VEOLIA

Appendix Y

Biodiversity development assessment report

Woodlawn Advanced Recovery Centre

Biodiversity Development Assessment Report

Prepared for Veolia Environmental Services (Australia) Pty Ltd

August 2022

Woodlawn Advanced Recovery Centre

Biodiversity Development Assessment Report

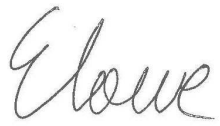
Veolia Environmental Services (Australia) Pty Ltd

J200931 RP6

August 2022

Version	Date	Prepared by	Reviewed by	Comments
1	23 August 2022	Kirsten Vine, Paul Rossington	Paul Rossington	

Approved by



Erin Lowe
Associate Ecologist
23 August 2022

BAM Accredited: BAAS18135

Ground floor 20 Chandos Street
St Leonards NSW 2065
PO Box 21
St Leonards NSW 1590

Executive Summary

ES1 Project description

Veolia Environmental Services (Australia) Pty Ltd (Veolia) owns and operates the Woodlawn Eco Precinct (the Eco Precinct), located on Collector Road, approximately 6 kilometres (km) west of Tarago, approximately 50 km south of Goulburn and 70 km north of Canberra. The Eco Precinct is located in the Goulburn Mulwaree local government area (LGA). The regional setting is shown in Figure 3.1 and local setting is shown in Figure 1.1.

Veolia proposes to develop and operate the Woodlawn Advanced Energy Recovery Centre (ARC) (the project), an energy recovery facility (ERF), at the Eco Precinct. This involves the development of an additional waste management technology at the Eco Precinct, processing residual waste feedstock which is already approved to be received, and generating electricity from the energy recovery process.

The project will involve construction and operation of the following key ARC components:

- construction of the ARC, comprising an ERF for the thermal treatment of residual municipal solid waste (MSW) and commercial and industrial (C&I) waste (referred to as waste feedstock) that would otherwise be disposed to landfill;
- thermal treatment in the ARC of up to 380,000 tonnes per annum (tpa) of residual waste feedstock;
- installed capacity of up to 30 megawatts (MW) of electricity (generation of up to 240,000 megawatt hours (MWh) of electricity per annum);
- on-site management of residual by-products generated by the ARC, including construction of an encapsulation cell; and
- construction of ancillary infrastructure to facilitate construction and operation of the project, including a new access road.

This report accompanies an environmental impact statement (EIS) to support an application for development consent under Part 4, Division 4.7 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The project has been classified as a State significant development (SSD) under the EP&A Act.

This Biodiversity Development Assessment Report (BDAR) assesses the potential impact of the project on threatened terrestrial and semi-aquatic biodiversity listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), describes biodiversity offset requirements under the Biodiversity Assessment Method (BAM, DPIE 2020) and recommends measures to minimise impacts.

ES2 Landscape features

The project study area is located within the Monaro subregion of the broader South Eastern Highlands region of the Interim Biogeographic Regionalisation of Australia (IBRA). The South Eastern Highlands sits between the coastal South East Corner and Sydney Basin and the Australian Alps Bioregions. This region forms part of the Lachlan fold belt, consisting of Ordovician to Devonian sandstones, shales, and volcanic rocks that are intruded by granites. The soils vary across the region according to rainfall, altitude, and underlying geology (NPWS, 2003).

The project study area lies within the Gundary Plains Mitchell Landscape, which is typified by rolling hills and low ranges on lower Ordovician geologies (DECC, 2002). The Gundary Plains Mitchell Landscape has a native vegetation cover of only 28%.

The project study area has a history of high levels of soil and vegetation disturbance commonly associated with quarry activities and adjacent agriculture, which is reflected in the high weed densities and large unvegetated patches evident on the subject land. The headwaters of an ephemeral tributary of Crisps Creek are within the project study area, which form part of the broader Mulwaree River catchment. The headwaters of another small ephemeral tributary of Allianoyonyiga Creek occur in the western portion of the project study area, which feed into Lake George. Lake George is listed in the Directory of Important Wetlands in Australia (DAWE, 2021f). Lake George is 8–8.5kms from the project study area.

The soils are mapped as Yellow Kurosols and Yellow Kandosols. The area historically supported grazing by sheep and cattle.

ES3 Native vegetation

The project study area is predominantly cleared of vegetation, but contains:

- several planted corridors of moderately sized Eurabbie (*Eucalyptus bicostata)* and Cootamundra Wattle (*Acacia baileyana*) with remnant native understorey;
- thick regrowth of Silver Wattle (*Acacia dealbata*) across parts of the historic quarry area;
- derived native grassland patches closer to Collector Road;
- a Common Reed (*Phragmites australis*) wetland, in the headwaters of Crisps Creek;
- a corridor of mature Radiata Pine (*Pinus radiata*) with no understorey; and
- exotic grassland previously used for agriculture.

The only PCT within the subject land (development footprint) is:

- PCT 1191 – Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion. Within the subject land, PCT 1191 is highly disturbed, with no remnant native canopy species remaining. There is a total of 1.55 ha of PCT 1191 within the subject land. For the purposes of BAM (DPIE, 2020) assessment, 0.15 ha of vegetation to be impacted that is clearly dominated by exotic species was also assigned to this PCT.

ES4 Threatened species and ecological communities

Twenty-six predicted 'species credit species' (candidate species), comprising 13 flora species and 13 fauna species, were predicted to occur in the BAM Calculator (BAM-C), prior to further assessment (habitat assessment) in accordance with Section 5.2.3 of BAM (DPIE, 2020). Subsequently, targeted surveys were undertaken for the following candidate threatened flora species:

- Austral Toadflax (*Thesium australe*);
- Black Gum (*Eucalyptus aggregata);*
- Buttercup Doubletail (*Diuris aequalis);*
- Button Wrinklewort (*Rutidosis leptorrhynchoides);*
- Camden Woollybutt (*Eucalyptus macarthurii*);
- Dwarf Kerrawang (*Commersonia prostrata);*

- Hoary Sunray (*Leucochrysum albicans* var. *tricolor);*
- Mauve Burr-daisy (*Calotis glandulosa);*
- Silky Swainson-pea (*Swainsona sericea);*
- Tarengo Leek Orchid (*Prasophyllum petilum); and*
- Thick Lip Spider Orchid (*Caladenia tessellata*

Targeted surveys were undertaken for the following candidate threatened fauna species:

- Koala (*Phascolarctos cinereus*), and
- Southern Myotis (*Myotis macropus*).

One threatened ecological community (TEC), *Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions,* which corresponds to PCT 1191, has been recorded within the subject land. This TEC is listed as critically endangered under the BC Act but is not listed under the EPBC Act. The occurrence of the TEC in the subject land is in very poor condition, consisting only of Acacia-dominated regrowth, derived native grassland and the understorey component of an area of planted with non-locally-indigenous trees.

A second TEC associated with PCT1256 was recorded in the project study area but occurs adjacent to the subject land; Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions. This TEC is listed as critically endangered under the BC Act but is not listed under the EPBC Act. The occurrence of the TEC in the project study area is in poor condition, consisting only of a low diversity of remnant native wetland grasses, sedges, rushes, and forbs. Due to changes in project design this PCT and TEC will no longer be directly impacted.

Serious and Irreversible Impacts (SAII) candidate species and/or communities likely to be directly impacted include:

- PCT 1191 Snow Gum – Candlebark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion occurs within the project study area. This PCT is associated with the Critically Endangered *Werriwa Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions* (BC Act).

SAII candidate species and/or communities which may be indirectly impacted include:

- Yellow-spotted Tree Frog (*Litoria castanea*).

The Regent Honeyeater and Swift Parrot are candidate species for SAII however, the threatened biodiversity data collection (TBDC) profiles for both species state that “Ecosystem credit areas are unlikely to be potential serious and irreversible impacts”. Only ecosystem credit areas could conceivably be impacted by the project as it is outside of important habitat map areas that define the species credit generating habitat for the species. No further SAII assessment is required for these species.

An assessment of the project impacts against the SAII criteria set out in Section 9.1.1 of the BAM (DPIE 2020) has been undertaken.

ES5 Groundwater-dependent ecosystems

The subject land does not contain any aquatic or terrestrial groundwater dependant ecosystems (GDE) (BoM, 2021) (EMM 2021).

The nearest aquatic groundwater dependent ecosystems (GDEs) are Crisps and Allainoyonyiga Creeks at approximately 0.3–0.5 kms from the project study area boundaries.

ES6 Aquatic and riparian biodiversity

Several small artificial wetlands and highly modified wetland areas occur to the north of the subject land which may support threatened terrestrial and semi-aquatic fauna and flora. These wetland areas will not be directly impacted by the project. These wetland areas appear to be dependent on surface water flow and impeded drainage (caused by the Collector Road structure) and are not likely to be indirectly affected by the project as groundwater flow processes are expected to remain relatively unchanged (EMM 2021).

ES7 Impact avoidance, minimisation, and mitigation

Key avoidance measures that have been implemented include:

- redesigning the project to avoid the placement of the ARC access road through wetland areas of PCT 1256, which avoids potential impacts on threatened frog species;
- avoiding disturbance to the catchment area and hydrology of the wetland; and
- minimising the impact on PCT 1191 (planted native corridor and the derived native grasslands).

Other measures proposed to minimise and mitigate residual impacts in the subject land are detailed in Section 7.3.

ES8 Assessment of impacts under other relevant biodiversity legislation

The following species were assessed for impact significance under the *Environmental Protection and Biodiversity Act 1999* (EPBC Act):

- Australasian Bittern (*Botaurus poiciloptilus*) (Endangered);
- Australian Painted Snipe (*Rostratula australis*) (Endangered);
- Gang-gang Cockatoo (*Callocephalon fimbriatum*);
- Green and Golden Bell Frog (*Litoria aurea*) (Vulnerable);
- Koala (*Phascolarctos cinereus*) (Vulnerable);
- Latham's Snipe (*Gallinago hardwicki*) (Migratory);
- Regent Honeyeater (*Anthochaera phrygia*);
- Spotted-tail Quoll (*Dasyurus maculatus*) (Endangered);
- Swift Parrot (*Lathamus discolor*);
- White-throated Needletail (*Hirundapus caudacutus*) (Vulnerable); and
- Yellow-spotted Tree Frog (*Litoria castanea*) (Endangered).

The impacts of the project on these species and communities were not considered to be significant. The project will not result in a significant impact to any Matters of National Environmental Significance and referral of the project to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) is not required.

ES9 Biodiversity impacts and offsets

The project will be fully contained within the subject lands as defined in Figure 3.2 and involve total clearance of vegetation. The project will have negligible indirect impacts due to the high existing level of disturbance to the surrounding landscape and the impact mitigation strategies that will form part of the project.

An assessment of prescribed impacts in Section 7.2 concluded that minimal to negligible impacts will be created by the project from prescribed impacts.

The ecosystem credit requirements of the project include:

- 31 credits of Snow Gum – Candlebark woodland on broad valley flats of the tablelands and slopes, South Eastern highlands Bioregion (PCT 1191).

Ecosystem credits species (predicted species) are species that are predicted to occur within the vegetation communities present and do not require species-specific credits.

Candidate (species-credit) species are not reliably predicted based on vegetation communities and require species-specific credits based on the impacts of a project.

No candidate species were detected during targeted surveys and therefore there is no species credit requirement for the project.

Offsets for the residual impacts upon PCT 1191 will be provided in accordance with the Biodiversity Offsets Scheme (BOS). Due to the relatively small biodiversity credit requirement and timeframe constraints of the project, the offset liability for the project may be primarily or entirely met through a combination of the following methods:

- purchase and retirement of available like-for-like biodiversity credits from the biodiversity offsets trading market; and
- payment to the biodiversity conservation fund.

Glossary

ARC	Woodlawn Advanced Energy Recovery Centre
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Calculator
BC Act	*Biodiversity Conservation Act* 2016 (NSW)
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offsets Scheme
DAWE	Department of Agriculture, Water, and the Environment
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DPE	Department of Planning and Environment
DPIE	Department of Planning, Industry and Environment
Eco Precinct	Woodlawn Eco Precinct
EMM	EMM Consulting Pty Limited
EP&A Act	*Environmental Planning and Assessment Act* 1979 (NSW)
EPBC Act	*Environmental Protection and Biodiversity Act* 1999 (Commonwealth)
ERF	Energy recovery facility
FM Act	*Fisheries Management Act* 1994 (NSW)
GDE	Groundwater Dependant Ecosystem
GMC	Goulburn Mulwaree Council
IBRA	Interim Biogeographic Regionalisation of Australia
IUCN	International Union for the Conservation of Nature
KFH	Key Fish Habitat
KTP	Key threatening process
PCT	Plant Community Type
PMST	Protected Matters Search Tool
SAII	Serious and Irreversible Impact
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
Veolia	Veolia Environmental Services (Australia) Pty Ltd
WM Act	*Water Management Act* 2000 (NSW)

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1 Introduction

1.1 The project

1.1.1 Project overview

Veolia Environmental Services (Australia) Pty Ltd (Veolia) owns and operates the Woodlawn Eco Precinct (the Eco Precinct), located on Collector Road, approximately 6 kilometres (km) west of Tarago, approximately 50 km south of Goulburn and 70 km north of Canberra. The Eco Precinct is located in the Goulburn Mulwaree local government area (LGA). The Eco Precinct has provided sustainable and innovative waste management services since 2004.

Veolia proposes to develop and operate the Woodlawn Advanced Energy Recovery Centre (ARC) (the project), an energy recovery facility (ERF), at the Eco Precinct. This involves the development of an additional waste management technology at the Eco Precinct, processing a portion of the residual waste feedstock received at the site, and generating electricity from the energy recovery process.

This Biodiversity Development Assessment Report (BDAR) has been prepared by EMM Consulting Pty Limited (EMM) and assesses the potential impact of the project on threatened terrestrial biodiversity listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), describes biodiversity offset requirements under the Biodiversity Assessment Method (BAM) (DPIE 2020) and recommends measures to minimise impacts. This BDAR accompanies an environmental impact statement (EIS) prepared by EMM on behalf of Veolia to support an application for development consent under Part 4, Division 4.7 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The project is classified as a State significant development (SSD) under the EP&A Act.

1.1.2 Scope of project

The project will involve construction and operation of the following key components comprising the ARC:

- construction of the ARC, comprising an ERF for the thermal treatment of residual municipal solid waste (MSW) and commercial and industrial (C&I) waste (referred to as waste feedstock) that would otherwise be disposed to landfill;
- thermal treatment in the ARC of up to 380,000 tonnes per annum (tpa) of residual waste feedstock;
- installed capacity of up to 30 megawatts (MW) of electricity (generation of up to 240,000 megawatt hours (MWh) of electricity per annum);
- on-site management of residual by-products generated by the ARC, including construction of an encapsulation cell; and
- construction of ancillary infrastructure to facilitate construction and operation of the project, including a new access road.

Construction and operation of the project will be 24 hours per day, seven days a week.

1.1.3 Project study area and location

The subject land, shown in Figure 1.1, covers all or parts of the following land parcels:

- Lots 1 and 2 DP1179305;
- Lots 5 and 6 DP830765;
- Lot 8 DP534616; and
- Lot 30 DP754919.

The project study area is part of Veolia's integrated waste management operations. Veolia's landholdings, including the broader Eco Precinct area including the Pylara Farm as shown in Figure 1.1, provide a buffer between operations and surrounding private properties. The project study area has been subject to disturbance associated with historic and current mining operations and integrated waste management operations.

