to MNES are provided in **Section 7.0** above.

11.6 Impacts

One MNES, White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, was found to be present within the Project Area. Impacts to this CEEC have been avoided with none of the CEEC to be directly impacted by the public road and culvert upgrade works.

A summary of impacts to MNES as a result of the public road and culvert works is provided within **Table 11.4** below.

Table 11.4 Impact to EPBC Act species and communities

Name of EPBC Act listed entity	Nature & consequence of impact (direct and indirect)	Duration of impact (e.g. construction, operation, life of the Project)	Quantum of impact (ha)	Consequence of impact (local, state & national scales)	Impact requires offsetting? (significant or not)
White Box -Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Nil	N/A	0.00	N/A	Not significant (for impacts associated with the public road and culvert upgrades)

11.6.1 Assessment of Significance

An Assessment of Significance was carried out in order to assess potential impacts of the public road and culvert upgrade to White Box -Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland as detailed in **Table 11.5** below.

Table 11.5 Assessment of Significance for White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland

	An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:
Criteria	a) reduce the extent of an ecological community
Response	The public road and culvert upgrade component of the Project has avoided impacts that would result in the clearing of an area meeting the condition threshold of the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC. As such works associated with the public road and culvert upgrade component of the Project would not reduce the extent of the CEEC.
Criteria	b) fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines
Response	The distribution of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland is highly fragmented across the Development Footprint. The public road and culvert upgrade component of the Project has avoided impacts that would result in the clearing of an area meeting the condition threshold of the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC. The Project would not further fragment or increase fragmentation of the CEEC.
Criteria	c) adversely affect habitat critical to the survival of an ecological community
Response	The National Recovery Plan for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland defines habitat critical to the survival of the CEEC as all areas of Box-Gum Grassy Woodland which meet the minimum condition criteria for the community. In addition, degraded woodland areas which do not meet the necessary condition requirements of the listed CEEC may also be essential to the long-term conservation of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, as a result of their landscape setting or remaining flora/fauna habitat features, and should also be considered as potential habitat critical to the survival of this ecological community.

	An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:
	While the public road and culvert works would not remove any extents of EPBC listed White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland, the work would result in clearing of up to 0.09 ha of woodland areas which do not meet the necessary condition requirements to the CEEC under the EPBC Act. As such, the public road and culvert works would result in the removal of up to 0.09 ha woodland which may be considered potential habitat critical for the survival of the CEEC.
Criteria	d) modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including a reduction in ground water levels, or substantial alteration of surface water drainage patterns
Response	The public road and culvert upgrade component of the Project has avoided impacts that would result in the clearing of an area meeting the condition threshold of the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC. As such, the public road and culvert works would not result in modification or destruction of abiotic (non-living) factors (such as water, nutrients, or soil) necessary for the CEEC's survival in adjacent areas. Furthermore, impacts to abiotic factors potentially influencing adjacent areas would be managed to prevent impacts outside of the Development Footprint (refer to **Section 7.0**).
Criteria	e) cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionality important species, for example through regular burning or flora or fauna harvesting.
Response	The public road and culvert upgrade component of the Project has avoided impacts that would result in the clearing of an area meeting the condition threshold of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC. As such, the works would not result in changes that would result in broader changes in the species composition of an occurrence of the CEEC, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.
Criteria	f) cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: • assisting invasive species, that are harmful to the listed ecological community, to become established, or • causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or
Response	The public road and culvert upgrade component of the Project has avoided impacts that would result in the clearing of an area meeting the condition threshold of the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC. The works are located in a road and road reserves which are in an agricultural rural landscape, the CEEC in this area is consequently subject to existing threats associated with road activities, invasive species and agricultural activities. The works are unlikely to substantially change these threats. Consequently, the Project would be unlikely to a cause a substantial reduction in the quality or integrity of the CEEC where it occurs adjacent the Project Area.
Criteria	g) interfere with the recovery of an ecological community
Response	The public road and culvert upgrade component of the Project has avoided impacts that would result in the clearing of an area meeting the condition threshold of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC, however, the works would result in the removal of up to 0.09 ha woodland which may be considered potential habitat critical for the survival of the CEEC.

	An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:
	While the works are unlikely to interfere with the recovery of the CEEC, the removal of potential critical habitat is unlikely to facilitate CEEC recovery.
Conclusion	**The public road and culvert upgrade works are considered unlikely to have a significant adverse impact on the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grasslands.**

11.7 Offsets

The public road and culvert upgrade component of the Project has avoided impacts that would result in the clearing of an area meeting the condition threshold of the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC, as such, there would be no impacts associated to the CEEC associated with this component of the Project.

Impacts to White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed under the BC Act will be offset in accordance with the BAM as outlined in **Section 12.0**.

There are no additional significant residual impacts to MNES not addressed by the BAM.

12.0 Biodiversity Credit Obligations

Biodiversity Credit Reports which identify the like-for-like and variation credit requirements are provided in **Appendix E**. Further details on the biodiversity credit requirements for the project are provided as follows.

12.1 Ecosystem Credits

The ecosystem credit requirements and those that could be retired in accordance with the offset rules are listed in **Table 12.1**.

Table 12.1 Ecosystem Credit Class and Matching Credit Profiles

Ecosystem Credit	Attributes shared with matching credits						
	PCT Name	PCT Vegetation Class	PCT Vegetation Formation	Associated TEC	Offset Trading Group	Hollow bearing trees present?	IBRA subregion (in which proposal is located)
PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley **9 credits**	74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698	Grassy Woodlands	Western Slopes Grassy Woodlands	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC	Yes	Kerrabee , Hunter, Inland Slopes, Liverpool Range, Pilliga, Wollemi and Yengo. or Any IBRA subregion that is within 100 km of the outer edge of the impacted site.

12.2 Species Credits

There is no species credit requirement for the proposed works assessed within this Report.

12.3 Biodiversity Credit Retirement

Lightsource bp is committed to delivering a biodiversity offset strategy that appropriately compensates for the unavoidable loss of ecological values as a result of the Project.

Lightsource bp has, where practicable, altered the Project to avoid and minimise ecological impacts in the planning stage, and a range of impact mitigation strategies have been included to mitigate the impact on ecological values prior to the consideration of offsetting requirements.

The retirement of biodiversity credits is proposed to be undertaken following a staged approach, to match the areas of staged clearing. Lightsource bp is currently considering the merits of all options available under the BOS to satisfy the offsetting requirements for the Project. The offset options available under the BC Act and BC Regulation include:

- land based offsets through the establishment of new Stewardship Sites or by retiring credits from existing Stewardship Sites
- purchasing credits from the market, and/or
- paying into the Biodiversity Conservation Fund.

The Proponent has committed to further investigate the retirement of biodiversity credits through the establishment of a Biodiversity Stewardship Site within the residual parts of the proposed Goulburn River Solar Farm property and this may include ecological rehabilitation of land to generate biodiversity credits. Where credits are not directly generated and retired through a Biodiversity Stewardship Agreement within the Goulburn River Solar Farm property, they would be purchased from the market or a payment would be made to the Biodiversity Conservation Fund. The like-for-like credit rules would be followed for nationally listed entities which require credits. The like-for-like or variation rules would be followed for all other entities which require credits.

13.0 References

Australian Bureau of Meteorology (BOM) (2022) Climate Data Online, Rainfall and Temperatures, Australian Government. Accessed June 2022 Online at <http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=136&p_display_type=dailyDataFile&p_startYear=2021&p_c=-751265162&p_stn_num=061287>