The project study area represents the broad area of investigation, which was considered during the assessment and design phase. It includes the subject land (development footprint), which represents the extent of surface disturbance proposed by the project and assessed in the EIS. All works and disturbance for the project will occur within the subject land and they are:

- The ARC – portion of the subject land (development footprint) encompassed by the main ARC building and ancillary infrastructure, IBA area and new access road and intersection. This area currently contains former mine plant infrastructure, water management infrastructure (plant collection dam) and other disturbed areas used for ancillary waste management operations.
- Encapsulation cell – the area encompassed by the dedicated lined and engineered cells for the encapsulation of stabilised air pollution control residues (APCr) from the flue gas treatment system. This area is disturbed and currently comprises water management infrastructure (evaporation dam 1, known as ED1).

The subject land (development footprint) area totals 38.42 hectares (ha), of which only 1.7 ha contains either native or exotic vegetation. Of the 1.7 ha of vegetation present, 1.55 ha is dominated by native plant species, and the remaining 0.15 ha is dominated by exotic plant species. The vegetation is highly modified growing in disturbed soils and is highly fragmented by internal unsealed tracks and other clearings. The project study area and subject land (development footprint) are shown in Figure 4.1.

1.2 Purpose of this report

This BDAR addresses terrestrial and semi-aquatic species (eg frogs) listed under the BC Act and EPBC Act.

The specific objectives of this assessment are to:

- describe biodiversity values of the subject land;
- assess the likelihood that threatened species and communities (threatened biodiversity) listed under the BC Act and EPBC Act could occur in or near the subject land;
- document the strategies implemented to avoid and/or minimise impacts of the project on threatened biodiversity;
- assess residual threatened biodiversity impacts, after avoidance and minimisation strategies have been implemented;

- provide environmental safeguards to mitigate threatened biodiversity impacts during construction and operation; and
- describe the offsets, including the numbers and types of biodiversity credits, required to address residual impacts.

1.3 Definitions of frequently used terms

Project elements referred to in this BDAR are described in Table 1.1 and Figure 3.2.

Table 1.1 Project elements referred to in this BDAR

Project elements	Definition
Landscape assessment area	The area used to describe landscape features, consisting of a 1500 m buffer around the subject land.
Project study area	The broader area of land that was subject to initial inspection and constraints assessment to inform impact avoidance during project reference design.
Subject land (development footprint)	Also known as the development footprint in the EIS. It is the extent of direct surface disturbance proposed by the project and assessed in the EIS.

1.4 Assessment requirements

Table 1.2 lists the assessment requirements relevant to the project and describes where these are addressed in the BDAR.

Table 1.2 Secretary's Environmental Assessment Requirements

Requirement	Section addressed
Planning Secretary's Environmental Assessment Requirements	
An assessment of the proposal's biodiversity impacts in accordance with the *Biodiversity Conservation Act 2016*, including the preparation of a Biodiversity Development Assessment Report (BDAR) where required under the Act, except where a waiver for preparation of a BDAR has been granted.	This entire report.
BCD Environmental Assessment Requirements for the proposed Woodlawn ARC – Biodiversity	
1. BDAR must be in accordance with the BC Act and regulations.	This entire report.
2. Potential impacts should as a minimum include clearing associated with residual incombustible material and disturbance areas form site preparation works eg access roads.	This entire report.
3. Potential indirect and direct impacts described.	See Section 7.
4. Must document the avoid, minimise, and offset framework in accordance with the BAM.	This entire report.
5. Must include details on credits and offset options.	See Sections 7.6 and 9, and Appendix B.

Table 1.2 Secretary's Environmental Assessment Requirements

Requirement	Section addressed
6. Be prepared by a BAM Accredited person.	Prepared by Kirsten Vine, (BAAS19031), reviewed by Paul Rossington (BAAS18065), and reviewed and certified by Erin Lowe (BAAS18135)
7. Must address Serious and Irreversible Impacts.	See Section 7.4.
8. Must document impacts to EPBC Act species and communities.	See Section 8.
9. Identify mitigation measures for impacts.	See Sections 7.2 and 7.3.
10. An assessment of likely impacts under *Fisheries Management Act 1994.*	Minimal impact to aquatic habitats or species is likely. Impacts on water quality and sensitive receiving environments are addressed in the EIS (EMM 2022).
11. Map features relevant to water and soils.	See Section 3.1.2 and Section 6
12. Background conditions for any water resource likely to be affected.	Refer to following technical assessments within the EIS (EMM 2022): • *Groundwater Assessment, Woodland Advanced Energy Recovery Centre* (EMM 2022a). • *Surface Water Assessment, Woodland Advanced Energy Recovery Centre* (EMM 2022b).
13. Impacts on water quality.	Refer to following technical assessments within the EIS (EMM 2022): • *Groundwater Assessment, Woodland Advanced Energy Recovery Centre (EMM 2022a).* • *Surface Water Assessment, Woodland Advanced Energy Recovery Centre (EMM 2022b).*
14. Impacts on hydrology.	Refer to following technical assessments within the EIS (EMM 2022): • *Groundwater Assessment, Woodland Advanced Energy Recovery Centre (EMM 2022a).* • *Surface Water Assessment, Woodland Advanced Energy Recovery Centre (EMM 2022b).*
15-19 Impacts on flooding.	Refer to following technical assessments within the EIS (EMM 2022): • *Surface Water Assessment, Woodland Advanced Energy Recovery Centre* (EMM 2022b).

1.5 Information sources

1.5.1 Publications and databases

In order to provide context for the project, data about flora and fauna species, populations, communities, and habitats from the locality were obtained from the following databases:

- NSW BioNet (Department of Planning, Industry and Environment; DPIE):
  - BioNet Atlas – threatened species records;

- BioNet Threatened Biodiversity Data Collection; and
- BioNet Vegetation Classification database – Plant Community Types (PCTs).

- NSW Threatened biodiversity profile search (Department of Planning, Industry and Environment; DPIE).
- Commonwealth Species Profile and Threats Database (Department of Agriculture, Water, and the Environment; DAWE 2021c).
- Protected Matters Search Tool (PMST) (DAWE, 2021b and DCCEEW, 2022).
- Directory of Important Wetlands: Nationally Important Wetlands (DAWE 2005).
- NSW Wetlands (DPIE 2018).
- Groundwater Dependent Ecosystems Atlas (Bureau of Meteorology; BoM 2021).
- PlantNET (The NSW Plant Information Network System) (Royal Botanic Gardens and Domain Trust).
- Atlas of Living Australia ((National Collaborative Research Infrastructure Strategy (NCRIS) and CSIRO)).
- Google Earth aerial images for the project study area and locality.

1.5.2 Other relevant reports

This BDAR has been prepared with reference to other technical reports that were prepared as part of the project. The other relevant reports referenced in this biodiversity assessment are listed below:

- EMM, 2022, Groundwater assessment; Woodlawn Advanced Energy Recovery Centre.

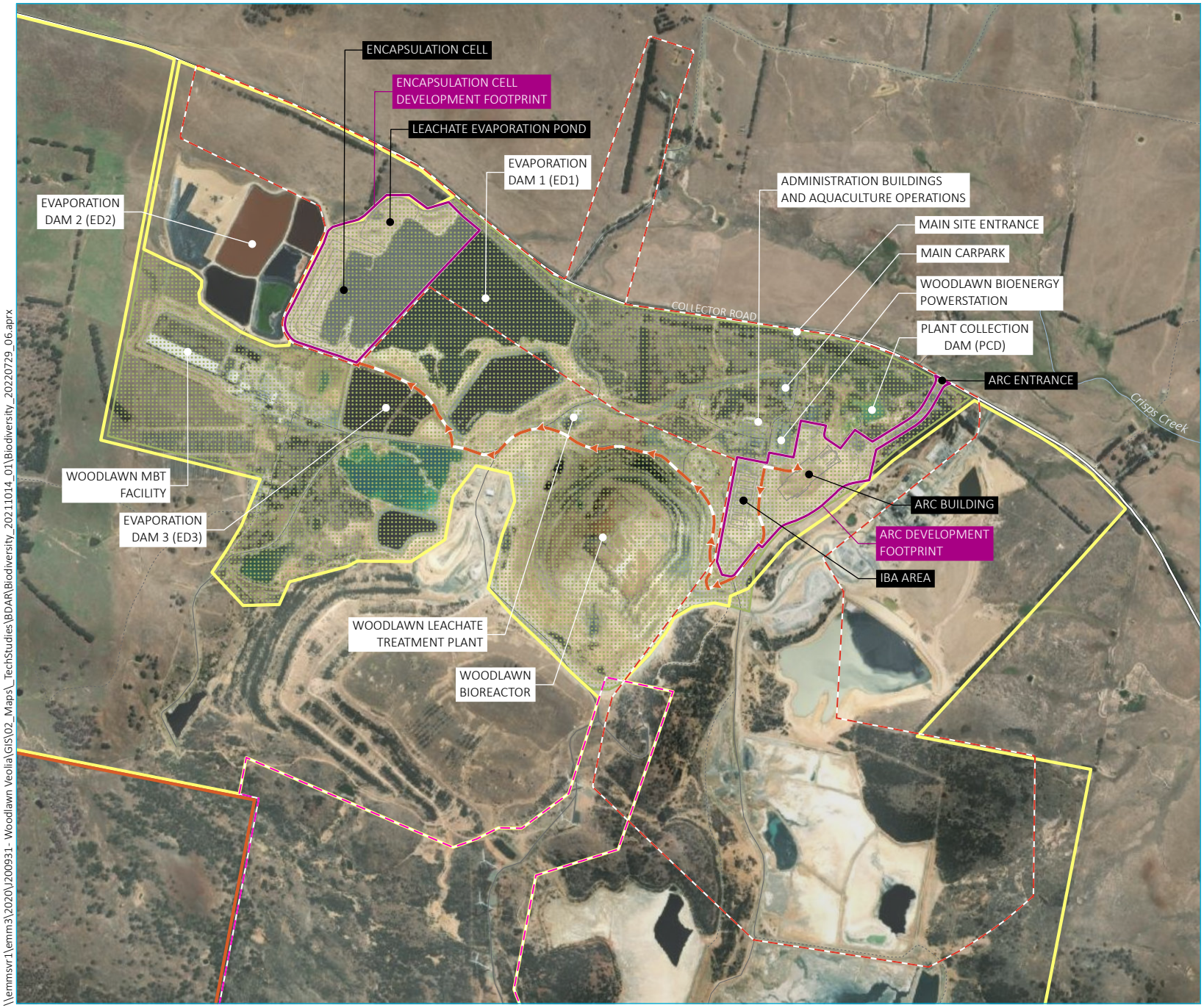
1.5.3 Spatial data

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

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

- South East Local Land Services Biometric vegetation map – VIS_ID 4211 (DPIE 2014);
- *Mitchell Landscapes Version V3.1* (SEED 2016);
- *Interim Biogeographic Regionalisation of Australia* (IBRA) *Version 7* (SEED 2016a);
- directory of important wetlands (SEED 2010a); and
- NSW Wetlands (SEED 2010).

Mapping undertaken during the site assessment was conducted using a hand-held global positioning system (GPS) unit, mobile tablet computers running FieldMaps for ArcGIS™ and Survey123 for ArcGIS™ and aerial photo interpretation. Accuracy is subject to accuracy of GPS devices, generally ± 5 m. Mapping has been produced using a Geographic Information System (GIS; ArcGIS 10.5). Following lodgement of the BDAR, relevant spatial data was provided to the DPE.



KEY

- Development footprint (Subject land)
- Project study area
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- APCr transport route
- Major road
- Minor road
- Vehicular track
- Watercourse

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Source: EMM (2022); Veolia (2022); DFSI (2017)

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GDA 1994 MGA Zone 55

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The project

Woodlawn Advanced Energy Recovery Centre
Biodiversity development assessment report
Figure 1.1

EMM creating opportunities

2 Legislative context

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

2.1 Commonwealth

2.1.1 Environmental Protection and Biodiversity Conservation Act 1999

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

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

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

The Eco Precinct is highly disturbed from current and historic activities. The project will require only minor disturbance of existing vegetation. Due to the highly disturbed nature of the Eco Precinct, significant impacts to MNES are not expected. Notwithstanding, an assessment of biodiversity impacts and consideration of MNES is included in this report.

An assessment of the project against the EPBC Act is provided in Section 8.1. An EPBC Act referral is not required for this project.

2.2 State

2.2.1 Environmental Planning and Assessment Act 1979

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

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

i State Environmental Planning Policy (Planning Systems) 2021

The project has been classified as a State significant development (SSD) under the EP&A Act as it is both 'electricity generating works and heat or co-generation' (Section 20) and 'waste and resource management facilities' (Section 23) under Schedule 1 of the *State Environmental Planning Policy (State and Planning Systems) 2021*. SEARs were issued on 2 July 2021.

2.3 Biodiversity Conservation Act 2016

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

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

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

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

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

2.4 Biosecurity Act 2015

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

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

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

The Goulburn Mulwaree Local Weed Management Plan is based on the South East Regional Strategic Weed Management Plan (GMC, 2019). This plan identifies the weeds with which the Council maintains active compliance and management.

The provisions of the Biosecurity Act are discussed further in Section 8.3.

2.5 Water Management Act 2000

Division 6 of the *Water Management Act 2000* (WM Act) requires consideration of aquifer interference activities. The NSW Aquifer Interference Policy (NOW 2012) requires an assessment of potential impacts on groundwater users, including groundwater dependent ecosystems.

An assessment of potential risks to groundwater was undertaken as part of the EIS (EMM 2021).

The project will require construction of a number of elements requiring excavation. These include a waste bunker at the ARC, and dedicated encapsulation cell for APCr management. These have the potential to impact surface water and groundwater.

Construction of the encapsulation cell is expected to have minimal effect on the groundwater flow regime and would therefore not impact any receptors. During operation of and filling of the encapsulation cell, impacts to groundwater are likely to include:

- a gradual and localised, temporary increase in groundwater level in the immediate vicinity; and
- possible localised discharge of existing groundwater in the in the ED1 and/or encapsulation area.

Allianoyonyiga Creek, which is part of the broader Willeroo borefield, is located in the Lake George catchment. Process water supply for the Eco Precinct is via extraction of this Willeroo borefield. Groundwater extraction would not exceed the amounts approved under Veolia's existing license/permit (EMM 2021).

Due to the low risk of the works affecting groundwater sources, the risk of substantial impacts on groundwater dependent ecosystems is considered to be negligible.

Impacts on riparian land are considered in Section 8.4 of this report.

Section 1 – Biodiversity assessment

3 Landscape features

3.1 Landscape features

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

3.1.1 Bioregions and landscapes

The subject land is located wholly within the Monaro subregion of the broader South Eastern Highlands bioregion of the *Interim Biogeographic Regionalisation of Australia* (IBRA). The South Eastern Highlands bioregion sits between the coastal South East Corner and Sydney Basin Bioregions and the Australian Alps Bioregions. They are part of the Lachlan fold belt consisting of Ordovician to Devonian sandstones, shales, and volcanic rocks that are intruded by granites. The soils vary across the region according to rainfall, altitude, and underlying geology (NPWS, 2003).

The subject land contains the Gundary Plains Mitchell Landscape, which is typified by rolling hills and low ranges on lower Ordovician geologies (DECC, 2002). The Gundary Plains Mitchell Landscape has a native vegetation cover of only 28%, yet the landscape assessment, which calculates the native vegetation cover in the locality, calculated a lower score of 10.8% native vegetation cover.

3.1.2 Rivers, streams, estuaries, and wetlands

There are no distinct waterways within the subject land. There is a wetland area to the north-west of the proposed access road (and outside of the subject land). It is likely that part of this wetland is a natural feature and part an anthropogenic feature caused by alteration to local hydrology initiated by the construction of Collector Road and infrastructure within the Eco Precinct. There are also several small artificial wetland structures to the north of the subject land, containing native vegetation and potential habitat for fauna.

Two Strahler Order 1 and 2 tributaries of Crisps Creek, which form part of the broader Mulwaree River catchment, are located outside of the subject land within the landscape assessment area to the north (refer to Figure 3.3). Another Strahler Order 1 tributary of Allianoyonyiga Creek, which feeds into Lake George, crosses the landscape assessment area near the western portion of the subject land. Lake George is listed in the Directory of Important Wetlands in Australia (DAWE, 2021f). Lake George is around 8 km from the subject land.

The landscape assessment area does not contain any nationally important wetlands, local wetlands or important wetlands listed on the NSW Wetlands layer (SEED 2020).

3.1.3 Connectivity

Habitat within the subject land is highly fragmented with native vegetation occurring as isolated patches of regrowth and derived grassland and scattered trees surrounded by agricultural land, roads, and other infrastructure in the landscape assessment area. This pattern is also prevalent in the broader landscape assessment area except for the north-west edge where a large expanse (>2000 ha) of relatively intact native vegetation occurs on steeper terrain (refer to Figure 3.2). Habitat connections between the subject land and this large area of vegetation are tenuous, consisting only of very narrow, discontinuous, strips of roadside vegetation, windbreaks and scattered, isolated trees.

There is a similarly tenuous connectivity between the habitat of the project study area and other disturbed and fragmented habitat within the landscape assessment area to the south.

Only highly mobile species such as birds and bats are likely to be able to frequently move between habitats within the project study area and those in the broader landscape.

3.1.4 Areas of geological significance and soil hazard features

The project study area occurs within the Lachlan Fold Belt and is partially within the catchment of Lake George. Lake George is considered one of the world's oldest lakes. It is a large shallow brackish lake with fluctuating water levels that attracts migratory birds and other aquatic or semi-aquatic species.

No areas of geological significance occur in the landscape assessment area. Lake George and its ephemeral tributaries occur in the broader area; however, there is unlikely to be any biodiversity impacts on this waterbody. There are no important areas of geological significance within the landscape assessment area.

There are no karst limestone cave systems, caves, crevices, cliffs, or other important areas of geological significance within, or adjacent to the subject land.

Areas adjacent to the subject land show minor occurrences of erosion within the wetland area (known as PCT_1256 as described in Section 4.3.2) that are related to the fluctuating water levels of the wetland area and surface water flow into the wetland. Erosion depth does not exceed 10 cm. Areas of bare soil also occur within PCT1256_Poor, potentially due to mild soil salinity and/or historic disturbances.

3.1.5 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value, as declared by the NSW Minister for Energy and Environment, within the subject land or landscape assessment area. The activity is therefore unlikely to have any impact on Areas of Outstanding Biodiversity Value.

3.2 Assessment of native vegetation cover

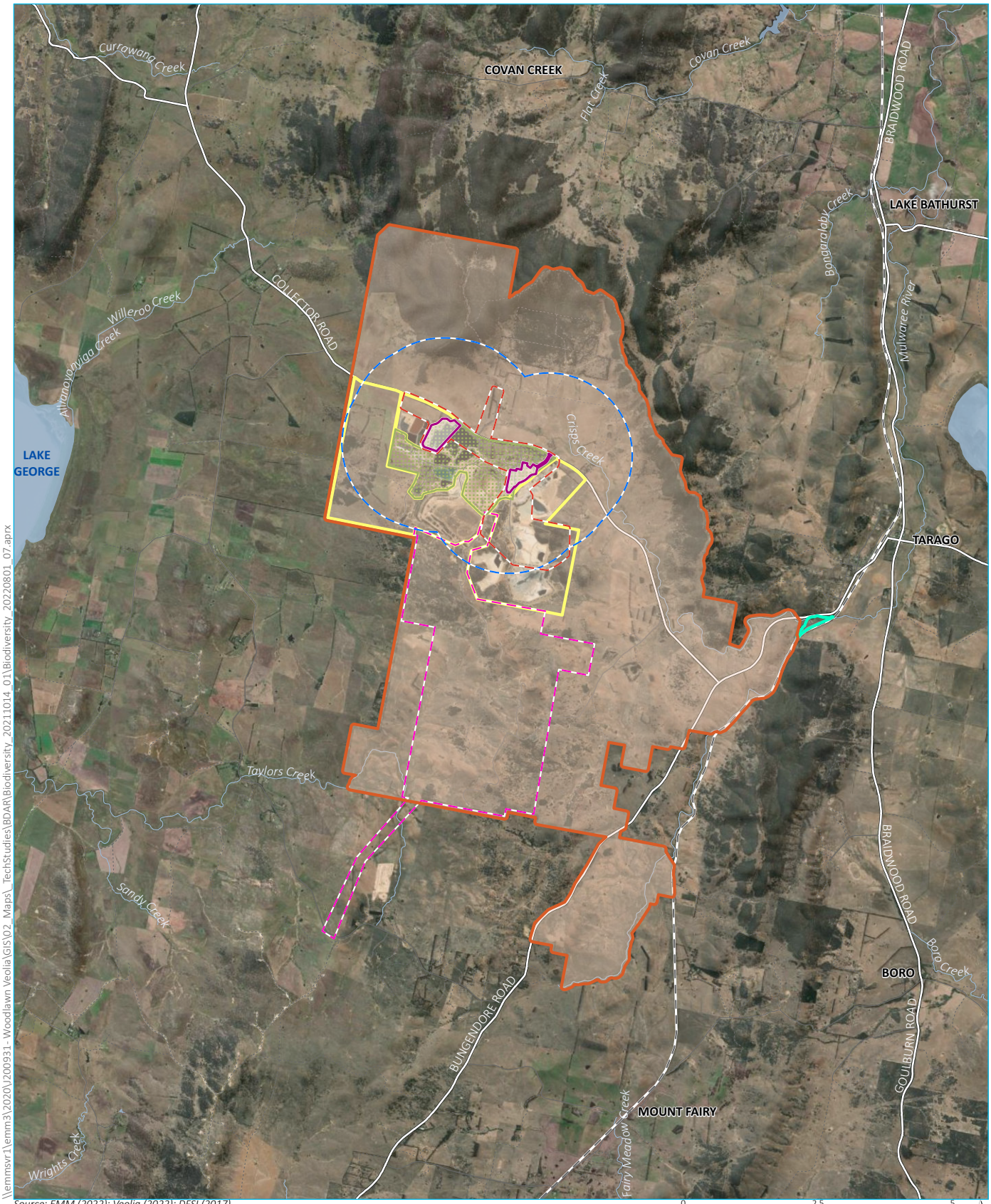
Native vegetation cover surrounding the subject land in the landscape assessment area (1500 m buffer) has been assessed in accordance with Section 3.2 of BAM (DPIE 2020) and is presented in Table 3.1.

The cover of native vegetation within the landscape assessment area was estimated using vegetation mapping collected as a part of surveys and aerial photograph interpretation.

It is noted that the cover of native vegetation entered in to the BAM-C is 11%, which was the percentage based on the earlier designs of the project and development footprint (subject land). The 11% was retained within the BAM-C as a conservative approach, since the predicted and candidate species assessments had already been undertaken based on this higher percentage native vegetation cover.

Table 3.1 Percentage of native vegetation cover

Native vegetation in landscape assessment area (ha)	Landscape assessment area (ha)	Percentage of native vegetation in landscape assessment area
160.15	1693.73	9.46%



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Source: EMM (2022); Veolia (2022); DFSI (2017)

0 2.5 5 km

GDA 1994 MGA Zone 55

N

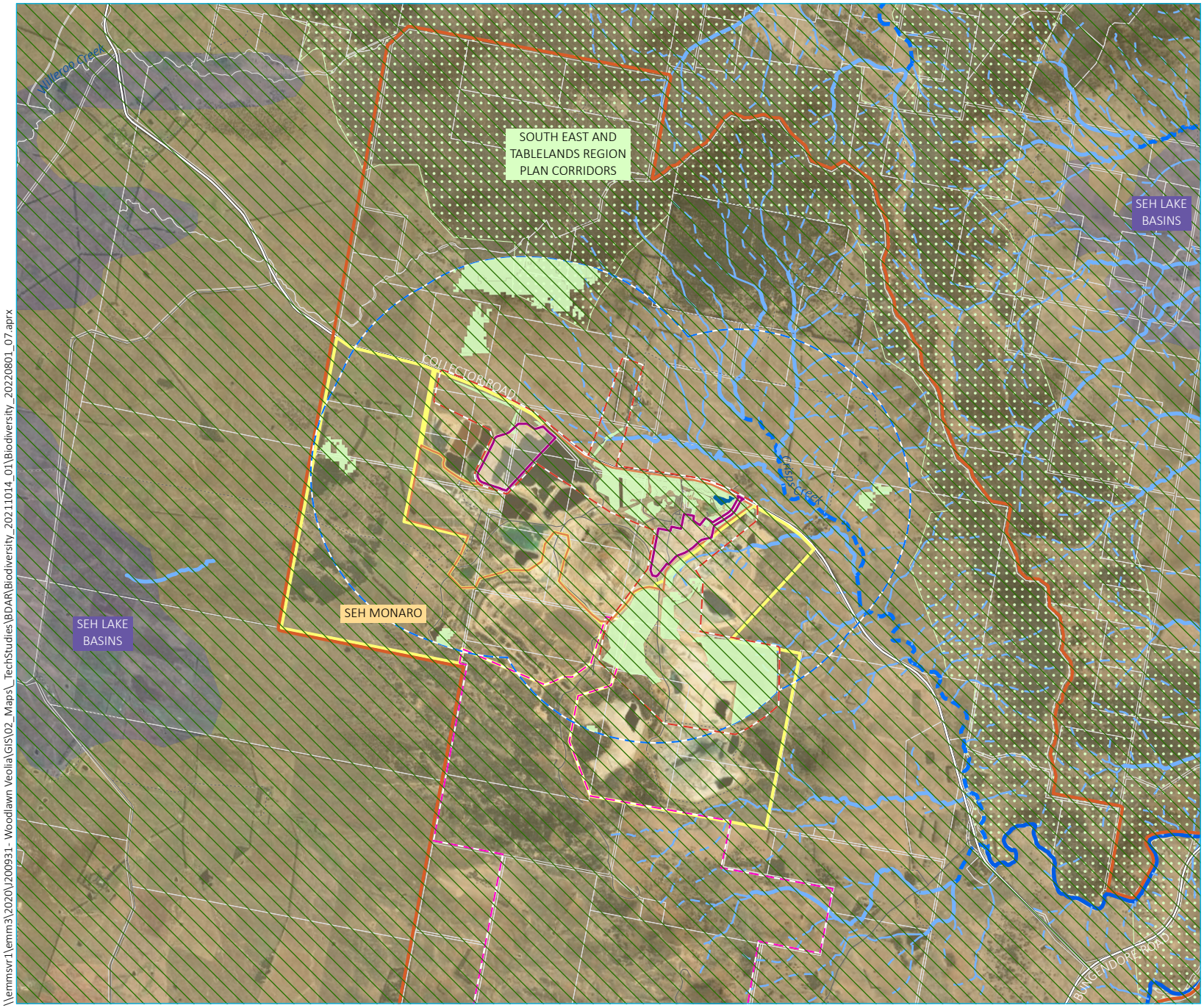
Location map

KEY

- Development footprint (Subject land)
- Project study area
- Landscape assessment area
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Rail line
- Major road
- Minor road
- Vehicular track
- Watercourse

Woodlawn Advanced Energy Recovery Centre
Biodiversity development assessment report
Figure 3.1

EMM
creating opportunities



KEY

- Development footprint (Subject land)
- Project study area
- Landscape assessment area
- Subject land/development footprint
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Rail line
- Major road
- Minor road
- Vehicular track
- Cadastral boundary
- Areas of Outstanding Biodiversity (none in assessment area)
- Native vegetation
- Regional corridors
- Wetland
- Monaro IBRA sub-region/South Eastern Highlands IBRA bioregion

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order
- 5th order

Mitchell landscapes

- SEH Lake Basins
- SEH Monaro

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Source: EMM (2022); Veolia (2022); DFSI (2017); DPI (2013)

0 1 2 km

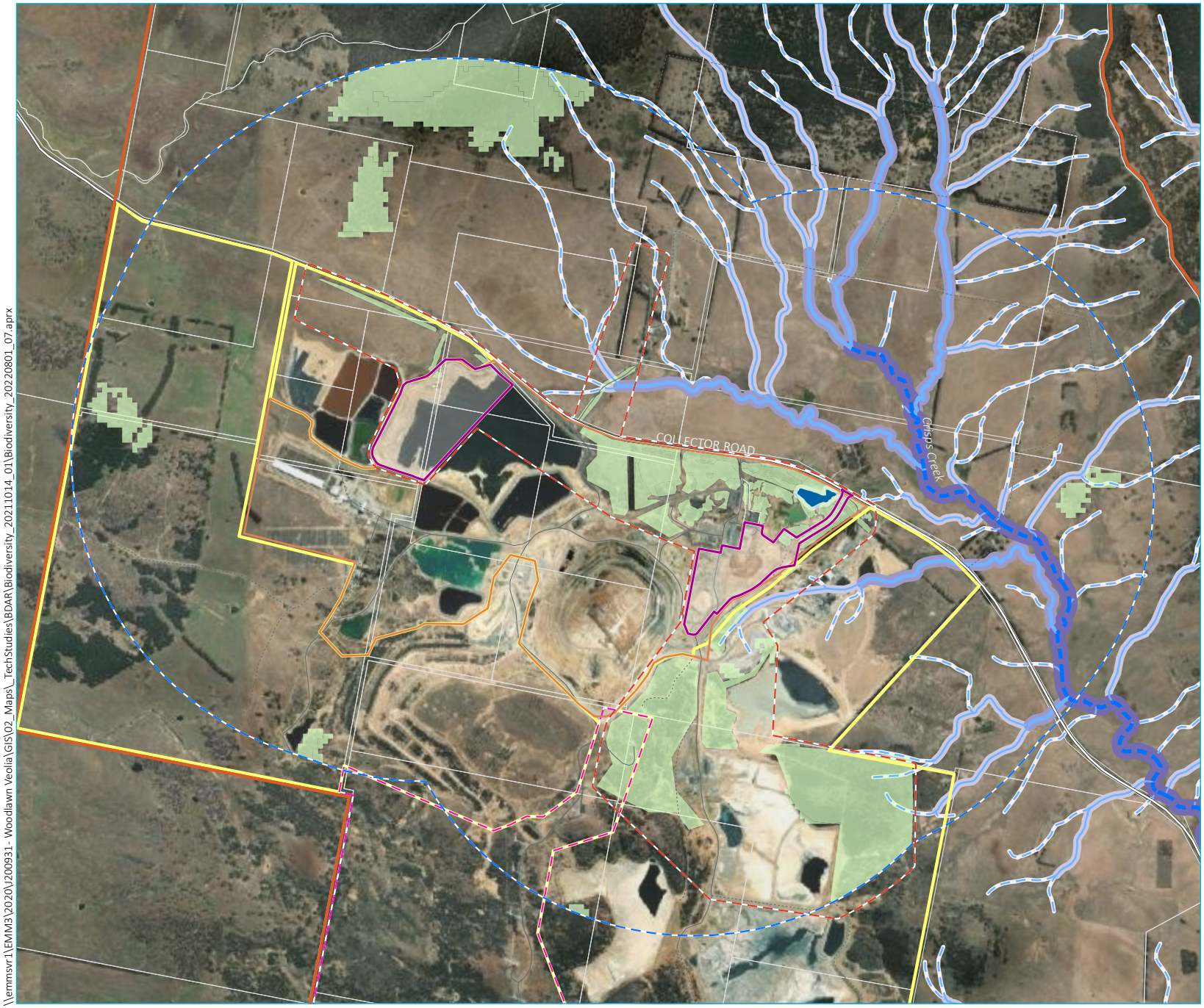
GDA 1994 MGA Zone 55

N

Landscape features

Woodlawn Advanced Energy Recovery Centre
Biodiversity development assessment report
Figure 3.2

EMM
creating opportunities



KEY

- Development footprint (Subject land)
- Project study area
- Landscape assessment area
- Subject land/development footprint
- Veolia integrated waste management operations
- Woodlawn Eco Precinct
- Crisps Creek Intermodal Facility (IMF)
- Woodlawn Mine operations area
- Woodlawn Wind Farm
- Major road
- Minor road
- Vehicular track
- Cadastral boundary
- Native vegetation
- Wetland

Strahler stream order

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

Riparian buffer

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

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Source: EMM (2022); Veolia (2022); DFSI (2017); DPI (2013)

0 1 2 km

GDA 1994 MGA Zone 55

N

Strahler streams and buffers

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Biodiversity development assessment report
Figure 3.3

EMM
creating opportunities

4 Native vegetation

4.1 Background review

For the purpose of the BDAR, a landscape assessment area was determined based on the subject land/development footprint, plus a 1500 m buffer. This area was assessed using vegetation mapping collected as a part of surveys, aerial photograph interpretation and existing broad scale vegetation mapping datasets. The most relevant vegetation mapping data set for the area was considered to be the *Biometric Vegetation Compilation for the South East Local Land Services Region* (ELA 2015). Five biometric vegetation types (BVTs) were mapped within the 1500 m buffer. The BVTs mapped correspond directly to the following Plant Community Types (PCTs):

- Broad-leaved Peppermint – Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion (PCT 731);
- Narrow-leaved Peppermint – Mountain Gum – Brown Barrel moist open forest on high altitude ranges, northern South Eastern Highlands Bioregion (PCT 963);
- Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion (PCT 1093);
- Silvertop Ash – Narrow-leaved Peppermint open forest on ridges of the eastern tableland, South Eastern Highlands Bioregion and South East Corner Bioregion (PCT 1155); and
- Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion (PCT 1191).