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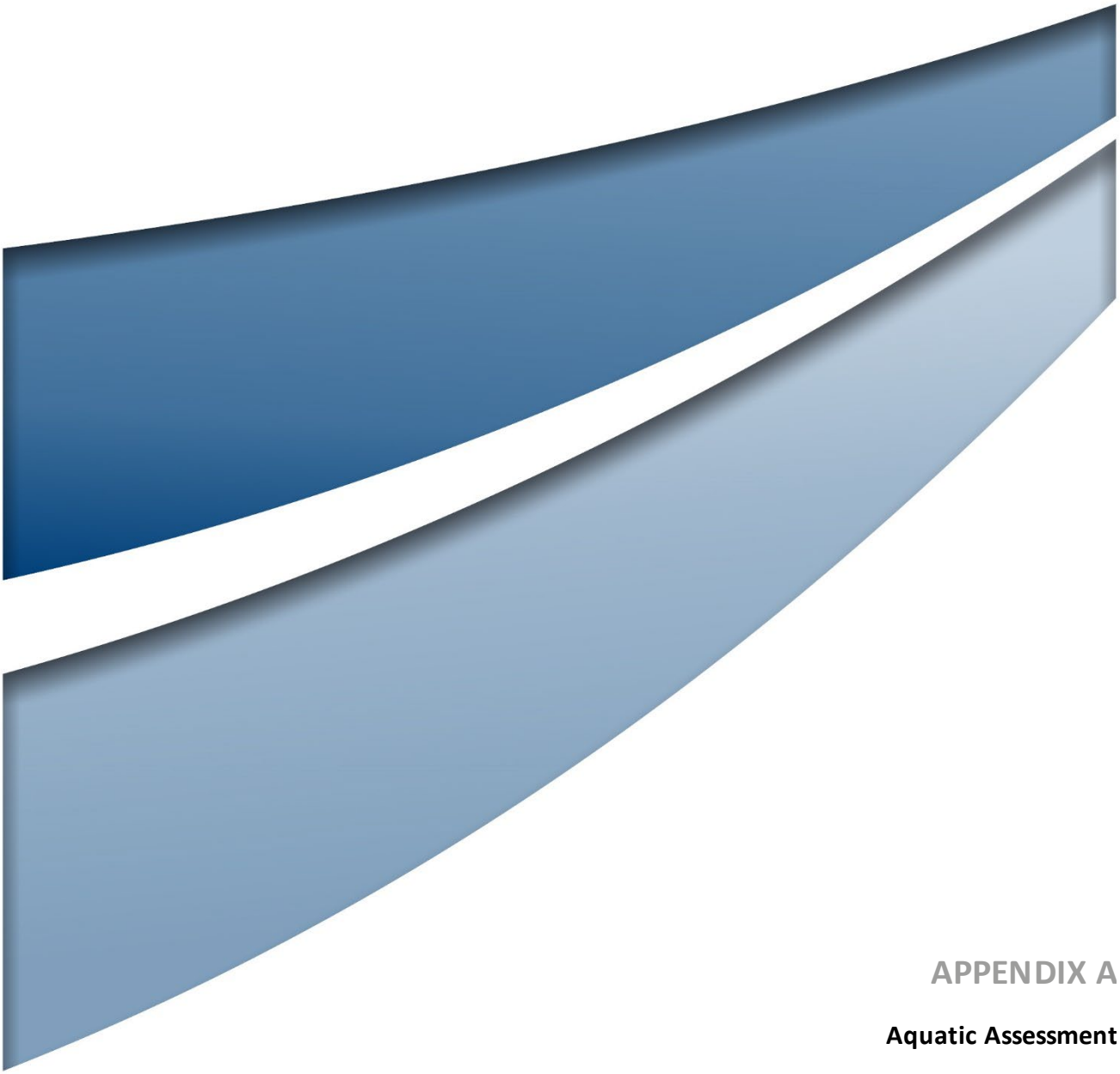

APPENDIX A

Aquatic Assessment

1.0 Introduction

1.1 Proposed Development

The proposed works will require upgrades to existing culverts along Ringwood Road at the water crossings of Bow River and Killoe Creek.

The culvert upgrades will include:

- Installing culverts designed to accommodate two-way heavy vehicles.
- Culvert width 7 m (3.5 m lane width) sealed carriageway with suitable guardrail and signage and associated drainage works.
- Stockpile site to be located on disturbed land within the road reserve in consultation with Upper Hunter Council.
- Temporary side track at both locations to facilitate access during construction.

1.2 Impact Minimisation and Habitat Rehabilitation Measures

The proposed culverts are expected to improve fish passage at both the Bow River and Killoe Creek watercourse crossing points. The culverts will have a larger diameter compared to the existing causeway, which will be removed, and will be constructed to maintain existing conditions or further replicate the expected natural hydraulic, hydrologic, geomorphic and ecological functions of both watercourses.

The works will include design and control measures to protect against scour and erosion and sediment control and a vegetation management plan will be prepared and implemented for areas of exposed waterfront land which are disturbed by the works.

1.3 SEARS Requirements Addressed

The Project SEARs require an assessment of the likely impacts on listed aquatic threatened species, populations or ecological communities, scheduled under the NSW *Fisheries Management Act 1994* (FM Act), and a description of the measures to minimise and rehabilitate impacts.

The SEARs also state, where the project involves works within 40 metres of any river, lake or wetlands (collectively waterfront land), identify likely impacts to the waterfront land, and how the activities are to be designed and implemented in accordance with the *DPI Guidelines for Controlled Activities on Waterfront Land* (2018) (updated in 2022) and (if necessary) *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (NSW DPI/Fairfull and Witheridge 2003), and *Policy & Guidelines for Fish Habitat Conservation & Management* (NSW DPE, 2013).

2.0 Works Area Characteristics

2.1 Watercourse and Fish Habitat Characteristics

A site inspection of each watercourse crossing was completed on 5 December 2022. The characteristics of each crossing observed during the site inspection are described below.

2.1.1 Bow River

The Bow River watercourse crossing intersects a >4th order section of the river. Here the river displays an alluvial channel with defined bed and banks with likely semi-permanent pools and flow. Stream width is approximately 15 m upstream and approximately 5–15 m downstream with restriction of flow and pooling observed upstream due to the existing culverts. The water depth at the time of the inspection was estimated at 0.5–1 m. Water quality visually appeared to be good with no visual signs of disturbance.

The confluence of the Bow River and Killoe Creek is approximately 2 km downstream to the south of the Bow River watercourse crossing.

The native riparian vegetation has been generally cleared, with a remnant *Casuarina cunninghamiana* (River Oak) observed approximately 75 m upstream. The riparian vegetation consists of predominantly exotic grasses with low levels of native grasses, sedges and forbs. An exotic willow tree (*Salix babylonica*) is directly adjacent to the downstream side of the crossing. The bed is composed of alluvium and over larger basalt rock. There is concrete within the downstream bed which has broken off from the existing crossing and rock material which has potentially been deposited to stabilise the crossing.

The existing water course crossing consists of a series of small diameter pipes (<400 mm approx.) under a concrete crossing which sits above the natural bed height. The water level was over the crossing during the site inspection.

Photo 2.1 and **Photo 2.2** show the Bow River watercourse crossing and the adjoining habitats.

Photo 2.1 **View of Bow River watercourse crossing looking upstream**

Photo 2.2 **View of Bow River directly downstream of watercourse crossing**

2.1.2 Killoe Creek

The Killoe Creek watercourse crossing intersects a 4th order section of the creek. Here the creek displays an alluvial channel with defined bed and banks with likely semi-permanent to ephemeral pools and flow. Stream width is narrow (<1 m) directly upstream and downstream, although widens with increasing distance from the existing single culvert, with no pools observed directly upstream. Stream depth was observed to be less than 0.5 metres at the time of the site inspection. Water quality visually appeared to be clear, however green algal growth was observed.

The confluence of the Bow River and Killoe Creek is approximately 1.5 km downstream to the south of the Killoe Creek watercourse crossing.

The native instream riparian vegetation has been generally cleared and consists of predominantly exotic grasses with some *Juncus acutus* in clumps along the water edge. Remnant *Eucalyptus melliodora* trees were observed on the high bank on the southern side of the creek. The bed is composed of sandstone bedrock with the stream channel cut into the bedrock through erosion.

The existing water course crossing consists of a small diameter pipe (<400 mm approx.) under a concrete crossing which sits slightly above the natural bed height. The water level was over the crossing during the site inspection.

3.0 Relevant Guidelines

3.1 DPI Guidelines for Controlled Activities on Waterfront Land

Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary. Controlled activities include works and development within these areas. NSW DPI have released controlled activity guidelines for:

- In-stream works.
- Laying pipes and cables in watercourses.
- Outlet structures.
- Riparian corridors.
- Vegetation management plans.
- Watercourse crossings.

These guidelines were updated in 2022 and are listed in the References section of this Report. Controlled activity approvals are not required for State Significant Development (SSD) projects, however the controlled activity guidelines provide best practice design considerations and management measures for controlled activities.

It is recommended that the *Controlled Activity Guidelines for Watercourse Crossings on Waterfront Land* is considered and the final design for each culvert is generally consistent with this guideline. Specifically, the proposed works should be designed to maintain the existing natural hydraulic, hydrologic, geomorphic and ecological functions of the watercourses. It is also recommended that measures to protect against scour and erosion and sediment control are provided. Where revegetation is required, it is recommended that a vegetation management plan is prepared in accordance with *Controlled Activity Guidelines for Vegetation Management Plans*.