Much of the highly modified vegetation apparent in the subject land and the broader landscape assessment area is not mapped as native vegetation in broad-scale mapping. Disturbed vegetation such as derived native grassland and regrowth shrubland is often omitted from regional mapping projects due to the difficulty in differentiating disturbed native and exotic vegetation based on remote imagery.

The project study area is predominantly cleared of vegetation, but contains:

- several planted corridors of moderately sized Eurabbie (*Eucalyptus bicostata)* and Cootamundra Wattle (*Acacia baileyana*);
- thick regrowth of Silver Wattle (*Acacia dealbata*) across parts of the historic quarry area;
- derived native grassland patches closer to Collector Road;
- a Common Reed (*Phragmites australis*) wetland, in the headwaters of Crisps Creek;
- a corridor of mature exotic Radiata Pine (*Pinus radiata*) with no understorey; and
- exotic grassland previously used for agriculture.

The only PCT within the subject land is:

- PCT 1191 – Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion.

Within the subject land, PCT 1191 is highly disturbed, with no remnant native canopy species remaining. There is a total of 1.55 ha of PCT 1191 within the subject land, plus an additional 0.15 ha assigned as exotic grassland.

4.2 Methods

4.2.1 Detailed vegetation mapping

The *Biometric Vegetation Compilation for the South East Local Land Services Region* (ELA 2015) is the best available vegetation mapping for the locality. This regional vegetation mapping encompasses the subject land but is not of a fine enough scale or accuracy to determine the distribution of PCTs or vegetation zones on the subject land.

Vegetation in the project study area was mapped to PCTs using a combination of:

- *Biometric Vegetation Compilation for the South East Local Land Services Region* (ELA, 2015), to identify which PCTs are mapped in the locality on similar terrain and landscape position to that of the subject land.
- Forest Ecosystems: Native Vegetation of the Southern Forests: South-east Highlands, Australian Alps, South-West Slopes, and South-East Corner bioregions. Pre-1750 (VIS ID 3859) (DPIE, 2011), to determine which PCTs are modelled to have occurred in the subject land prior to European settlement.
- Comparing floristic data from field assessment and pre-existing vegetation mapping with the PCT descriptions in the Bionet Vegetation Classification database (DPIE, 2021a).

An initial assessment of the project study area was undertaken on 21 June 2021, and further survey completed from 6–8 October 2021 to undertake further PCT mapping and BAM (DPIE, 2020) plots. The site inspection was completed by an EMM BAM Accredited Ecologist and a supporting Field Ecologist. BAM (DPIE, 2020) plots were completed in accordance with the *Biodiversity Assessment Method 2020* (DPIE, 2020a). Initially, one plot in each vegetation zone was completed to guide PCT identification. All flora was identified in accordance with PlantNet (RBGDT, 2021). The project area was traversed on foot and by vehicle, with vegetation mapped and aligned with NSW PCTs. Vegetation was mapped in the field using GPS-enabled tablet computers using FieldMaps for ArcGIS™. PCTs were stratified into vegetation zones based on broad condition state using the definitions in Table 4.1.

Table 4.1 Definitions used in delineation of vegetation zones

Condition class	Description
High	Largely intact with all strata present and minimal disturbance.
Moderate	Some elements or stratum missing or immature, but minimal disturbance.
Regrowth	Regeneration is occurring due to previous human impacts, such as clearing or fire, but minimal to moderate disturbance to other strata.
Derived native grassland (DNG)	Tree stratum and shrub stratum missing. Native vegetation restricted to groundcover.
Poor	Tree stratum and shrub stratum absent, and understorey vegetation degraded due to weeds or other major disturbance.

4.2.2 Vegetation integrity assessment

Following the stratification of vegetation zones within the project study area, native vegetation integrity was assessed using data obtained via a series of plots, as per the methodology outlined in Section 4.2.1, 4.3.3 and 4.3.4 of the BAM (DPIE 2020). Plot data was collected from the project study area on 21 June 2021 and between 6–8 October 2021. At each plot location the following was undertaken:

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

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

The assessment of function recorded the number of large trees, the presence of tree stem size class, tree regeneration, number of trees with hollows and length of fallen logs, as well as leaf litter cover within the 20 x 50 m plot and five 1 x 1 m subplots. The minimum number of plots and transects per vegetation zone was determined using Table 3 of the BAM (DPIE 2020). A total of 12 plots were undertaken within the project study area, within or near the subject land. Datasheets for the 12 plots are provided in Appendix A. Eight plots were ultimately entered into the BAM-C due to the evolution of the project design (and reduction of the development footprint),

Surveys for flora and vegetation communities were completed under the authority of Scientific License (SL100409).

4.2.3 Identification of threatened ecological communities

Candidate threatened ecological communities (TECs) were identified through review of the TEC associations in the BioNet Vegetation Classification database (DPIE, 2021a) for PCTs recorded in the subject land (development footprint). The TECs recorded and predicted to occur in the locality based on searches of the EPBC Act Protected Matters Search Tool (PMST) and the NSW Threatened biodiversity profile search tool were also considered.

The data collected in the subject land (development footprint) was compared with the relevant descriptions to determine where TECs are present as detailed in Section 4.3.5.

4.3 Results

4.3.1 Vegetation description

Vegetation within the landscape assessment area is highly modified and disturbed due to historical clearing for agricultural practices, mining, and infrastructure development.

Vegetation within the subject land consists of:

- PCT 1191 – Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion; and
- non-native vegetation.

All areas of PCT 1191 in the subject land are highly modified, consisting of derived native grasslands, tall regenerating shrubland and a remnant native understorey under planted native tree species.

Vegetation that is not able to be reliably assigned to a PCT also occurs within the subject land. This vegetation is dominated by non-native grassland and non-native tree species located in areas with a history of substantial soil disturbance.

For the purposes of assessing their value under the BAM (DPIE, 2020), areas of non-native vegetation and planted vegetation were assigned to the most likely vegetation community that was present pre-1750 in that location and on surrounding vegetation and landscape characteristics, namely PCT 1191.

Consideration was given to assessing the 'Planted' vegetation zone under Appendix D (Streamlined assessment module – Planted native vegetation) of the BAM (DPIE, 2020) which would result in a less detailed assessment for this zone. The vegetation contains a mixture of planted trees and apparently remnant and regrowth understorey within an area that contains a mosaic of planted and remnant native vegetation. It was therefore considered appropriate to assign it to the most likely PCT based on the composition of the understory, soil, and landscape characteristics and to assess the zone in full under the BAM (DPIE, 2020).

The recorded PCT, including vegetation formation and vegetation class, are described in the following Sections, in Table 4.2, and shown in Figure 4.1.

Patch size was estimated in accordance with the Biodiversity Assessment Method Operational Manual Stage 1 (DPIE 2021b). As it was not possible to reliably determine the native versus exotic status of highly modified contiguous vegetation in the broader locality, a conservative approach was taken, and the maximum patch size of > 101 ha was used in the BAM calculator (BAM-C).

4.3.2 Plant community types

Table 4.2 provides an overview of the recorded PCTs within the broader project study area, and area within the subject land. It is noted that due to the evolution of the project design, and resulting reduction of the development footprint, only PCT 1191 occurs within the subject land.

Table 4.2 Recorded PCTs within the project study area and subject land

Plant community types in the project study area	Vegetation formation	Vegetation class	Percentage cleared (BioNet)	Area in subject land (ha) (including areas dominated by exotic plant species)
1191 – Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion	Grassy Woodlands	Subalpine Woodlands	95	1.70
1256 – Tableland Swamp Meadow on impeded drainage sites of western Sydney and South Eastern Highlands Bioregion	Freshwater Wetlands	Montane Bogs and Fens	85	0

4.3.3 Vegetation zones

Vegetation zones were delineated by the presence/absence of canopy and shrub layer species and the condition of the derived, highly modified grassland and wetlands.

A list of vegetation zones recorded in the project study area and subject land (development footprint) is provided in Table 4.3. Due to evolution of the project design (and resulting reduction in the size of the subject land), two vegetation zones identified are no longer within the subject land but are included in the table for context.

Table 4.3 Vegetation zone identified in the subject land and broader project study area

PCT ID	PCT name	Vegetation zone name	Description	Extent in subject land (ha)
1191	Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion	Planted (vegetation zone 1)	Planted rows of Eurabbie *Eucalyptus bicostata,* Cootamundra Wattle and other native species unlikely to have occurred naturally in the location, with occasional remnant shrubs and a predominantly exotic grass/forb ground layer.	0.09
		Regrowth (vegetation zone 2)	Silver Wattle (*Acacia dealbata*) dominated tall shrubland, lacking a eucalypt canopy with a mixed native and exotic ground layer, typically dominated by native grasses and forbs. Some *Pinus radiata* encroaching on interface with Pine Corridor.	1.34
		Derived Native grassland (DNG)_Exotic (vegetation zone 3)	Exotic grassland with history of grazing occurring in the western portion of the impact area. Small occurrences of native grass species	0.15
		DNG) (vegetation zone 4)	Grassland with minimal (< 10%) cover of woody Silver Wattle vegetation. Dominated by native grasses and forbs, but with a small component of exotic forb species.	0.12
1256	Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	Moderate (vegetation zone 5) (removed from BAM-C due to reduction to development footprint)	This community consists of an overstorey of Narrow-leaved Cumbungi (*Typha domingensis*) and Common Reed (*Phragmites australis*), with Swamp Weed (*Selliera radicans*) and other semi-aquatics forbs as the understorey.	0
		Poor (vegetation zone 6) (removed from BAM-C due to reduction to development footprint)	This area consists of exotic grasses and Swamp Weed (*Selliera radicans*). It consists only of a short groundcover stratum and an exotic component of approximately 30%	0

KEY

- Development footprint (Subject land)
- Project study area
- Landscape assessment area
- BAM plot
- Major road
- Minor road
- Vehicular track
- Cadastral boundary
- Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions

PCT 1191 | Snow Gum- Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion

- Native planted
- Exotic planted
- Regrowth
- DNG
- Exotic DNG

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Source: EMM (2022); Veolia (2022); DFSI (2017); DPI (2013)

0 250 500 m

GDA 1994 MGA Zone 55

N

Native vegetation

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Biodiversity development assessment report
Figure 4.1

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i PCT 1191 – Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion

PCT 1191 is described as dry grassy woodland. PCT 1191 has been heavily disturbed across the subject land due to recent and historic mining and grazing activities. Areas of high to poor quality are distinguished largely by presence or absence of woody debris, and by the species composition. Table 4.4 provides a description of the vegetation zones attributed to this PCT.

Table 4.4 PCT1191 Vegetation zones 1-4 description

PCT ID	1191
Common name	Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion
Condition class	Vegetation zone 1 – Planted Vegetation zone 2 – Regrowth Vegetation zone 3 – Exotic_DNG Vegetation zone 4 – DNG
Extent within subject land	Total of 1.70 ha, comprising: • 0.09 ha (Planted) • 1.34 ha (Regrowth) • 0.15 ha (Exotic_DNG) • 0.12 ha (DNG)
Description	PCT1191 is highly disturbed throughout the project study area, with no remnant native canopy species remaining. Vegetation Zone 1 is a fenced planted corridor of Eurabbie *Eucalyptus bicostata,* Budjur *Melaleuca linariifolia,* and Cootamundra Wattle *Acacia baileyana*. There is scattered occurrences of native shrubs, such as Kangaroo Apple *Solanum aviculare*, Cherry Ballart *Exocarpus cupressiformis*, She- Oak *Allocasuarina* sp., Tree Everlasting *Ozothamnus ferrugineus* and Dogwood *Cassinia arculeata*. The groundcover stratum is predominantly exotic grasses and forbs. Vegetation Zone 2 contains areas regenerating naturally after soil disturbance consist of Silver Wattle and Pine canopy with an understorey of small native shrubs and native and exotic forbs and grasses. This area contains a mosaic of areas with thick and thin native groundcover depending on the density of Silver Wattle and time since previous disturbance. Vegetation Zone 3 consists of highly disturbed areas, historically used for grazing. It has no canopy or shrub stratum and contains predominantly exotic grasses and forbs. Vegetation Zone 4 comprises of less than 10% regenerating small Silver Wattle with a dense cover of native grasses and forbs with less than 10% exotic groundcover. The native groundcovers consist mainly of the Daisies; *Brachyscome dentata, Chrysocephalum apiculatum*, and *Vittadinia muelleri;* and the grasses, Wallaby Grasses *Rytidosperma* sp.*,* Snow Grass *Poa sieberiana,* and Windmill Grass *Chloris truncata.*
Survey effort	Eight plots/transects within the project study area: • Vegetation zone 1 – Planted: 2 • Vegetation zone 2 – Regrowth: 3 • Vegetation zone 3 – Exotic_DNG: 1 • Vegetation zone 4 – DNG: 2

Table 4.4 PCT1191 Vegetation zones 1-4 description

PCT ID	1191
Condition description	PCT 1191 is highly disturbed from historic clearing throughout the site and has no remaining Eucalyptus canopy. Some areas have minimal shrub cover and no canopy stratum and are now Derived Native Grasslands (DNG). These were further defined by the dominance of exotic species, with Exotic_DNG being more than 95% exotic grasses and forbs from historic grazing, and the remaining DNG being of moderate to high condition native grasslands/forblands. The DNG is primarily native species and occurs on the edges of tracks and roads between the wetland and planted areas. There is a regeneration of native species dominated by Silver Wattle (*Acacia dealbata*) across a significant portion of the subject land on areas previously disturbed by activities associated with mining. The areas are disjunct from each other and have incursions of exotic pasture species. There is a significant diversity of native small shrubs, forbs and grasses throughout this area which are shared by the DNG areas. The planted area occurs within several lines of old fencing that is in poor condition. The mature planted native Eucalyptus species are senescing, but signs of them regenerating naturally.
Characteristic species used for identification of PCT	The *BioNet Vegetation Information System* (DPIE 2021a) states that the canopy for this community should consist of a suite of Eucalyptus species which are not present in the project study area. The PCT was selected due it is presence nearby in the similar landscape positions of low undulating hills and being known to occur in the Monaro IBRA sub-region. Further justification for this PCT selection was due to the presence of characteristic mid-stratum species of Silver Wattle (*Acacia dealbata*) and groundcover stratum species of Yellow Buttons (*Chrysocephalum apiculatum*), Raspwort (*Gonocarpus* sp.), and various native grasses still present and regenerating across the subject land. The long history of disturbance, initially through grazing and then through mining has substantially modified this community and damaged the seedbank. The species still present regenerating at the site are species that are common in the area and adapted to survive the changed conditions. While the Eucalyptus canopy species for this PCT no longer occur on the subject land, the planted Eucalyptus species allow for the development of a regenerating grassy woodland community with areas of DNG.
Status	PCT 1191 Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion is associated with the following TECs: • listed BC Act, Critically Endangered: Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion; and • listed BC Act, Critically Endangered: Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions. The various condition zones of PCT 1191 in the project study area do not meet the criteria for Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion due to the distribution constraint of needing to be located between Captains Flat in the north and Bombala in the south (OEH 2021). The criteria of the Critically Endangered Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions is: • within area where it was previously most extensive (4.2); • characteristic tree species present or if removed, the characteristic understorey species are present. (4.1); • occurs on valley floors and gentle slopes, as occurs in the subject land (4.3 and 4.4); and • average rainfall between 650–800 mm per annum (BoM 2021) (4.5 and 4.7). While the disturbance of the subject land is substantial, the following zones do meet the criteria for the critically endangered Werriwa Tablelands Cool Temperate Grassy Woodland of the South Eastern Highlands (OEH 2021): • Vegetation zone 2 – Regrowth; and • Vegetation zone 4 – DNG. This TEC is present but in poor condition. The vegetation community does not align with any TECs listed under the EPBC Act.
Estimate of percent cleared value of PCT across its distribution	95%
Patch size	A default maximum patch size of 101 ha was used for all vegetation zones.

Table 4.4 PCT1191 Vegetation zones 1-4 description

PCT ID	1191
Hollow-bearing trees	• Vegetation zone 1 – Planted: 0 • Vegetation zone 2 – Regrowth: 0 • Vegetation zone 3 – Exotic_DNG: 0 • Vegetation zone 4 – DNG: 0

ii PCT 1256 – Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion

Due to evolution of the project design (and resulting reduction in the size of the subject land), PCT 1256 occurs outside of the subject land and will not be impacted directly or indirectly (due to mitigation measures) by the project. To provide context of the project evolution, and demonstrate avoidance measures undertaken, a description of the PCT has been retained in Table 4.5.

Table 4.5 PCT1256 Vegetation zones 5-6 description

PCT ID	1256
Common name	Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion
Condition class	Vegetation zone 5 – 1256_Poor Vegetation zone 6 – 1256_Moderate
Extent within subject land	0 ha (Poor) 0 ha (Moderate) **Occurs adjacent to subject land, due to project redesign.**
Description	The PCT in the project study area consists of a Typha/Phragmites wetland with a Swamp Weed (*Selliera radicans*) understorey (1256_Moderate) up to 2 metres in height and occurs primarily in inundated or ephemerally inundated zones. Surrounding PCT1256_Moderate, is an area consisting of Swamp Weed and exotic grasses and forbs (1256_Poor) which only reaches 10 cm in height and occurs on areas only occasionally inundated. No shrub or canopy species are present in either condition zone. The area receives surface flows from within the study area. Due to the historic disturbance and potentially developed as a secondary consequence to other site disturbances, this PCT contains few characteristic species.
Survey effort	Three plots/transects within the project study area: • Vegetation zone 5 – 1256_Poor: 2 • Vegetation zone 6 – 1256_Moderate: 1
Condition description	The PCT in the project study area has been the subject of historic clearing for agricultural purposes and then mining activities. The impeded drainage of the headwaters of Crisps Creek may have been a secondary consequence of the mining activities or road construction of Collector Road.
Characteristic species used for identification of PCT	The *BioNet Vegetation Information System* (DPIE 2021a) states that the canopy for this community lists few characteristic species, of which the primary characteristic species dominant at the site is Common Reed (*Phragmites australis*). Other characteristic species present in the subject land include Rush (*Juncus* sp.), River Buttercup (*Ranunculus inundatus*) and Pennywort (*Hydrocotyle sibthorpides*).
Justification of evidence used to identify the PCT	There are only 9 vegetation communities that belong in the Southern Highlands IBRA Region that are swamps or montane bogs or fens, of these only 1256 meets the structure and composition of the vegetation in the project study area. The wetland in the project study area contains few native species and has been impacted by exotic species, but the characteristic Typha and Phragmites is dominant in the 1256_Moderate area.

Table 4.5 PCT1256 Vegetation zones 5-6 description

PCT ID	1256
Status	PCT 1256 Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion is associated with the following Threatened/Endangered Ecological Communities (TEC/EEC): • Listed BC Act *Endangered Montane Peatlands and Swamps of the New England Tableland NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands, and Australian Alps bioregions*: PCT1256 only meets the location-based key indicators for this EEC and contains none of the key indicator flora species. It does not meet the criteria for this EEC (OEH 2021). • Listed EPBC Act, *Critically Endangered: Natural Temperate Grassland of the South Eastern Highlands* (Part): Does not meet the criteria as listed in Figure 1 of the guidelines (DEE 2016) at the characteristic species step. • Listed BC Act, Endangered: *Newnes Plateau Shrub Swamp in the Sydney Basin* Bioregion (Equivalent): Does not meet the distribution criteria for this EEC (OEH 2021) • Listed EPBC Act, Endangered: *Temperate Highland Peat Swamps on Sandstone* (Equivalent): Does not meet the distribution criteria for this EEC, as it does not occur on sandstone (DAWE 2021a). • The various condition zones of PCT1256 on the project study area do not meet the criteria for any of the EPBC Act or BC Act listed TEC/EECs, due to the distribution geology and characteristic species constraint. Note: due to project redesign this PCT is no longer within the subject land.
PCT1256	85%
Patch size	As this vegetation zone was removed from the subject land, due to project redesign, it was removed from the BAM-C, and therefore no patch size was required to be selected.
Hollow-bearing trees	Vegetation zone 5 – Poor: 0 Vegetation zone 6 – Moderate: 0

4.3.4 Vegetation integrity scores

Two PCTs occur in the project study area, with six vegetation zones mapped and entered into the BAM-C (with zones 5 and 6 later removed due to reduction of the subject land) to determine vegetation integrity scores (as explained in Section 4.2.2). A summary of the vegetation integrity score for each vegetation zone is provided in Table 4.6. The vegetation integrity score is based on the plot data which is compared with benchmark values for each vegetation type.

Table 4.6 Vegetation integrity scores for each vegetation zone

PCT ID	PCT name	Vegetation zone name	Vegetation integrity score	Extent in subject land (ha)
1191	Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion	Planted	57	0.09
		Regrowth	31.6	1.34
		DNG_Exotic	0	0.15
		DNG	30.6	0.12
1256	Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	Moderate	27.4	0
		Poor	15.8	0

Vegetation integrity scores for native planted vegetation was a higher-than-expected score for an area that was highly modified. This higher score of 57 for PCT 1191_Planted vegetation zone is explained by the fact that the

planted trees and shrubs present, while not locally indigenous, do occur naturally in other parts of NSW. The BAM (DPIE 2020) does not differentiate between species that are locally indigenous to an area and species introduced from other parts of NSW, even in the case (eg of Cootamundra Wattle) where a non-locally indigenous species is considered to be an environmental weed.

The moderate to low vegetation integrity scores in general reflect the high levels of historic disturbance in the project study area.

4.3.5 Threatened ecological communities

Based on the information outlined in Table 4.4 and Table 4.5 one threatened ecological community (TEC), *Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions,* which corresponds to PCT 1191*,* has been recorded within the subject land. This TEC is listed as critically endangered under the BC Act but is not listed under the EPBC Act. The occurrence of the TEC in the subject land is in very poor condition, consisting only of Acacia-dominated regrowth, derived native grassland and the understorey component of an area planted with non-locally indigenous trees.

A second TEC was recorded in the project study area but occurs adjacent to the subject land; *Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands, and Australian Alps bioregions*. This TEC is listed as critically endangered under the BC Act but is not listed under the EPBC Act. The occurrence of the TEC in the project study area is in poor condition, consisting only of a low diversity of remnant native wetland grasses, sedges, rushes, and forbs.

The possibility that grassland areas of the site could correspond to the EPBC Act listed Critically Endangered TEC, Natural Temperate Grassland of the South Eastern Highlands, was considered. The floristic composition of the vegetation observed was similar to that of the Natural Temperate Grassland TEC but was considered to be a better fit for a modified, derived grassland form of PCT 1191 due to the abundance of Silver Wattle (*Acacia delalbata*) regrowth within adjacent grassland areas, the presence in the surrounding landscape of remnant woodland patches in similar landscape positions and the low abundance of indicator species observed. All observed indicator species are widespread species, associated with both woodland and grassland habitats.

A summary is provided in Table 4.7.

Table 4.7 Threatened ecological community PCT and vegetation zone association

PCT ID	PCT Name	Vegetation Zones	Associated TEC – BC Act status	Associated TECs – EPBC Act status	Serious and irreversible impact (SAII) candidate status of TEC
1191	*Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion*	Regrowth Derived Native grassland (DNG) Planted	**Critically Endangered** – *Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions*	No associated TEC	Yes
1256	*Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion*	Moderate Poor	**Endangered** – Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands, and Australian Alps bioregions (Equivalent)	Associated with: • Natural Temperate Grassland of the South Eastern Highlands (**Critically Endangered**), and • Alpine Sphagnum Bogs and Associated Fens (**Endangered**); Due the non-alpine location and altitude (< 1000 m asl) of the site and its vegetation composition (dominated by wetland species as opposed to dryland grasses and forbs) neither of these communities is considered to occur.	Yes, but no longer within the subject land.

5 Threatened species

5.1 Threatened species habitat description

The project study area has an extensive history of disturbance associated with agricultural practices and construction of infrastructure. The modified and fragmented vegetation present provides limited refuge or foraging habitat for fauna. Fauna habitat features possibly important for threatened species were limited to areas of wetland vegetation and artificial water bodies with fringing vegetation that have potential to be occupied by threatened species of frogs.

Areas of regenerating woodland, native and exotic tree planting contain a low abundance of fallen timber and a sparse to moderate litter cover. No hollow-bearing trees are present within the subject land. The groundcover consists of a sparse to moderate cover of native grasses, including tussock grasses, and forbs. These areas represent marginal foraging habitat for some species of threatened woodland birds, raptors and bats that are more tolerant of habitat modification and fragmentation. Due to its modified structure, fragmentation, and lack of mature and hollow-bearing trees this habitat is unlikely to be utilised for breeding by any threatened bird or bat species.

Waterbodies within the subject land have been modified through historical clearing, altered drainage patterns and runoff from adjacent agricultural, mining, and industrial activities. Two threatened frog species considered to have potential to occur in this habitat, the Green and Golden Bell Frog and Yellow-spotted Tree Frog, are associated with similarly disturbed and modified habitats in agricultural and industrial settings. Several common frog species were opportunistically recorded during surveys undertaken to date, indicating that frog habitat is present.

5.2 Ecosystem credit species

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

A list of ecosystem credit species predicted to occur within the subject land, based on the PCT present and generated by the BAM-C is provided in Table 5.1.

Table 5.1 Ecosystem credit species assessment

Step 1 – Identify ecosystem credit species for assessment				Step 2 – Assessment of habitat constraints and vagrant species				Ecosystem credit species retained	
Scientific name	**Common name**	**Source**	**Dual credit species?**	**Habitat constraints/ Geographic limitations**	**Vagrant species?**	**Species retained for further assessment?**	**Reason for exclusion**	**Vegetation zone ID species retained in**	**Sensitivity to gain class**
Anthochaera phrygia	Regent Honeyeater (Foraging)	BAM-C	Yes	-	-	Part	Due to lack of foraging habitat excluded from: • 1191_Exotic_DNG • 1191_DNG	• 1191_Planted • 1191_Regrowth	High
Artamus cyanopterus	Dusky Woodswallow	BAM-C	No	-	-	Part	Due to lack of suitable habitat excluded from: • 1191_Exotic_DNG • 1191_DNG	• 1191_Planted • 1191_Regrowth	Moderate
Callocephalon fimbriatum	Gang-gang Cockatoo (Foraging)	BAM-C	Yes	-	-	Part	Due to lack of foraging habitat excluded from: • 1191_Exotic_DNG • 1191_DNG	• 1191_Planted • 1191_Regrowth	Moderate
Calyptorhynchus lathami	Glossy Black-Cockatoo (Foraging)	BAM-C	Yes	Presence of Allocasuarina and casuarina species	-	No	Unlikely to occur in all vegetation zones due to their highly simplified structure, fragmentation, and the lack of preferred Allocasuarina and Casuarina feed trees.	-	-
Chthonicola sagittate	Speckled Warbler	BAM-C	No	-	-	Yes	Due to lack of suitable habitat excluded from: • 1191_Exotic_DNG • 1191_DNG	• 1191_Planted • 1191_Regrowth	High
Circus assimilis	Spotted Harrier	BAM-C	No	-	-	Yes	n/a	• All zones	Moderate
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	BAM-C	No	-	-	Part	Due to lack of suitable habitat excluded from: • 1191_Exotic_DNG • 1191_DNG	• 1191_Planted • 1191_Regrowth	High
Daphoenositta chrysoptera	Varied Sittella	BAM-C	No	-	-	Part	Due to lack of suitable habitat excluded from: • 1191_Exotic_DNG • 1191_DNG	• 1191_Planted • 1191_Regrowth	Moderate
Dasyurus maculatus	Spotted-tailed Quoll	BAM-C	No	-	-	Part	Due to lack of suitable habitat excluded from: • 1191_Exotic_DNG • 1191_DNG	• 1191_Planted • 1191_Regrowth	High
Glossopsitta pusilla	Little Lorikeet	BAM-C	No	-	-	Part	Due to lack of suitable habitat excluded from: • 1191_Exotic_DNG • 1191_DNG	• 1191_Planted • 1191_Regrowth	High
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	BAM-C	Yes	Water body or within 1km of river, lake, large dam/creek, wetland, coastline	-	Yes	n/a	• All zones	High
Hieraaetus morphnoides	Little Eagle (Foraging)	BAM-C	Yes	-	-	Yes	n/a	• All zones	Moderate
Hirundapus caudacutus	White-throated Needletail	BAM-C	No	-	-	Yes	n/a	• All zones	High
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	BAM-C	No			Yes	n/a	• All zones	Moderate
Miniopterus orianae oceanensis	Large Bent-winged Bat (Foraging)	BAM-C	Yes	-	-	Yes	n/a	• All zones	High
Neophema pulchella	Turquoise Parrot	BAM-C	No	-	-	Yes	n/a	• All zones	High
Ninox connivens	Barking Owl (Foraging)	BAM-C	Yes	-	-	Yes	n/a	• All zones	High

Table 5.1 Ecosystem credit species assessment

Step 1 – Identify ecosystem credit species for assessment				Step 2 – Assessment of habitat constraints and vagrant species				Ecosystem credit species retained	
Scientific name	**Common name**	**Source**	**Dual credit species?**	**Habitat constraints/ Geographic limitations**	**Vagrant species?**	**Species retained for further assessment?**	**Reason for exclusion**	**Vegetation zone ID species retained in**	**Sensitivity to gain class**
Ninox strenua	Powerful Owl (Foraging)	BAM-C	Yes	-	-	Yes	n/a	• All zones	High
Petroica boodang	Scarlet Robin	BAM-C	No	-	-	Yes	n/a	• All zones	Moderate
Petroica phoenicea	Flame Robin	BAM-C	No			Yes	n/a	• All zones	Moderate
Stagonopleura guttata	Diamond Firetail	BAM-C	No	-	-	Yes	n/a	• All zones	Moderate
Suta flagellum	Little Whip Snake	BAM-C	No			Yes	n/a	• All zones	High
Varanus rosenbergi	Rosenberg's Goanna	BAM-C	No	-	-	Yes	n/a	• All zones	High

5.3 Species credit species

5.3.1 Candidate species assessment

In accordance with Step 3, Section 5.2.3 of BAM (DPIE 2020), a field assessment of habitat constraints and microhabitats was undertaken to determine the suitability of habitat within the subject land for species credit species (candidate species).