3.2 Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (DPI 2003)

This Guideline provides measures to minimise impacts on fish passage by providing practical guidelines for the planning, design, construction and maintenance of watercourse crossings. This guideline defines four classes of fish habitat:

- Class 1 Major Fish Habitat is permanently or intermittently flowing waterway (e.g. river or major creek), habitat of a threatened fish species.
- Class 2 Moderate Fish Habitat is named permanent or intermittent stream, creek or waterway with clearly defined bed and banks with semi - permanent to permanent waters in pools or in connected wetland areas. Marine or freshwater aquatic vegetation is present. Known fish habitat and/or fish observed inhabiting the area.

- Class 3 Minimal Fish Habitat is Named or unnamed waterway with intermittent flow and potential refuge, breeding or feeding areas for some aquatic fauna (e.g. fish, yabbies). Semi - permanent pools form within the waterway or adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or recognised aquatic habitats.

- Class 4 Unlikely Fish Habitat is Named or unnamed waterway with intermittent flow following rain events only, little or no defined drainage channel, little or no flow or free-standing water or pools after rain events (e.g. dry gullies or shallow floodplain depressions with no permanent aquatic flora present).

The Bow River and Killoe Creek watercourse crossing points are considered to constitute Class 2 Moderate Fish Habitat under these guidelines. For Class 2 Moderate Fish Habitat this guideline recommends bridges, arch structures, culverts or fords as the crossing type. Culverts are identified as suitable for the proposed crossings and the level of fish habitat present and it is recommended that the design measures for culverts within this guideline are considered.

3.3 Policy & Guidelines for Fish Habitat Conservation & Management (DPE, 2013)

These guidelines focus on promoting compliance with legislation relating to fish habitat conservation and management and are used for assessing developments and activities affecting fish habitats.

3.3.1 Habitat Sensitivity Type

These guidelines provide a Key Fish Habitat and associated sensitivity scheme which defines three types of habitats, these are:

- Type 1 Highly Sensitive Key Fish Habitat.

- Type 2 Moderately Sensitive Key Fish Habitat.

- Type 3 Minimally Sensitive Key Fish Habitat.

Bow River is considered to constitute a Type 1 Highly Sensitive Key Fish Habitat as it contains instream gravel beds. Killoe Creek is considered to constitute a Type 2 Moderately Sensitive Key Fish Habitat as it contains freshwater habitats other than those defined in Type 1 and is not an ephemeral habitat.

3.3.2 Waterway Class

These Guidelines further provide a Waterway Classification Scheme which includes the following four classes:

- Class 1 Major Key Fish Habitat.

- Class 2 Moderate Key Fish Habitat.

- Class 3 Minimal Key Fish Habitat.

- Class 4 Unlikely Key Fish Habitat.

Both watercourse crossings are considered likely to form a Class 2 Moderate Key Fish Habitat being non-permanently flowing (intermittent) stream, creek or waterway (generally named) with clearly defined bed and banks with semi-permanent to permanent waters in pools or in connected wetland areas. Freshwater aquatic vegetation is present. Type 1 and 2 Key Fish Habitats are present, as set out in **Section 3.3.1**.

3.3.3 Riparian and Freshwater Aquatic Vegetation

The proposed works are considered unlikely to require the removal of riparian or freshwater aquatic vegetation as the works areas have been historically cleared and are within an existing road reserve.

3.3.4 Snags

The proposed works are not likely to affect snags or instream debris as none were observed during the site inspection. If instream snags or debris occur within the works area they will be retained and relocated downstream prior to works commencing.

4.0 Database Searches

4.1 Fisheries NSW Spatial Data Portal

A review of the *Fisheries NSW Spatial Data Portal* (NSW Department of Primary Industries, 2023a) was undertaken to identify areas of key fish habitats and of the watercourses present.

4.1.1 Condition of Fish Communities

The spatial data portal identifies the condition of freshwater fish communities in NSW and ranks the Bow River as Poor Condition.

4.1.2 Key Fish Habitat

The spatial data portal identifies that both watercourses are classified as key fish habitat for the Hunter Central Rivers Basin. Fish habitat sensitivity and waterway class is documented in **Section 3.3.2.**

4.1.3 Freshwater Fish Threatened Species Habitat Maps

The freshwater fish threatened species habitat maps prepared by the Department of Primary Industries were reviewed for the watercourses which intersect the works area. The maps did not identify the presence of any habitat for threatened species or other species listed within the FM Act, within the works areas, however the following threatened entities were identified for further assessment:

- Southern Purple Spotted Gudgeon (*Mogurnda adspera*).
- Darling River Hardyhead (*Craterocephalus amniculus*) Hunter River population.

4.2 Other Database Searches

The following databases were searched for records of threatened species listed within the FM Act within a 10 km buffer of the proposed works:

- Atlas of Living Australia database (NSW DPI 2023).
- BioNet Atlas of NSW Wildlife (NSW DPIE 2023).

These searches did not identify any records for threatened entities listed within the FM Act within a 10 km buffer area.

5.0 Fisheries Management Act

5.1 Fisheries Management Act Threatened Species Likelihood of Occurrence Assessment

A likelihood of occurrence assessment for threatened entities listed within the FM Act is provided in **Table 5.1**.

Table 5.1 FM Act Threatened Entity Likelihood of Occurrence Assessment

Entity Name	FM Act Listing Status	Assessment Comments	Likelihood of Occurrence	Included in Test of Significance
Southern Purple Spotted Gudgeon (*Mogurnda adspera*)	Endangered	This species has a patchy distribution mapped in both east and west flowing waterways on the Fisheries NSW Spatial Data Portal. This species occupies a variety of habitats including freshwater rivers and creeks. The population within the Hunter Valley is known from Goorangoola Creek.	Low	Yes
Darling River Hardyhead (*Craterocephalus amniculus*) Hunter River population	Endangered Population	Habitat for the Darling River was identified within the locality on the Fisheries NSW Spatial Data Portal for larger watercourses including the Goulburn River, Krui River and the Merriwa River. A small population of this species is known to occur in the Hunter Catchment. This species prefers slow flowing, clear shallow freshwaters and faster flowing runs at the head of pools.	Low to Moderate	Yes

5.2 Fisheries Management Act Test of Significance

5.2.1 Test of Significance

The following test of significance has been completed for the proposal in accordance with Section 220ZZ(2A) of the FM Act.

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The proposed works area provides low potential habitat for one threatened species listed within the FM Act, the Southern Purple Spotted Gudgeon (*Mogurnda adspera*).

Suitable design measures will be implemented to retain the existing areas of habitat present upstream and downstream of the proposed works and improve fish passage.

Suitable erosion and sediment controls will be implemented for all works.

It is considered that the action proposed is not likely to have an adverse effect on the lifecycle of a threatened species such that a viable population of the species is likely to be placed at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

The proposed works area provides low to moderate potential habitat for one endangered population listed within the FM Act, Darling River Hardyhead (*Craterocephalus amniculus)* Hunter River population.

Suitable design measures will be implemented to retain the existing areas of habitat present upstream and downstream of the proposed works and improve fish passage.

Suitable erosion and sediment controls will be implemented for all works.

It is considered that the action proposed is not likely to have an adverse effect on the lifecycle of a species that constitutes an endangered population listed under the FM Act, such that a viable local population of the species is likely to be placed at risk of extinction.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed—

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

The Development Footprint does not contain any modelled, known or suitable habitat for endangered ecological communities listed under the FM Act.

Suitable design measures will be implemented to retain the existing areas of habitat present upstream and downstream of the proposed works and improve fish passage.

Suitable erosion and sediment controls will be implemented for all works.

It is considered that the action proposed is not likely to have an adverse effect on the extent of a threatened ecological community or substantially and adversely modify the composition of an ecological community such that its local occurrence is likely to be placed at risk of extinction.

(d) in relation to the habitat of a threatened species, population or ecological community—

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

Suitable design measures will be implemented to retain the existing areas of habitat present upstream and downstream of the proposed works and improve fish passage and suitable erosion and sediment controls will be implemented for all works.

It is therefore considered that the proposal will not result in the removal, fragmentation or isolation of any known, modelled or suitable habitat for threatened species, populations or ecological communities listed under the FM Act. Impact associated with the modification of habitats are anticipated to be positive impacts which will improve fish passage.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

The Development Footprint does not contain or adjoin any areas of critical habitat listed under the FM Act. The proposal is not likely to have an adverse effect on critical habitat either directly or indirectly.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

The proposal is not inconsistent with the objectives or actions of a recovery plan or threat abatement plan made under the FM Act.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key threatening processes listed under the Fisheries Management Act include:

- Degradation of native riparian vegetation along New South Wales water courses.
- Hook and line fishing in areas important for the survival of threatened fish species.
- Human-caused climate change.
- Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams.
- Introduction of fish to waters within a river catchment outside their natural range.
- Introduction of non-indigenous fish and marine vegetation to the coastal waters of New South Wales.
- Removal of large woody debris from New South Wales rivers and streams.
- The current shark meshing program in New South Wales waters.