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

Table 5.2 Candidate threatened species assessment

Step 1 – Identify threatened species for assessment			Step 2 – Assessment of habitat constraints and vagrant species				Step 3 – Identify candidate species for further assessment	
Scientific name	**Common name**	**Source**	**Habitat/geographic constraints**	**Constraint present in subject land?**	**Habitat degraded?**	**Vagrant species?**	**Candidate species (yes/no) and rationale**	**Vegetation zone ID species retained within**
Flora								
Caladenia tessellata	Thick-lip Spider Orchid	BAM-C	N/A	N/A	-	N/A	Yes. The species is now known with certainty from only two populations around Braidwood and in Morton National Park. Most other records are old and many of these populations are now considered to be extinct. Habitat in the subject land has a history of physical disturbance and grazing and the species is unlikely to persist there however it was included in surveys as a precaution.	• 1191_Planted • 1191_Regrowth • 1191_DNG
Calotis glandulosa	Mauve Burr-daisy	BAM-C	South of Michelago	No	Yes	N/A	Yes. Habitat in the subject land has a history of physical disturbance and grazing and the species is unlikely to persist there however it was included in surveys as a precaution.	• 1191_Planted • 1191_Regrowth • 1191_DNG
Commersonia prostrata	Dwarf Kerrawang	BAM-C	N/A	N/A	-	N/A	Yes.	
Diuris aequalis	Buttercup Doubletail	BAM-C	North of Hoskintown	Yes	Yes	N/A	Yes. Habitat in the subject land has a history of physical disturbance and grazing and the species is unlikely to persist there however it was included in surveys as a precaution.	• 1191_Planted • 1191_Regrowth • 1191_DNG
Dodonaea procumbens	Creeping Hop-bush	BAM-C	Cooma-Monaro Shire south of Michelago	No	-	N/A	No. The subject land is not part of the Cooma-Monaro Shire or south of Michelago.	-
Eucalyptus aggregata	Black Gum	BAM-C	East of a line that runs north to south about 5km west of Bungendore	Yes	-	N/A	Yes.	• 1191_Planted • 1191_Regrowth • 1191_DNG
Eucalyptus macarthurii	Camden Woollybutt	BAM-C	NA	NA	-	No	Yes. Known to occur naturally or potentially planted within 30 km of study area. The study area contains similar planted areas as those where the species is recorded.	• 1191_Planted • 1191_Regrowth • 1191_DNG
Euphrasia scabra	Rough Eyebright	BAM-C	Montane bogs or within 50m	No	Yes	N/A	No. The subject land is greater than 150 km north of the nearest known extant population at Nunnock Swamp. All records from north of the known extant populations are from more than a century ago. Habitat on the site is degraded and is outside of the likely current distribution of the species.	-
Leucochrysum albicans var. tricolor	Hoary Sunray	BAM-C	N/A	N/A	-	N/A	Yes.	• 1191_Planted • 1191_Regrowth • 1191_DNG
Prasophyllum petilum	Tarengo Leek Orchid	BAM-C	N/A	N/A	Yes	N/A	Yes. Habitat in the subject land has a history of physical disturbance and grazing and the species is unlikely to persist there however it was included in surveys as a precaution.	• 1191_Planted • 1191_Regrowth • 1191_DNG
Rutidosis leptorrhynchoides	Button Wrinklewort	BAM-C		N/A	-	N/A	Yes.	• 1191_Planted • 1191_Regrowth • 1191_DNG

Table 5.2 Candidate threatened species assessment

Step 1 – Identify threatened species for assessment			Step 2 – Assessment of habitat constraints and vagrant species				Step 3 – Identify candidate species for further assessment	
Scientific name	**Common name**	**Source**	**Habitat/geographic constraints**	**Constraint present in subject land?**	**Habitat degraded?**	**Vagrant species?**	**Candidate species (yes/no) and rationale**	**Vegetation zone ID species retained within**
Swainsona sericea	Silky Swainson-pea	BAM-C	N/A	N/A	-	N/A	Yes.	• 1191_Planted • 1191_Regrowth • 1191_DNG
Thesium australe	Austral Toadflax	BAM-C	N/A	N/A	-	N/A	Yes.	• 1191_Planted • 1191_Regrowth • 1191_DNG
Fauna								
Anthochaera phrygia	Regent Honeyeater	BAM-C	Important mapped areas (breeding).[1]	No	-	N/A	No. The subject land is not a mapped important area.	-
Aprasia parapulchella	Pink-tailed Legless Lizard	BAM-C	Rocky areas, or within 50 m of rocky areas.	No	-	No	No. The subject land does not contain rocky areas, nor is it within 50 m of rocky areas.	-
Callocephalon fimbriatum	Gang-gang Cockatoo (Breeding)	BAM-C	Eucalypt tree species with hollows greater than 9 cm diameter	No	-	No	No. The subject land does not contain eucalypts with hollows greater than 9 cm diameter.	-
Calyptorhynchus lathami	Glossy Black-Cockatoo (Breeding)	BAM-C	Living or dead tree with hollows greater than 15 cm diameter and greater than 5 m above ground.	Yes	-	No	No The subject land does not contain trees with hollows greater than 15 cm diameter and greater than 5 m above ground.	-
Cercartetus nanus	Eastern Pygmy-possum	BAM-C	N/A	N/A	Yes	No	No. No spatially accurate local records of the species are found in the locality and the habitat in the subject land is highly modified, fragmented. It contains only a low diversity and abundance of potential food resources such as nectar-producing and fleshy-fruited shrubs. Trees hollows are also very scarce in the subject land.	-
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)	BAM-C	Living or dead mature trees within suitable vegetation within 1 km of a rivers, lakes, large dams or creeks, wetlands, and coastlines	No	-	No	No. No living or dead mature trees within suitable vegetation within 1 km of a river, lake, large dam, creek, wetland, and coastline are present.	-
Hieraaetus morphnoides	Little Eagle (Breeding)	BAM-C	Nest trees – live (occasionally dead) large old trees within vegetation.	No	-	No	No. No nest trees or potential nest trees are present eg no live or dead large old trees within vegetation.	-
Miniopterus orianae oceanensis	Large Bent-winged Bat (Breeding)	BAM-C	Cave, tunnel, mine, culvert, or other structure known or suspected to be used for breeding including species records with microhabitat code “IC – in cave;” observation type code “E nest-roost;” with numbers of individuals >500.	No	-	No	No. No caves/mine shafts/tunnels possibly suitable for maternity sites are found within or adjacent to the subject land.	-

Table 5.2 Candidate threatened species assessment

Step 1 – Identify threatened species for assessment			Step 2 – Assessment of habitat constraints and vagrant species				Step 3 – Identify candidate species for further assessment	
Scientific name	**Common name**	**Source**	**Habitat/geographic constraints**	**Constraint present in subject land?**	**Habitat degraded?**	**Vagrant species?**	**Candidate species (yes/no) and rationale**	**Vegetation zone ID species retained within**
Myotis macropus	Southern Myotis	BAM-C	Hollow-bearing trees; within 200 m of riparian zone; bridges, caves, or artificial structures within 200 m of riparian zone; Waterbodies, including rivers, creeks, billabongs, lagoons, dams, and other waterbodies on or within 200 m of the site.	Yes	-	No	Yes. The subject land contains associated PCTs within 200 m of waterbodies with pools 3 m or wider.	• 1191_Regrowth • 1191_Planted.
Ninox connivens	Barking Owl	BAM-C	Living or dead trees with hollows greater than 20 cm diameter and greater than 4 m above the ground.	No	-	No	No. The subject land does not contain living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground.	-
Ninox strenua	Powerful Owl	BAM-C	Living or dead trees with hollow greater than 20 cm diameter	No		No	No. The subject land does not contain living or dead trees with hollows greater than 20 cm diameter.	-
Petroica rodinogaster	Pink Robin	BAM-C		N/A	Yes	No	No. Excluded as the vegetation of the subject land is highly modified and lacks the wet forest habitat typically utilised by the species. Habitat is degraded.	-
Phascolarctos cinereus	Koala (Important habitat)	BAM-C	Important habitat (however this is not a mapped important habitat area), defined by the density of koalas and quality of habitat determined by on-site survey.	No	Yes	No	Yes. Eucalypt forest in the subject land is restricted to small, narrow strips of planted eucalypts. No evidence of Koala activity was found in the subject land and the small area of fragmented habitat present is unlikely to constitute important habitat for the species. Habitat in the subject land has a history of physical disturbance and grazing and the species is unlikely to persist there, however it was included in surveys as a precaution.	• 1191_Regrowth • 1191_Planted.

5.3.2 Candidate species credit species requiring further assessment

Candidate species for further assessment were identified in accordance with Step 1 to 2 (Section 5.2.1 to 5.2.2 of BAM (DPIE 2020). A list of species requiring further assessment or survey is provided in Table 5.3.

Table 5.3 Candidate species credit species requiring further assessment

Scientific name	Common name	EPBC Act	BC Act	Flora or fauna
Caladenia tessellata	Thick Lip Spider Orchid	Vulnerable	Endangered	Flora
Calotis glandulosa	Mauve Burr-daisy	Vulnerable	Vulnerable	Flora
Commersonia prostrata	Dwarf Kerrawang	Endangered	Endangered	Flora
Diuris aequalis	Buttercup Doubletail	Vulnerable	Endangered	Flora
Eucalyptus aggregata	Black Gum	Vulnerable	Vulnerable	Flora
Eucalyptus macarthurii	Camden Woollybutt	Endangered	Endangered	Flora
Leucochrysum albicans var. *albicans*	Hoary Sunray	Endangered	Not listed	Flora
Myotis macropus	Southern Myotis	Not listed	Vulnerable	Fauna
Phascolarctos cinereus	Koala	Vulnerable	Vulnerable	Fauna
Prasophyllum petilum	Tarengo Leek Orchid	Endangered	Endangered	Flora
Rutidosis leptorrhynchoides	Button Wrinklewort	Endangered	Endangered	Flora
Swainsona sericea	Silky Swainsona	Not listed	Vulnerable	Flora
Thesium australe	Austral Toadflax	Vulnerable	Vulnerable	Flora

5.3.3 Targeted survey methods

i Targeted flora surveys

Targeted flora surveys were undertaken over 3 days between 6 and 8 October 2021 in the project study area. Surveys were undertaken in accordance with NSW (DPIE 2020) guidelines and included transects spaced at intervals of 10 m at the level required for the most survey intensive species, namely orchids, grasses, and forbs. Given the nature of site with areas of overlapping habitat, all flora species listed below were surveyed throughout the subject land, excepting water deeper than 10 cm. Recent rainfall means some plants were closer to water than normal, hence 10 cm depth mark. Targeted flora survey transect locations are illustrated in Figure 5.1.

Surveys for the following threatened flora were conducted:

- Austral Toadflax (*Thesium australe*);
- Black Gum (*Eucalyptus aggregata);*
- Buttercup Doubletail (*Diuris aequalis);*
- Button Wrinklewort (*Rutidosis leptorrhynchoides);*
- Camden Woollybutt (*Eucalyptus macarthurii*);
- Dwarf Kerrawang (*Commersonia prostrata);*
- Hoary Sunray (*Leucochrysum albicans* var. *tricolor);*
- Mauve Burr-daisy (*Calotis glandulosa);*
- Silky Swainson-pea (*Swainsona sericea);*
- Tarengo Leek Orchid (*Prasophyllum petilum); and*
- Thick Lip Spider Orchid (*Caladenia tessellata).*

Further flora surveys were conducted for Austral Toadflax within the prescribed survey period of November to January. All areas of potential habitat were surveyed on 18 January 2022. This species was also surveyed at the time of previous surveys in October in case the species may have been evident earlier in the year than usual due to the unusually wet conditions in the preceding months.

ii Targeted fauna surveys

Targeted fauna surveys were undertaken over three days between 6–8 October 2021 in suitable habitat in the project study area. Surveys have been conducted in accordance with various NSW and Commonwealth guidelines. Weather during surveys were mild, with no rainfall or frost occurring.

Survey methods and effort are outlined for each fauna group below. Fauna survey locations are illustrated in Figure 5.2.

a Arboreal mammals

Arboreal mammal surveys were undertaken for the following species:

- Koala (*Phascolarctos cinereus*).

Surveys were undertaken in accordance with the Spot Assessment Technique of Phillips and Callaghan (2011). Methods and survey effort are outlined in Table 5.4.

Table 5.4 Methods and survey effort – Koala

Method	Survey description	Survey effort
Spot Assessment Technique (SAT)	The SAT method requires application of a uniform assessment method across a broad area, but due to the discreet nature of the treed vegetation in the project study area, every Eucalyptus and *Pinus radiata* tree within, and in close proximity to, the subject land was surveyed. At each individual tree, the SAT (Phillips and Callaghan 2011) was undertaken, as follows: • Koala faecal pellets were searched for beneath every tree within the subject land and all trees in close proximity to the subject land. Initial inspections were checked in undisturbed ground surface, followed by a more thorough inspection involving disturbance of leaf litter and ground cover (if no faecal pellets were initially detected); • an average of approximately two person minutes per tree were dedicated to the faecal pellet search; and • activity levels can be interpreted using Table 2 from Phillips and Callaghan (2011). Note: *Pinus radiata* trees were also searched due to being part of a corridor continuous with Eucalyptus tree species in the project study area.	All Eucalyptus and *Pinus radiata* were searched within zones 1191_Regrowth and 1191_Planted. These zones were the only zones with tree species present. SAT surveys of 2–4 minutes were undertaken at each tree more than 15 cm DBH.

b Microchiropteran bats

Microbat surveys were undertaken specifically to target Southern Myotis (*Myotis macropus*).

Methods and survey effort have been developed in accordance with the DPIE guidelines (2018). Methods and survey effort are outlined in Table 5.5.

Table 5.5 Methods and survey effort – Microchiropteran bats

Method	Survey description	Survey effort
Roost search	Roost searches were undertaken in accordance with the following: • the subject land and adjacent areas were searched for potential cave-like roost sites across the subject land (caves, scarps, cliffs, rock overhangs, disused mines, tunnels, bridges, culverts, old buildings, sheds); and • searches for potentially suitable tree hollows were also conducted.	The entirety of the subject land and adjacent areas were searched, and no potential roost sites were identified.
Acoustic detection	Acoustic surveys were undertaken as follows: • detectors were set adjacent to wetlands and in flyways likely to be utilised by bats; • detectors were placed a minimum of 50 m apart; • detectors were placed out for a minimum of two nights, with devices set to record between dusk and dawn; • calls were analysed by a person experienced in bat call analysis; and • acoustic detectors were placed on the lee side of each tree, protected from the prevailing wind direction to minimise wind noise interference.	The DPIE (2018) guidelines specify a minimum survey effort of four sites surveyed for four night (sixteen detector nights) for sites with riparian stream lengths less than 2.5 km. Surveys were undertaken over 8 sites, across 2 nights (5–7 October 2021), equating to sixteen detector nights. Minimum survey effort was met.

5.3.4 Targeted survey results

i Targeted flora surveys

Both targeted surveys did not record any threatened flora species, despite surveys having been undertaken during favourable seasonal timing and prevailing weather conditions. The locations of the flora survey transects are shown in Figure 5.1.

ii Targeted fauna surveys

a Bird breeding habitat (dual credit species)

No tree hollows of sufficient size for breeding by threatened species of owls or cockatoos nor any large stick nests likely to be utilised by threatened raptors were found within or adjacent to the subject land.

No threatened species of owls, cockatoos or raptors were observed.

It is unlikely that the subject land is utilised for breeding by any threatened species of owls, cockatoos, or raptors.

b Koala

No Koalas, or signs of Koala activity such as scats or deep scratch-marks were observed in, or around trees on the subject land. It is unlikely that the site is habitat for Koalas due to the lack of connectivity within the broader landscape. Treed areas surveyed by the Spot Analysis Technique (SAT) are shown in Figure 5.2.

c Microchiropteran bats

Acoustic bat calls were analysed by Corymbia Ecology on 12 October 2021. Four species of bats were definitively identified based on recordings from eight ultrasonic bat call recording devices, including:

- White-striped Freetail Bat (*Austronomus australis);*
- Chocolate Wattled Bat (*Chalinolobus morio);*
- Ride's Freetail Bat (*Mormopterus (Ozimops) ridei)* – definite identification of a single pass; and
- Large Forest Bat (*Vespadelus darlingtoni)* – definite identification from high activity levels.

Probable identifications of two additional species of bats were also made based on the recordings:

- Large Bent-winged Bat (*Miniopterus orianae oceanensis*); and
- Gould's Wattled Bat (*Chalinolobus gouldii*).

Other species were recorded but not definitively identified. A single pass was recorded that was attributable to either a *Nyctophilus* (long-eared bat) species, or the threatened Southern Myotis (*Myotis macropus)*. The single pass is unable to be further distinguished. See Appendix D for acoustic bat call analysis report. Acoustic bat recorder locations are shown in Figure 5.2.

Given that only a single pass, that is only doubtfully attributable to the species was recorded, it is unlikely that the subject land is occupied by Southern Myotis.

d Frogs

No targeted searches for frogs have been undertaken to date, however several common species were heard calling during flora surveys in areas around PCT 1256. Due to redesign of project, resulting in PCT 1256 being located outside of the subject land, frog species will no longer be impacted and not require survey.

KEY

- Development footprint (Subject land)
- Project study area
- Flora transect
- Major road
- Minor road
- Vehicular track
- Cadastral boundary

Plant community type (PCT) mapping

PCT 1191 | Snow Gum- Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion

- Native planted
- Exotic planted
- Regrowth
- DNG
- Exotic DNG

PCT 1256 | Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion

- Moderate
- Poor

Other

- Waterbody

Flora survey effort

0 250 500 m

GDA 1994 MGA Zone 55

N

Source: EMM (2022); Veolia (2022); DFSI (2017)

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Figure 5.1

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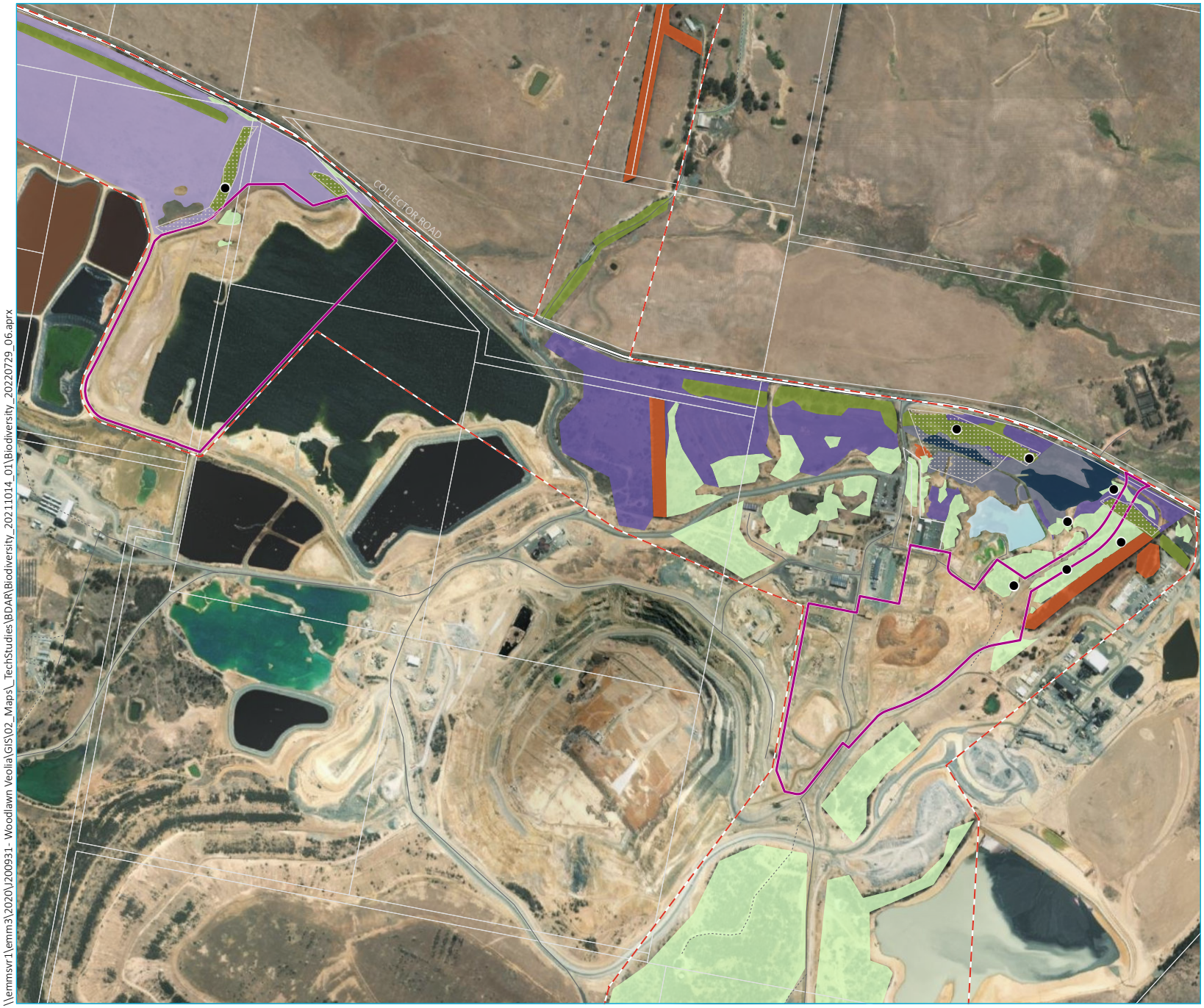

KEY

- Development footprint (Subject land)
- Project study area
- Anabat location
- Koala SAT location
- Major road
- Minor road
- Vehicular track
- Cadastral boundary

Plant community type (PCT) mapping

PCT 1191 | Snow Gum- Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion

- Native planted
- Exotic planted
- Regrowth
- DNG
- Exotic DNG

PCT 1256 | Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion

- Moderate
- Poor

Other

- Waterbody

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Source: EMM (2022); Veolia (2022); DFSI (2017); DPI (2013)

0 250 500 m

GDA 1994 MGA Zone 55

N

Fauna survey effort

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6 Groundwater dependent ecosystems

6.1 Methods

6.1.1 Subject land definition and ecosystems assessed

The groundwater impact assessment (Appendix R of the EIS) has considered groundwater dependent ecosystems (GDEs). This chapter assesses impacts of groundwater drawdown on terrestrial GDEs, comprising terrestrial native vegetation and groundwater-dependent wetlands and/or estuarine/near shore ecosystems. Aquatic GDEs, comprising baseflow dependent aquatic ecosystems, karst/caves and/or sub-surface aquatic ecosystems, are assessed in a separate water assessment.

6.1.2 Literature and spatial data review

The literature reviewed for this chapter include:

- *EMM Groundwater Assessment* (EMM 2021); and
- *Groundwater Dependant Ecosystems Atlas* (BoM 2021c).

6.1.3 Risk assessment

Table 6.1 defines the characteristics of terrestrial and aquatic ecosystems that fall within each category of the risk matrix (Serov et al 2012).

Table 6.1 Ecological value definitions

1 high ecological value	2 moderate ecological value	3 low ecological value
GDEs where only slight changes in groundwater quantity and quality would result in their loss (eg obligate GDEs).	GDEs where a moderate change in groundwater availability would change their distribution, composition, or condition.	A highly modified GDE.
GDEs located in a state or federal reserve system (eg National Park).	GDEs that provide ecological services to other ecosystems including rivers, wetlands, and estuaries.	A GDE that would involve a large cost to rehabilitate, in a catchment containing other GDEs in moderate to good condition.
GDEs in relatively unaltered and good condition.	GDEs in moderate to good condition.	
GDEs that are habitat for critically endangered or endangered species and/or communities listed under the BC Act, FM Act and/or EPBC Act.	GDEs that are habitat for vulnerable species and/or communities listed under the BC Act, FM Act and/or EPBC Act.	
-	GDEs that can respond to changes in water availability and/or quality.	
-	GDEs that only play a minor role in ecosystem functioning (eg at the end of a dry season or during extreme drought).	

6.2 Key conclusions of the groundwater assessment

The following is a summary of the key conclusions of the groundwater assessment (EMM 2021):

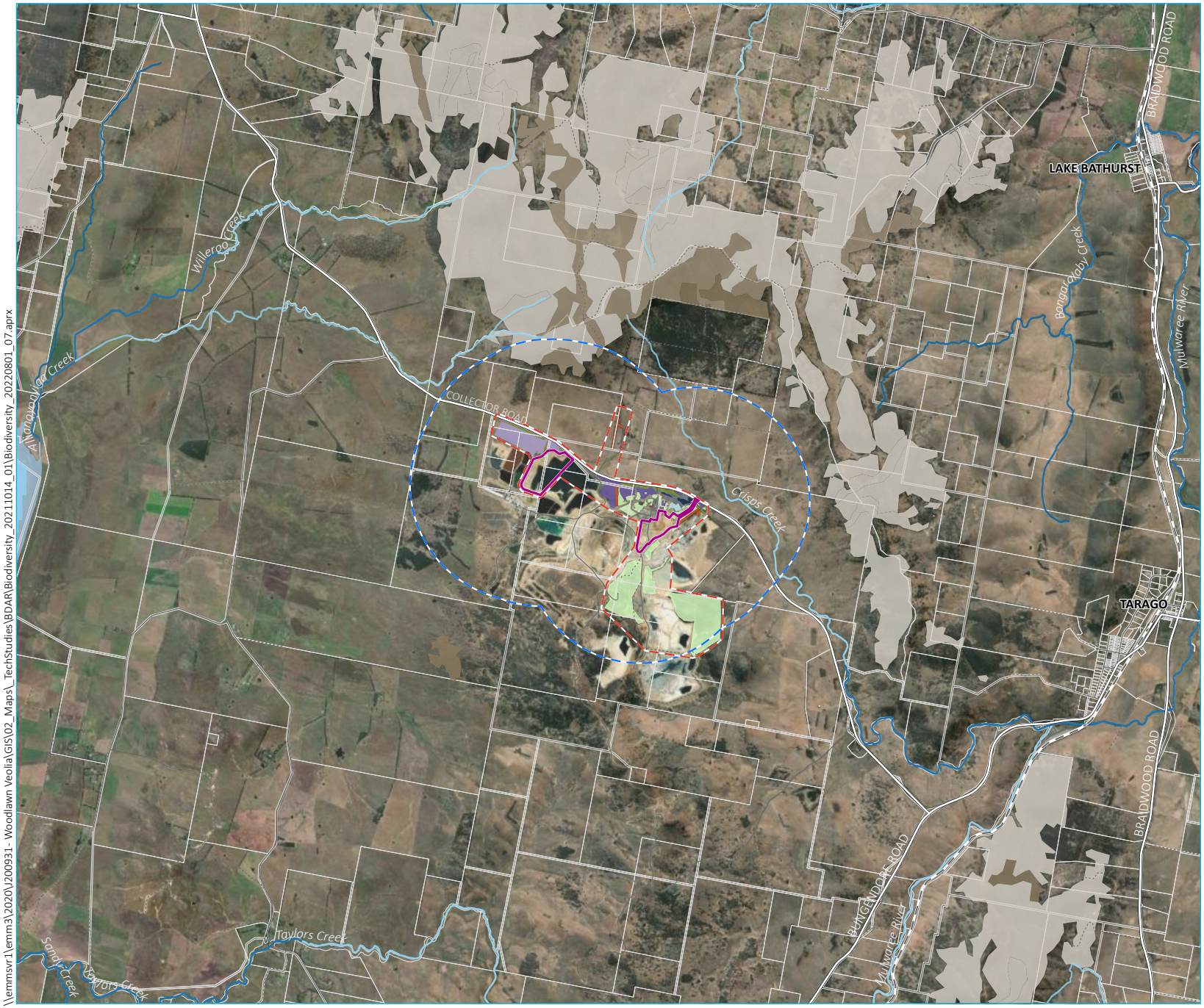
- the existing groundwater supply to the Eco Precinct from the Willeroo borefield is adequate to meet the project water requirements;
- Veolia holds sufficient entitlement for the take from the Willeroo borefield associated with operation of the project;
- excavation of the ARC bunker is expected to intercept groundwater for a short duration during construction and would not impact groundwater assets;
- development of the encapsulation cell is expected to consolidate the underlying clayey sediments of the alluvium/colluvium, causing the water pressure (groundwater level) to rise gradually and locally, which would dissipate with distance and time;
- groundwater flow processes are expected to remain relatively unchanged in the Crisps Creek and Spring 2 dam area, as this area will continue to receive water from rainfall and runoff (overland flow) and shallow groundwater discharge from the north;
- the potential effects of hydraulic loading on the groundwater system or excavation for the ARC bunker (the main water affecting activities in the Goulburn Fractured Rock Groundwater Source) is not expected to have an adverse impact on the water quality of groundwater discharging to Crisps Creek or the greater Sydney drinking water catchment; and
- monitoring of the groundwater monitoring network will continue, and the network will be expanded to target the identification of potential impacts from project activities. Triggers and thresholds will be developed to provide context on if, how and when management measures are required as part of the WMP for the project.

6.2.1 Groundwater dependant terrestrial ecosystems

The groundwater dependant ecosystems atlas (2021) identifies no areas within the project study area that are aquatic or terrestrial groundwater dependant ecosystems Within 5 kms of the project study area there are several vegetated landscapes and creeks which may interact with the subject land. The location of the terrestrial GDEs upstream of the Crisps Creek catchment and the subject land, indicated that the risk of impacts on these terrestrial GDEs, is low and a separate aquatic biodiversity assessment was deemed unnecessary. Aquatic GDEs in the project study area may be indirectly impacted to a small degree by the project however these ecosystems are likely to be dependent primarily on surface water flow. The Groundwater Impact Assessment (EMM 2021) details the impacts on local groundwater resources and concluded that impacts on groundwater are unlikely to be significant.