The proposed works will include the installation of instream structures in the form of culverts, however these will be larger than the existing culverts and will improve fish passage which is not likely to have a significant effect on any threatened entities listed within the FM Act.

5.2.2 Test of Significance Conclusion

The proposed works are not likely to significantly effect threatened entities listed under the FM Act and a Species Impact Statement is not required.

6.0 Concluding Comments

It is considered that proposed works:

- Will be undertaken generally in accordance with the relevant Department of Primary Industries Guidelines.
- Will not have a significant effect on threatened entities listed within the FM Act.
- Do not require the preparation of a Species Impact Statement.

It is further recommended that the impact minimisation and habitat rehabilitation measures recommended within **Section 1.2** of this Report are implemented for the proposed works.

7.0 References

NSW Department of Planning and Environment (DPE) 2022, NSW BioNet Atlas. Online:<https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet>.

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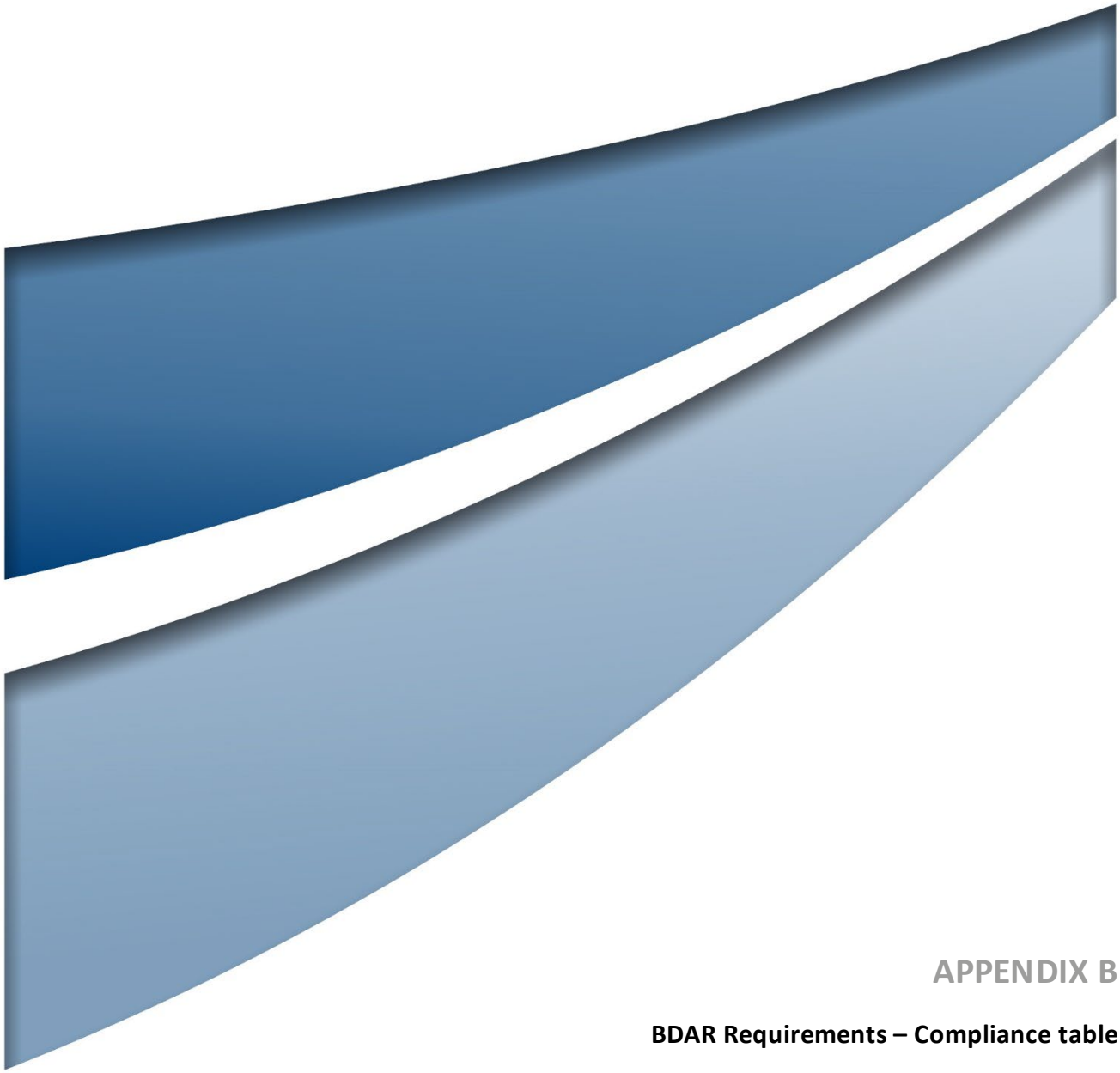


APPENDIX B

BDAR Requirements – Compliance table

1.0 SEARS & BDAR Requirement Compliance

1.1 BDAR Requirements Compliance Details

Compliance with the BDAR minimum information requirements of the BAM is documented in **Table A.1.**

Table A.1 Assessment of Compliance with BDAR Minimum Information Requirements

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
Introduction	Chapters 2 and 3	**Information**	
		Introduction to the biodiversity assessment including:	–
		☒ brief description of the proposal	Section 1.2.1
		☒ identification of subject land boundary, including: ☒ operational footprint ☒ construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure	Section 1.2.2 and Figure 1.1 and Figure 1.2
		☒ general description of the subject land	Section 1.1.2
		☒ sources of information used in the assessment, including reports and spatial data	Section 1.6. Also referenced in text and listed in the References Section.
		☒ identification and justification for entering the BOS	Section 1.1
		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 1.1
Landscape	Section 3.1 and Section 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 1.2.2
		☒ per cent native vegetation cover in the assessment area (as described in BAM Section 3.2)	Section 3.3 and Figure 1.2
		☒ IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	Section 3.2.1 and Figure 1.1 and Figure 1.2

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E)	Section 3.2.2 and Figure 1.1 and Figure 1.2
		☒ wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.))	Section 3.2.2 and Figure 3.1
		☒ connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	Section 3.2.3
		☒ 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 3.3
		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 1.1

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ 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 1.2
		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 ☒ 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	Figure 1.1 and Figure 1.2
		Data	
		☒ All report maps as separate jpeg files	–
		Individual digital shape files of:	–
		☒ subject land boundary	–
		☒ assessment area (i.e. subject land and 1500 m buffer area) boundary	–

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ cadastral boundary of subject land	–
		☒ areas of native vegetation cover	–
		☒ landscape features	–
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 and Figure 4.1
		☒ 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 2.2.1
		☒ Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	Section 2.2.3
		☒ 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)	Not applicable
		For each PCT within the subject land, describe:	–
		☒ PCT name and ID	Section 4.2.1, Table 4.1
		☒ vegetation class	Section 4.2.1, Table 4.1
		☒ extent (ha) within subject land	Section 4.2.1, 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 4.2.2
		☒ plant species relied upon for identification of the PCT and relative abundance of each species	Section 4.2.2

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.))	Section 4.2.2, Section 4.3 and Appendix C
		☒ estimate of per cent cleared value of PCT (BAM Subsection 4.2.1(5.))	Table 4.1
		Describe the vegetation integrity assessment of the subject land, including:	–
		☒ identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1)	Method provided in Section 2.2, Results provided in Table 4.1, Figure 4.2 and Section 4.2.2
		☒ description of vegetation zones within the subject land (as described in Operational Manual Stage 1 Table 2 and Subsection 3.3.2)	Section 4.2.2
		☒ area (ha) of each vegetation zone	Table 4.1
		☒ assessment of patch size (as described in BAM Subsection 4.3.2)	Table 4.1
		☒ survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.)	Table 2.1 and Table 4.9
		☒ 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)	Not applicable
		☐ provide justification for use of local data rather than BioNet Vegetation Classification benchmark values	Not applicable

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☐ provide written confirmation from the decision-maker that they support the use of local benchmark data	Not applicable
		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 4.1
		☒ Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	Figure 4.2
		☒ Map of vegetation zones within the subject land (as described in BAM Subsection 4.3.1)	Figure 4.2
		☒ Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCT boundaries	Figure 2.1
		☒ Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	Figure 4.3 and Table 4.8
		☒ Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	Patch size not mapped and exceeds 100 ha for all vegetation condition zones, as listed in Table 4.9
		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	Table 4.10
		Data	
		☒ All report maps as separate jpeg files	–

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ Plot field data (MS Excel format)	-
		☒ Plot field datasheets	-
		Digital shape files of:	–
		☒ PCT boundaries within subject land	–
		☒ TEC boundaries within subject land	–
		☒ vegetation zone boundaries within subject land	–
		☒ floristic vegetation survey and vegetation integrity plot locations	–
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.))	Table 5.1
		☒ 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)	Table 5.1
		☒ justification for addition of any ecosystem credit species to the list	Table 5.1 / Justification for inclusion of additional BioNet Atlas species documented in Section 2.4.2
		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)	Table 5.2 and Table 5.3
		☒ 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)	Table 5.2 and Table 5.3

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ 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)	Table 5.2 and Table 5.3
		☒ justification for addition of any species credit species to the list	Table 5.2 and Table 5.3 / Justification for inclusion of additional BioNet Atlas species documented in Section 2.4.2
		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.))	Table 5.4 and Table 5.5
		Present the outcomes of species credit species assessments from:	–
		☒ threatened species survey (as described in BAM Section 5.2.4)	Section 5.2.1 (flora) and Section 5.2.2 (fauna)
		☐ 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)	Not applicable
		Where survey has been undertaken include detailed information on:	–
		☒ survey method and effort (as described in BAM Section 5.3)	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 2.7, Section 2.3.4 and Section 2.4.4.1

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ 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	Table 5.6 and Table 5.7
		☒ survey personnel and relevant experience	Project Team including survey personnel are listed in the preface of the report. CVs can be provided on request.
		☒ describe any limitations to surveys and how these were addressed/overcome	Section 2.7
		Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include:	–
		☐ 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	Not applicable
		Where use of local data is proposed (BAM Subsection 1.4.2):	–
		☐ 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	Not applicable
		☐ provide written confirmation from the decision-maker that they support the use of local data	Not applicable
		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	Not applicable
		for species assessed by area:	–

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5)	Not applicable
		☒ 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	Not applicable
		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.))	Not applicable
		☒ the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken	Not applicable
		☒ 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	Not applicable
		☒ Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)	Not applicable
		Maps and tables	
		☒ Table showing ecosystem credit species in accordance with BAM Subsection 5.1.1, and identifying:	Table 5.1
		☒ the ecosystem credit species removed from the list	Table 5.1
		☒ the sensitivity to gain class of each species	Table 5.1
		☒ Table detailing species credit species in accordance with BAM Section 5.2 and identifying:	Table 5.2 and Table 5.3
		☒ 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 5.2 and Table 5.3
		☒ the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map	Table 5.4

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ 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)	Not applicable
		☒ 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)	Not applicable
		Data	
		☒ Digital shape files of suitable habitat identified for survey for each candidate species credit species	–
		☒ Survey locations including GPS coordinates of any plots, transects, grids	-
		☒ Digital shape files of each species polygon including GPS coordinates of located individuals	–
		☒ Species polygon map in jpeg format	–
		☐ Expert reports and any supporting data used to support conclusions of the expert report	Not applicable
		☒ Field datasheets detailing survey information including prevailing conditions, date, time, equipment used, etc.	-
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)	Table 6.1

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☐ 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)	Not applicable
		☒ 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)	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	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)	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)	Not applicable
		☐ provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.)	Not applicable
		☐ 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.))	Not applicable
		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	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.)	Not applicable, described in text
		☒ Map showing location of potential vehicle strike locations	Applies to entire length of development footprint / described in text.

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☐ 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)	Not applicable
		Data	
		☒ 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 7.1.2.6
		☒ routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route	Section 7.1.1.6
		☒ alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	Section 7.1.1.1 to Section 7.1.1.5, Section 7.1.1.8
		☒ 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 7.1.1.7
		☒ 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 7.1.2.1 and Section 7.1.2.2
		☒ 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 7.1.2.7
		☒ Detail measures or options considered but not implemented because they are not feasible and/or practical (e.g. due to site constraints)	Section 7.3
		Maps and tables	

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	Table 7.1
		☒ Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation	Figure 7.1a and 7.1b
		☒ Maps demonstrating indirect impact zones where applicable	Section 8.2
		Data	
		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)	Section 8.1
		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 8.3
		☒ documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications	Section 8.2, Table 8.3
		☒ reporting any limitations or assumptions, etc. made during the assessment	Section 8.2, Table 8.3
		☒ identification of the threatened entities and their habitat likely to be affected	Section 8.2, Table 8.3
		Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including:	–

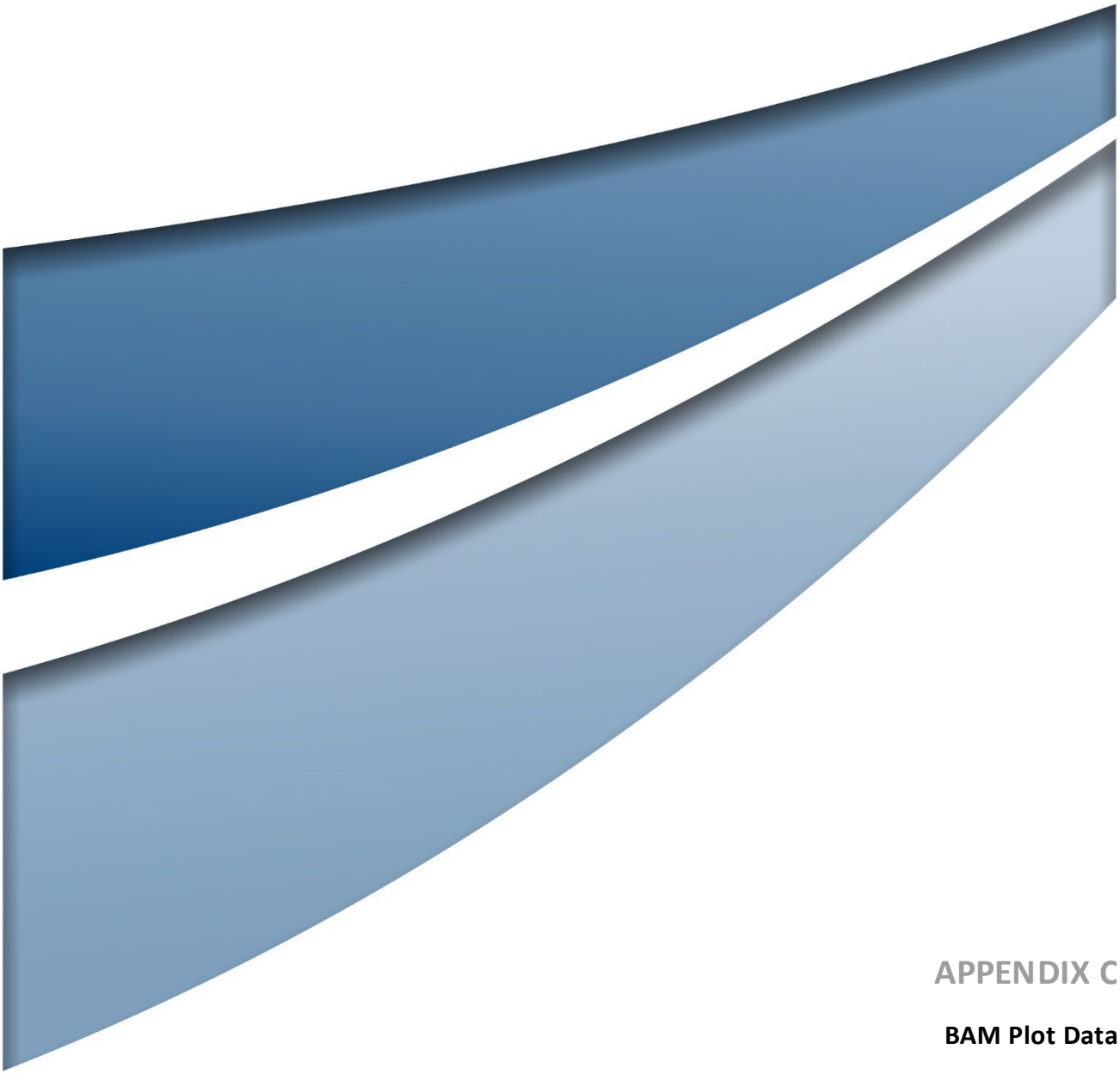
BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		assessment of the nature, extent frequency, duration and timing of impacts on the habitat of threatened species or ecological communities associated with:	–
		☒ karst, caves, crevices, cliffs, rocks and other features of geological significance	Section 8.3.1
		☒ human-made structures	Section 8.3.2
		☒ non-native vegetation	Section 8.3.3
		☒ connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Section 8.3.5
		☒ movement of threatened species that maintains their life cycle	Section 8.3.5
		☒ water quality, waterbodies and hydrological processes that sustain threatened species and threatened ecological communities	Section 8.3.6
		☐ assessment of the impacts of wind turbine strikes on protected animals	Not applicable
		☒ assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	Section 8.3.7
		☒ evaluate the consequences of prescribed impacts	Section 8.3
		☒ describe impacts that are uncertain	Section 8.5
		☒ document limitations to data, assumptions and predictions	Section 8.3.8
		Maps and tables	
		☒ Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	Table 10.1
		Data	
		N/A	–

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
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 8.3, Table 8.4
		☒ document any adaptive management strategy proposed	Table 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
		☒ Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	Table 8.5
		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 8.4
		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 9.1.1

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ for each TEC, report the extent of the TEC in NSW	Section 9.1.1
		☒ addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land	Section 9.1.2
		☒ for each threatened species, report the population size in NSW	Section 9.1.2
		☒ 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
		☒ Identification of impacts requiring offset in accordance with BAM Section 9.2	Section 10.1 and Table 10.1, Section 10.2 and Table 10.2
		☒ Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	Section 10.1.1 – Not applicable
		☒ Identification of areas not requiring assessment in accordance with BAM Section 9.3	Section 10.2
		Maps and tables	
		☒ Map showing the extent of TECs at risk of an SAII within the subject land	Figure 9.1
		☒ Map showing location of threatened species at risk of an SAII within the subject land	Figure 9.1
		Map showing location of:	–
		☒ impacts requiring offset	Figure 8.1
		☒ impacts not requiring offset	Table 10.1
		☒ areas not requiring assessment	Section 10.2
		Data	
		Digital shape files of:	–
		☒ extent of TECs at risk of an SAII within the subject land	-

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
		☒ location of threatened species at risk of an SAII within the subject land	-
		☒ boundary of impacts requiring offset	–
		☒ boundary of impacts not requiring offset	-
		☒ boundary of areas not requiring assessment	-
		☒ Maps in jpeg format	–
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
		☒ biodiversity risk weighting for each	Table 10.1 and 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	
		☒ Submitted proposal in the BAM Calculator	–

BDAR Section	BAM Ref.	BAM Requirement	Reference(s) in the BDAR
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 12.1, Table 12.2
		☒ BAM credit report in pdf format	Appendix E
		Maps and tables	
		☒ Table of credit class and matching credit profile	Table 12.1
		Data	
		☒ BAM credit report in pdf format	Appendix E



APPENDIX C

BAM Plot Data

1. Appendix C – BAM Plot Data

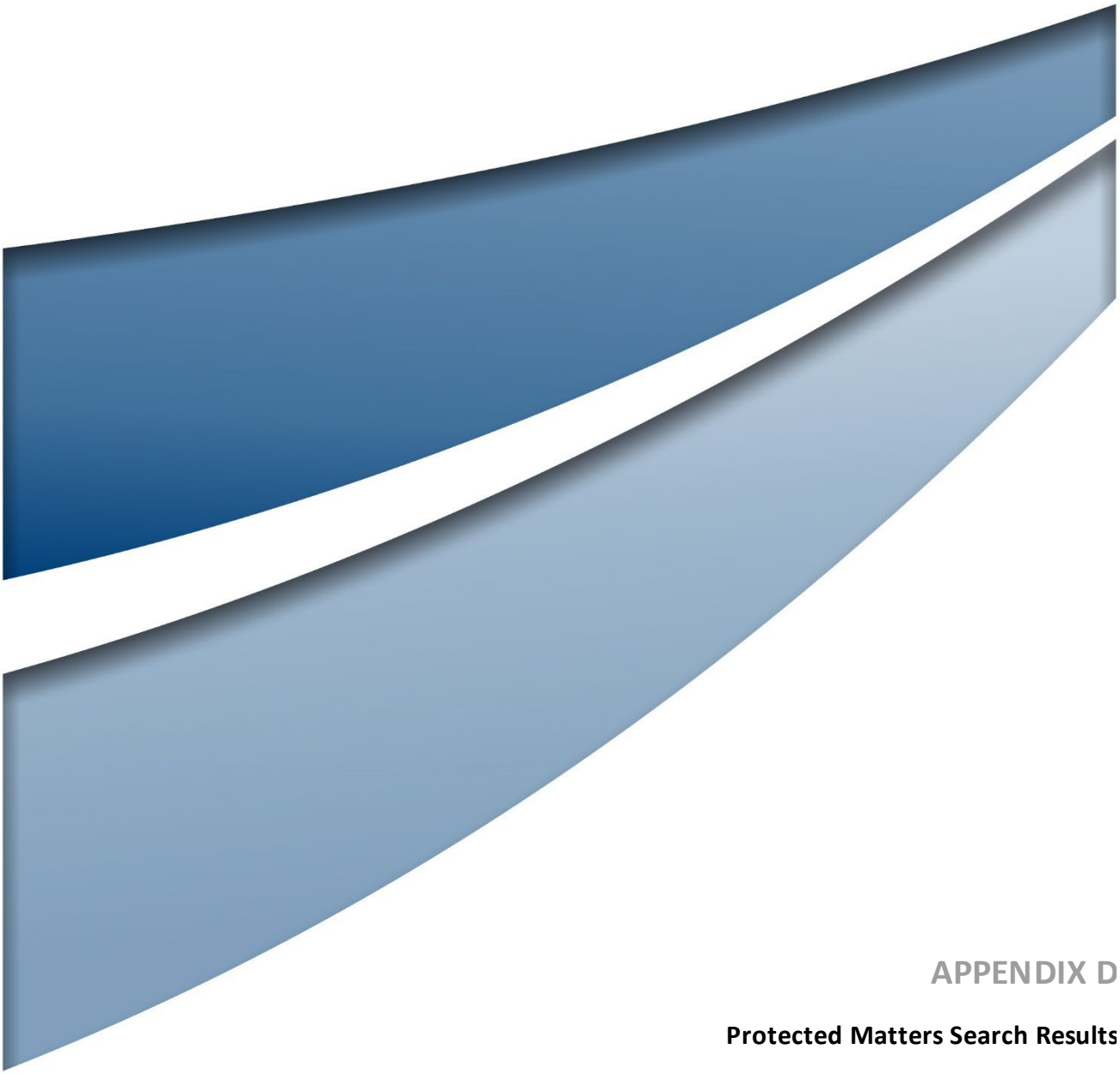
1.1 FLORA SPECIES LIST

BAM Growth Form Group	Family	Scientific Name	Common Name
Tree (TG)	Myrtaceae	*Eucalyptus melliodora*	Yellow Box
Shrub (SG)	Chenopodiaceae	*Sclerolaena birchii*	Galvinized Burr
Shrub (SG)	Scrophulariaceae	*Eremophila debilis*	Amulla
Shrub (SG)	Thymelaeaceae	*Pimelea latifolia*	
Grass & grasslike (GG)	Cyperaceae	*Carex inversa*	Knob Sedge
Grass & grasslike (GG)	Cyperaceae	*Cyperus gracilis*	Slender Flat-sedge
Grass & grasslike (GG)	Lomandraceae	*Lomandra filiformis subsp. filiformis*	
Grass & grasslike (GG)	Poaceae	*Aristida ramosa*	Purple Wiregrass
Grass & grasslike (GG)	Poaceae	*Austrostipa aristiglumis*	Plains Grass
Grass & grasslike (GG)	Poaceae	*Cynodon dactylon*	Common Couch
Grass & grasslike (GG)	Poaceae	*Dichanthium sericeum subsp. sericeum*	Queensland Bluegrass
Grass & grasslike (GG)	Poaceae	*Lachnagrostis filiformis*	
Grass & grasslike (GG)	Poaceae	*Microlaena stipoides var. stipoides*	Weeping Grass
Grass & grasslike (GG)	Poaceae	*Rytidosperma bipartitum*	Wallaby Grass
Grass & grasslike (GG)	Poaceae	*Rytidosperma richardsonii*	Straw Wallaby-grass
Forb (FG)	Acanthaceae	*Rostellularia adscendens*	Pink Tongues
Forb (FG)	Anthericaceae	*Tricoryne elatior*	Yellow Autumn-lily
Forb (FG)	Asparagaceae	*Arthropodium minus*	Small Vanilla Lily
Forb (FG)	Asteraceae	*Calotis lappulacea*	Yellow Burr-daisy
Forb (FG)	Asteraceae	*Vittadinia muelleri*	
Forb (FG)	Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell
Forb (FG)	Chenopodiaceae	*Einadia hastata*	Berry Saltbush
Forb (FG)	Chenopodiaceae	*Einadia nutans*	Climbing Saltbush
Forb (FG)	Convolvulaceae	*Dichondra repens*	Kidney Weed
Forb (FG)	Fabaceae (Faboideae)	*Cullen tenax*	Emu-foot
Forb (FG)	Geraniaceae	*Geranium solanderi*	Native Geranium
Forb (FG)	Geraniaceae	*Geranium solanderi var. solanderi*	
Forb (FG)	Haloragaceae	*Haloragis heterophylla*	Variable Raspwort
Forb (FG)	Lamiaceae	*Mentha satureioides*	Native Pennyroyal
Forb (FG)	Malvaceae	*Sida corrugata*	Corrugated Sida
Forb (FG)	Malvaceae	*Sida filiformis*	

BAM Growth Form Group	Family	Scientific Name	Common Name
Forb (FG)	Polygonaceae	*Rumex brownii*	Swamp Dock
Forb (FG)	Rosaceae	*Acaena sp.*	Sheep's Burr
Other (OG)	Fabaceae (Faboideae)	*Glycine clandestina*	Twining glycine
Other (OG)	Fabaceae (Faboideae)	*Glycine tabacina*	Variable Glycine
Other (OG)	Fabaceae (Faboideae)	*Grona varians*	
Exotic (HTE)	Clusiaceae	*Hypericum perforatum*	St. Johns Wort
Exotic (HTE)	Poaceae	*Bromus diandrus*	Great Brome
Exotic (HTE)	Poaceae	*Cenchrus clandestinus*	Kikuyu Grass
Exotic (HTE)	Poaceae	*Hyparrhenia hirta*	Coolatai Grass
Exotic (HTE)	Poaceae	*Paspalum dilatatum*	Paspalum
Exotic (non HTE)	Apiaceae	*Cyclospermum leptophyllum*	Slender Celery
Exotic (non HTE)	Asteraceae	*Cirsium vulgare*	Spear Thistle
Exotic (non HTE)	Asteraceae	*Conyza sumatrensis*	Tall fleabane
Exotic (non HTE)	Asteraceae	*Sonchus oleraceus*	Common Sowthistle
Exotic (non HTE)	Asteraceae	*Tragopogon porrifolius subsp. porrifolius*	Salsify
Exotic (non HTE)	Brassicaceae	*Rapistrum rugosum*	Turnip Weed
Exotic (non HTE)	Caryophyllaceae	*Petrorhagia dubia*	
Exotic (non HTE)	Fabaceae (Faboideae)	*Medicago sativa*	Lucerne
Exotic (non HTE)	Fabaceae (Faboideae)	*Vicia sativa*	Common vetch
Exotic (non HTE)	Gentianaceae	*Centaurium tenuiflorum*	Branched Centaury, Slender centaury
Exotic (non HTE)	Lamiaceae	*Marrubium vulgare*	White Horehound
Exotic (non HTE)	Lamiaceae	*Salvia verbenaca*	Vervain
Exotic (non HTE)	Malvaceae	*Sida rhombifolia*	Paddy's Lucerne
Exotic (non HTE)	Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues
Exotic (non HTE)	Poaceae	*Avena barbata*	Bearded Oats
Exotic (non HTE)	Poaceae	*Bromus catharticus*	Praire Grass
Exotic (non HTE)	Poaceae	*Bromus molliformis*	Soft Brome
Exotic (non HTE)	Poaceae	*Phalaris aquatica*	Phalaris
Exotic (non HTE)	Poaceae	*Polypogon monspeliensis*	Annual Beardgrass
Exotic (non HTE)	Poaceae	*Lolium perenne*	Perennial Ryegrass
Exotic (non HTE)	Polygonaceae	*Rumex crispus*	Curled Dock
Exotic (non HTE)	Primulaceae	*Lysimachia arvensis*	Scarlet Pimpernel
Exotic (non HTE)	Scrophulariaceae	*Verbascum virgatum*	Twiggy Mullein
Exotic (non HTE)	Verbenaceae	*Verbena bonariensis*	Purpletop

1.2 Vegetation Integrity Plot Data

Plot	PCT	Patch Size	Condition Class	Zone	Easting	Northing	Bearing	Composition (Species Richness)						Structure (Percentage Cover)						Function								
								Tree	Shrub	Grass	Forbs	Ferns	Other	Tree	Shrub	Grass	Forbs	Ferns	Other	Large Trees	Hollow Trees	Litter Cover (%)	Length Fallen Logs (m)	Tree Stems (cm)					Tree Regen	High Threat Exotics
																								5 to 9	10 to 19	20 to 29	30 to 49	50 to 79		
R1	483	100	Exotic	56	237323	6438598	10	0	0	5	1	0	0	0.0	0.0	3.0	0.2	0.0	0.0	0	0	83.0	0.0	0	0	0	0	0	0	70.0
R2	483	100	Remnant	56	237436	6438775	40	1	2	5	13	0	3	25.0	0.2	51.4	3.5	0.0	0.4	10	4	42.5	74.0	1	1	1	1	1	0	25.0
R3	483	100	Exotic	56	239171	6439021	100	0	1	2	5	0	0	0.0	0.1	10.1	5.9	0.0	0.0	0	0	66.0	0.0	0	0	0	0	0	0	7.0
R4	483	100	Exotic	56	239385	6439048	205	0	0	3	2	0	0	0.0	0.0	7.0	0.2	0.0	0.0	0	0	84.0	0.0	0	0	0	0	0	0	22.0



APPENDIX D

Protected Matters Search Results

EPBC Act Protected Matters Report

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

Report created: 19-Apr-2023

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	9
Listed Threatened Species:	37
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	18
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

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

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity	Buffer Status
Hunter estuary wetlands	100 - 150km upstream from Ramsar site	In feature area

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	Community may occur within area	In feature area
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Community may occur within area	In buffer area only
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community may occur within area	In feature area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area	In feature area
Hunter Valley Weeping Myall (Acacia pendula) Woodland	Critically Endangered	Community may occur within area	In feature area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community may occur within area	In feature area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community may occur within area	In buffer area only
Weeping Myall Woodlands	Endangered	Community may occur within area	In feature area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

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

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Aphelocephala leucopsis Southern Whiteface [529]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat may occur within area	In feature area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat known to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Leipoa ocellata](#) Malleefowl [934]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Melanodryas cucullata cucullata](#) South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat known to occur within area	In feature area
[Neophema chrysostoma](#) Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area	In feature area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
[Polytelis swainsonii](#) Superb Parrot [738]	Vulnerable	Species or species habitat may occur within area	In feature area
[Rostratula australis](#) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
[Stagonopleura guttata](#) Diamond Firetail [59398]	Vulnerable	Species or species habitat known to occur within area	In feature area
FROG			
[Heleioporus australiacus](#) Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Litoria booroolongensis](#) Booroolong Frog [1844]	Endangered	Species or species habitat may occur within area	In feature area
MAMMAL			
[Chalinolobus dwyeri](#) Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Dasyurus maculatus maculatus (SE mainland population)](#) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Nyctophilus corbeni			
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Petrogale penicillata			
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Pseudomys novaehollandiae			
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area	In feature area
PLANT			
Androcalva procumbens			
[87153]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Androcalva rosea			
Sandy Hollow Commersonia [86861]	Endangered	Species or species habitat may occur within area	In buffer area only
Dichanthium setosum			
bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Euphrasia arguta			
[4325]	Critically Endangered	Species or species habitat may occur within area	In feature area
Homoranthus darwinioides			
[12974]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Lepidium aschersonii			
Spiny Peppercress [10976]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Prasophyllum sp. Wybong (C.Phelps ORG 5269)			
a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
Thesium australe			
Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Vincetoxicum forsteri listed as Tylophora linearis			
[92384]	Endangered	Species or species habitat may occur within area	In feature area
REPTILE			
Aprasia parapulchella			
Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Delma impar			
Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Hirundapus caudacutus			
White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Motacilla flava			
Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Myiagra cyanoleuca			
Satin Flycatcher [612]		Species or species habitat likely to occur within area	In feature area
Rhipidura rufifrons			
Rufous Fantail [592]		Species or species habitat likely to occur within area	In feature area
Migratory Wetlands Species			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii			
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area	In feature area
Numenius madagascariensis			
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

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

Commonwealth Land Name	State	Buffer Status
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian Telecommunications Commission [12494]	NSW	In buffer area only

Listed Marine Species [Resource Information]

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

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

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

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Goulburn River	National Park	NSW	In buffer area only

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Gas Transmission Pipeline	2011/5917	Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Valley of the Winds wind farm	2020/8668	Controlled Action	Assessment Approach	In buffer area only
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
Aerial baiting for wild dog control	2006/2713	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Bioregional Assessments

SubRegion	BioRegion	Website	Buffer Status
Hunter	Northern Sydney Basin	BA website	In feature area

Caveat

1 PURPOSE

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

The report contains the mapped locations of:

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

2 DISCLAIMER

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

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

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

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

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

4 LIMITATIONS

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

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

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

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

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

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

Acknowledgements

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

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

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

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

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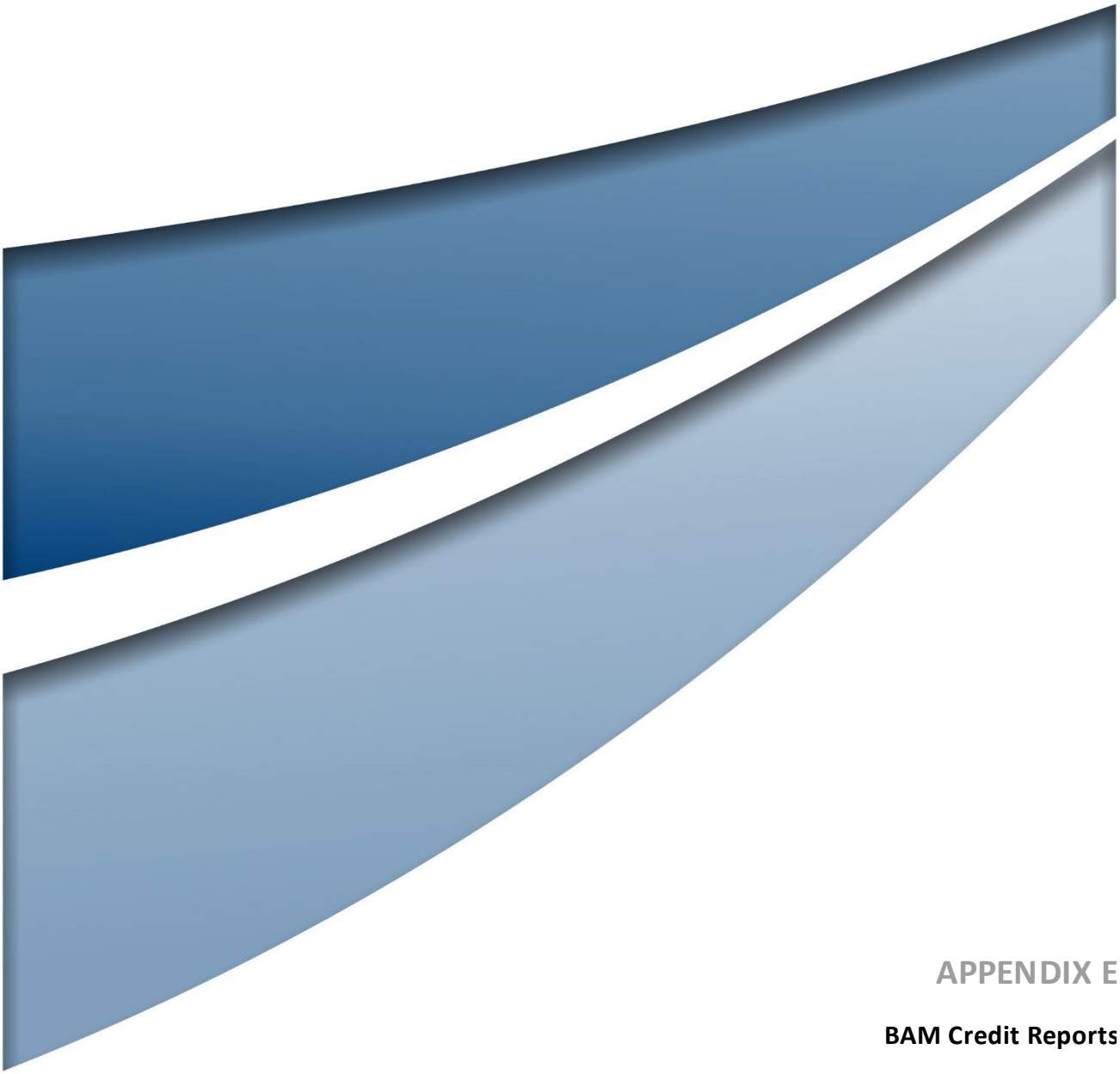

APPENDIX E

BAM Credit Reports

BAM Credit Summary Report

Proposal Details

Assessment Id
00032861/BAAS17099/23/00040004

Proposal Name
Goulburn River Solar Farm - Ringwood Road Upgrade Works

BAM data last updated *
14/04/2023

Assessor Name
Jacob Manners

Report Created
03/05/2023

BAM Data version *
58

Assessor Number
BAAS17099

BAM Case Status
Finalised

Date Finalised
03/05/2023

Assessment Revision
0

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

Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley												
1	483_Exotic_Grassland	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 Ri	9.3	9.3	2.1	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	0

2	483_Remnant	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 Ri	82.2	82.2	0.06	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	3
											Subtotal	**3**
											Total	**3**

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

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00032861/BAAS17099/23/00040004

Proposal Name
Goulburn River Solar Farm - Ringwood Road Upgrade Works

BAM data last updated *
14/04/2023

Assessor Name
Jacob Manners

Assessor Number
BAAS17099

BAM Data version *
58

Proponent Names

Report Created
03/05/2023

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Major Projects

Date Finalised
03/05/2023

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Ri	Critically Endangered Ecological Community	483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley

Predicted Threatened Species Not On Site

Name
Grantiella picta / Painted Honeyeater

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
483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	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 Ri	2.1	3	0	3

483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Ri This includes PCT's:	-	483_Exotic_Grassland	No	0	Liverpool Range, Hunter, Kerrabee, Liverpool Plains, Peel and Pilliga. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 847, 851, 921, 1099, 1303, 1304, 1307, 1324, 1329, 1330, 1332, 1383, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					
	White Box - Yellow Box - Blakely's Red Gum	-	483_Remnant	Yes	3	Liverpool Range, Hunter, Kerrabee, Liverpool Plains, Peel and Pilliga.

	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 Ri This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 847,					or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	851, 921, 1099, 1303, 1304, 1307, 1324, 1329, 1330, 1332, 1383, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like credit retirement options

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00032861/BAAS17099/23/00040004

Proposal Name
Goulburn River Solar Farm - Ringwood Road Upgrade Works

BAM data last updated *
14/04/2023

Assessor Name
Jacob Manners

Assessor Number
BAAS17099

BAM Data version *
58

Proponent Name(s)

Report Created
03/05/2023

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Major Projects

Date Finalised
03/05/2023

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Ri	Critically Endangered Ecological Community	483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley

Predicted Threatened Species Not On Site

Name
Grantiella picta / Painted Honeyeater

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	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 Ri	2.1	3	0	3.00

483-Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New	-	483_Exotic_ Grassland	No	0	Liverpool Range,Hunter, Kerrabee, Liverpool Plains, Peel and Pilliga. or Any IBRA subregion that is within 100 kilometers of the outer edge of the

	England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Ri This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 847, 851, 921, 1099, 1303, 1304, 1307, 1324, 1329, 1330, 1332, 1383, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406,					impacted site.

	3415, 3533, 4147, 4149, 4150					
	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 Ri This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 847, 851, 921, 1099, 1303,	-	483_Remnant	Yes	3	Liverpool Range,Hunter, Kerrabee, Liverpool Plains, Peel and Pilliga. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	1304, 1307, 1324, 1329, 1330, 1332, 1383, 1606, 1608, 1611, 1691, 1693, 1695, 1698, 3314, 3359, 3363, 3373, 3376, 3387, 3388, 3394, 3395, 3396, 3397, 3398, 3399, 3406, 3415, 3533, 4147, 4149, 4150					

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like options

Plant community types (PCT) & ecological communities

Formation *	Class *	Plant community type *	PCT % cleared	Associated TEC *	BC Act listing status	EPBC Act listing status	Action	Delete
Grassy Woodlands	Western Slopes Grassy Woodlands	**483** - Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley	90	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 R	Critically Endangered Ecological Community	Not Listed	ADD VEG ZONE Modify default benchmarks	✖

Select type:	Tree (3)	Shrub (4)	Grass & grass like (10)	Forb (12)	Fern (1)	Other (2)
Composition	3	5	10	13	1	3

Unlock Update Cancel

Select type:	Tree (18)	Shrub (2)	Grass & grass like (43)	Forb (7)	Fern (0)	Other (1)
Structure	17	2	45	7	0	1

Unlock Update Cancel

Select type:	Number of large trees (2)	Stem size class (4)	Length of fallen logs (41)	Regeneration stems (Present)	Litter cover (30)
Function	2	4	34	Present	15

Unlock Update Cancel

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