Table 6.2 Aquatic and Terrestrial GDEs in the locality and potential impacts

GDE	Potential for groundwater dependence	GDE Ecological value as per Table 6.1.	Potential impacts
Semi-aquatic – PCT 1256 – Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion. Equivalent to: • Eastern tablelands damp heath – *Epacris microphylla/Schoenus apogon;* • Tableland Sedge/grass herbland – *Themeda triandra/Carex appressa*; and • Tableland Alluvial Valley Floor Wetlands.	High	High	Little to no change to groundwater availability. The highly modified wetland areas in the project study area are unlikely to be substantially impacted by minor changes to groundwater conditions associated with the project. Any impacts associated with operation of the Willeroo borefield are considered to be existing impacts as the project would not require an increase to the existing groundwater supply entitlement for the Eco Precinct.
Aquatic – Crisps Creek	Moderate	Moderate	
Aquatic – Allianoyonyiga Creek	Moderate	Moderate	
Terrestrial – PCT 1191 – Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion. Equivalent to: • Eastern Tableland dry shrub/grass forest – *E.pauciflora/E.viminalis/Acacia dealbata/Themeda triandra*; and • Tablelands and slopes herb/grassland/woodland – *Themeda triandra plus E. pauciflora/E.rubida*.	Moderate	Moderate	
Terrestrial – Eastern tablelands dry shrub forest – *E.sieberi/E.dives/Brachyloma daphnoides/Poa sieberiana*	Low	Moderate	



KEY

- Development footprint (Subject land)
- Project study area
- Landscape assessment area
- Rail line
- Major road
- Minor road
- Vehicular track
- Cadastral boundary

Plant community type (PCT) mapping

PCT 1191 | Snow Gum- Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion

- Native planted
- Exotic planted
- Regrowth
- DNG
- Exotic DNG

PCT 1256 | Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion

- Moderate
- Poor

Other

- Waterbody

Groundwater dependant ecosystems (GDE)

Aquatic

- High potential for GW interaction
- Moderate potential for GW interaction

Terrestrial

- High potential for GW interaction
- Moderate potential for GW interaction
- Low potential for GW interaction

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Source: EMM (2022); Veolia (2022); BOM (2021); DFSI (2017)

0 1 2 km

GDA 1994 MGA Zone 55

N

Groundwater dependant ecosystems

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Figure 6.1

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6.3 Conclusion

The potential groundwater impacts of the project have been assessed with consideration of the SEARs and relevant regulations, policy and guidelines and considered unlikely to be significant, and therefore a separate aquatic biodiversity assessment was deemed unnecessary. An aquatic biodiversity assessment was not a SEARS requirement.

Section 2 – Impact assessment

7 Impact assessment

This chapter identifies the potential impacts of the project on the biodiversity values. Measures taken to date to avoid and minimise impacts are summarised and recommendations to assist in the design of the project that further avoids, minimises, and mitigates impacts are provided.

The development footprint (subject land) has maximised the use of disturbed areas, which assists in minimising impacts to biodiversity. Of the 38 ha of land within the development footprint (subject land), only 1.55 ha comprises native vegetation and associated habitat for threatened species. The ARC access road is the primary element of the project that impacts vegetation, and the footprint has been refined to minimise impacts as far as practicable, including the avoidance of a TEC. Potential impacts are described below.

7.1 Potential direct and indirect impacts

The project would result in the following direct impacts to threatened biodiversity:

- clearing of 1.70 ha of vegetation, 1.55 ha of which is dominated by native plant species, in the subject land (development footprint);
- loss of fauna habitat associated with native and exotic vegetation clearing; and
- increased fragmentation of vegetation remnants.

Wherever possible, direct impacts have been avoided and/or minimised through the design of the subject land (development footprint).

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

- alteration to surface water hydrology for groundwater and surface water dependent ecosystems in PCTs 1191 and 1256;
- erosion and sedimentation of waterbodies;
- exotic flora/fauna/pathogen introduction and spread throughout the subject land;
- potential inadvertent disturbance of retained habitats, particularly PCT 1256 and treed areas;
- increased noise, vibration and dust levels resulting in disturbance of fauna species, and consequent abandonment of habitat, or changes in behaviour (including breeding behaviour); and
- lighting for night works, resulting in disturbance to fauna species and changes in occupancy or behaviour.

Indirect impacts will be managed and mitigated through the implementation of the biodiversity management measures detailed in the below sections. Given the highly modified condition of all native vegetation and habitat affected by the project and the planned implementation of mitigation measures, indirect impacts on biodiversity would be negligible.

No evidence of the existence of plant pathogens (eg Armillaria, Phytophthora or Myrtle Rust) or associated disease was observed in the vegetation of the project study area, however other invasive species of animals and plants are present. With the implementation of the proposed management measures, the project is unlikely to significantly exacerbate the impact of exotic species.

Residual direct impacts would be compensated through implementation of the BOS through the purchase of credits (refer Section 7.6).

7.2 Prescribed impacts

A prescribed impact is a specific type of impact that is described in Section 6 of the BAM (DPIE, 2020) and must be assessed under the BOS.

The prescribed impacts as per Chapter 6 of the BAM (DPIE, 2020) as they relate to the subject land, include impacts on:

a) habitat of threatened entities not associated with native vegetation;

b) areas connecting threatened species habitat; and

c) water quality, water bodies and hydrological processes that sustain a threatened species.

Consideration has been given with regards to prescribed impacts on threatened species and communities recorded or assumed to be present within the subject land, as per Section 6 of the BAM (DPIE 2020). The prescribed impacts relevant to the project are documented in Table 7.1.

Table 7.1 Prescribed biodiversity impacts relevant to the subject land

Prescribed impact	Justification
Impacts of development on the habitat of threatened species or ecological communities associated with:	
• Karst, caves, crevices, cliffs, and other features of geological significance.	No karst (eroded limestone landscape) features are found within, or adjacent to, the subject land. No cliffs are found within, or adjacent to, the subject land.
• Human made structures.	The project is unlikely to affect habitat values provided by human made structures.
• Non-native vegetation.	Minimal areas (~0.15 ha) of non-native vegetation will be impacted by the project. This area is unlikely to support any threatened species.
Impacts on areas connecting threatened species habitat, such as movement corridors.	The project will have a minor impact on the connectivity of habitat within the subject land due to the further removal and fragmentation of vegetation. Landscaping with native species throughout the subject land will increase the vegetated area from its current extent. Assessed in Section 7.2.1.
Impacts that affect water quality, water bodies and hydrological processes that sustain threatened entities (including from subsidence or upsidence from underground mining).	The project may result in minor impacts to water quality downstream. Assessed in Section 7.2.2.
Impacts on threatened and protected animals from turbine strikes from a wind farm.	Not relevant to the project as it is not a wind farm.
Impacts on threatened species or fauna that are part of a TEC from vehicle strikes.	The project will involve a temporary increase in traffic in the area during construction. Several threatened species have been identified possibly occurring within the subject land that are likely to be susceptible to impact from vehicle strikes. Assessed in Section 7.2.3.

7.2.1 Impacts on areas connecting threatened species habitat such as movement corridors

Impacts on areas connecting threatened species habitat such as movement corridors are assessed in Table 7.2.

Table 7.2 Impacts on areas connecting threatened species habitat such as movement corridors

Associated features of site	Potential impacts	Relevant threatened species	Consequences of impacts on threatened entities
Native tree planting strips and sparse woodland regrowth that provide a tenuous local-scale connection between the regenerating woodland of the subject land and immediate surrounds and the more intact woodland on hills to the south.	The project will result in removal of 1.43 ha of regrowth and planted woodland at the edge of the corridor, and create a new road division between the wetland and regenerating and planted woodland	• Frogs • Koala • Spotted-tail Quolls • Threatened bird species	Frogs utilise grassed area immediately beside water bodies for foraging at night. The project will include a small, vegetated corridor between the wetland and the road, allowing the species to forage in all areas surrounding the wetland habitat. The project is unlikely to significantly impact the ability of threatened frog species to move through the landscape between areas of preferred habitat. Koalas and Spotted-tail Quolls may occur infrequently and would be unlikely to remain in the area due to lack of high foraging potential and lack of connectivity with other woodland areas. Threatened bird species are highly mobile and will utilise surrounding areas and are highly unlikely to be impacted by the small loss of vegetative cover.
Wetland/drainage line located to the north of the subject land that connects the wetland area to the north of (but not within) the subject land, via a culvert under Collector Road.	The project will not result in removal of wetland vegetation in or at the edge of the corridor. It is unlikely to have a significant effect on this corridor.	• Frogs	The project will have no direct impact on the already highly disturbed riparian vegetation corridors of tributaries of the Crisps Creek due to redesign of access road to avoid wetland areas. The project is unlikely to significantly impact the ability of threatened frog species to move through the landscape between areas of preferred habitat in the Crisps Creek catchment.

7.2.2 Impact on water quality, water bodies and hydrological processes that sustain threatened species

Impacts on water quality, water bodies and hydrological processes that sustain threatened species are assessed in Table 7.3.

Table 7.3 Impact on water quality, water bodies and hydrological processes

Associated features of site	Potential impacts	Relevant threatened entities	Consequences of impacts on threatened entities
Wetland/drainage line to the north of (but not within) the subject land.	Slightly increased erosion and sedimentation during construction in localised areas. Negligible change to floodplain conditions.	• Yellow-spotted Treefrog • Green and Golden Bell Frog	The slight increased and localised erosion and sedimentation during construction is unlikely to result in significant changes to the species' habitat. Downstream habitat is already significantly affected by erosion, sedimentation, grazing and weed invasion and the project is unlikely to significantly alter habitat suitability for these species in this area. Minimal impact.

7.2.3 Impacts on threatened species or fauna that are part of a TEC from vehicle strikes

Impacts on threatened species or fauna that are part of a TEC from vehicle strikes are assessed in Table 7.4.

Table 7.4 Impacts on threatened species or fauna that are part of a TEC from vehicle strikes

Associated features of site	Potential impacts	Relevant threatened species	Consequences of impacts on threatened entities
All roads likely to be utilised for construction access	Increased incidence of vehicle strike during construction due to increased traffic.	All threatened animal species that may utilise the project study area.	There may be a small overall increase in the incidence of mortality of individuals of threatened species during construction. Construction traffic speed limits and limitation of construction traffic movements at night would mitigate impacts. The overall long-term impact of vehicle strike associated with the project is unlikely to have a significant impact on populations of threatened species or fauna that are part of a threatened ecological community.

7.3 Avoidance, minimisation, and management

7.3.1 Avoidance and minimisation strategy

The project design has been optimised to be located predominantly in areas that lack vegetation, and which have significant historic soil disturbance. The subject land is approximately 38 ha, of which approximately 1.55 ha comprises native vegetation. Figure 7.1 shows that the subject land that contains native vegetation is primarily in the areas adjacent to Collector Road, where the ARC access road is.

Location and design of the ARC access road has avoided wetland and stands of mature native vegetation as far as practicable (see Figure 7.1). These stands of intentionally retained vegetation provide an aesthetic buffer and connectivity habitat in the broader landscape. The projects associated surface infrastructure has been designed, where possible, to avoid the sensitive biodiversity areas of the wetland and mature treed areas.

Figure 7.1 demonstrates that iterative project planning, informed by the baseline studies outlined above, has allowed a range of impacts to be avoided and others to be minimised throughout the life of the project. To compensate for unavoidable disturbance, biodiversity offsets will be provided.

Key avoidance measures that have been implemented include:

- redesigning the project to avoid the placement of the ARC access road through wetland areas PCT 1256, which avoids potential impacts on threatened frog species;
- avoiding disturbance to the catchment area and hydrology of the wetland; and
- minimising the impact on PCT 1191 (planted native corridor and the derived native grasslands).

The reduction of impact on PCT 1191 (native planted component) provides mature vegetation connectivity and habitat in the broader landscape.

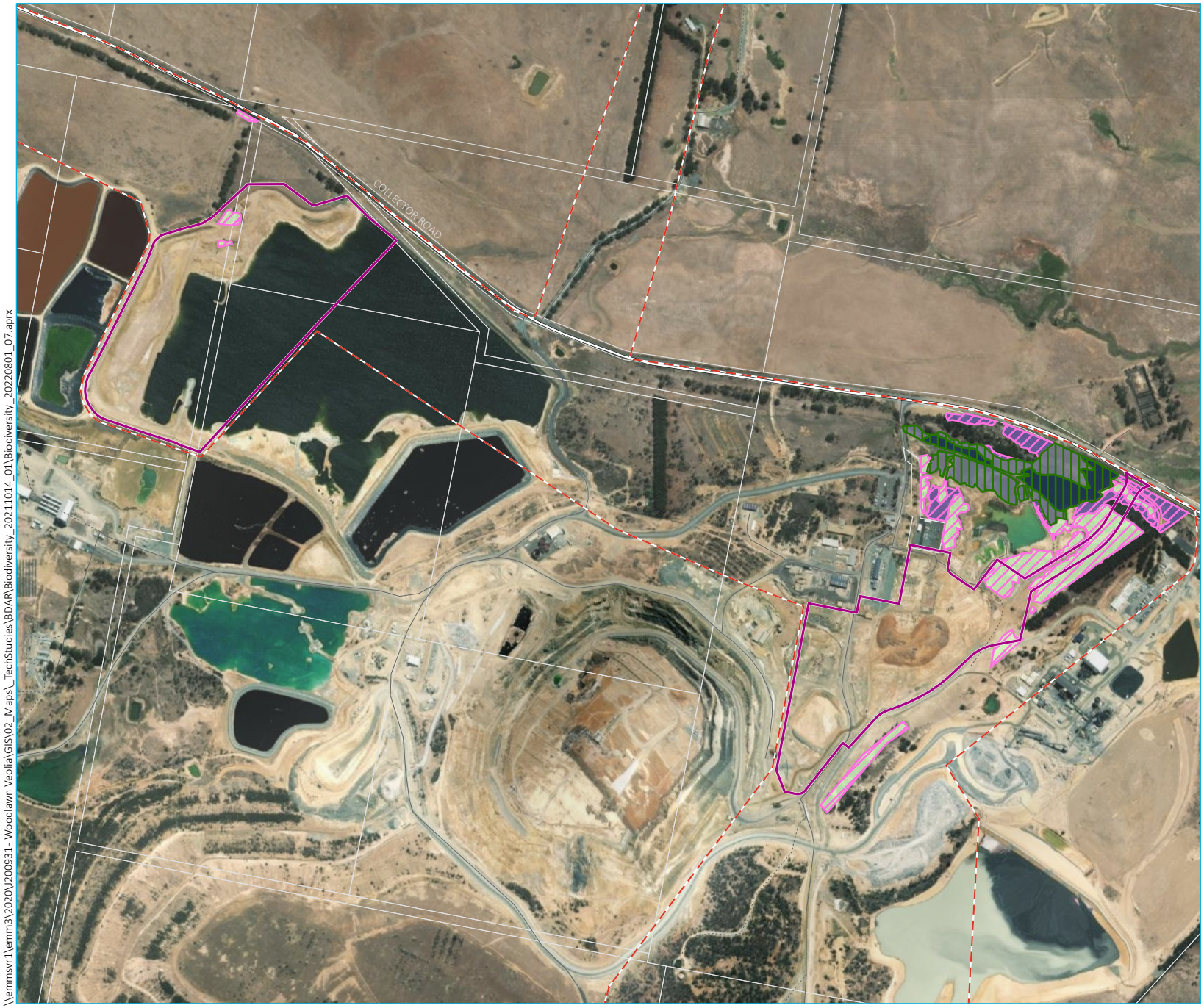
The design of the project has been iterative to avoid and minimise impacts on threatened biodiversity. Table 7.5 summarises the mitigation measures proposed to minimise the potential for residual impacts on biodiversity.

Table 7.5 Impact mitigation strategy

Impact	Action	Intended outcome	Timing	Responsibility
Clearing of native vegetation	Replace removed native vegetation with a planted corridor along each side of access road. Do not use adjacent areas for stockpiling.	Create healthy vegetation buffer between edge of wetland/woodland areas and the access road.	Landscaping	Proponent
Clearing/trampling of native vegetation adjacent to subject lands	Exclude activities from areas outside of the subject land that contain native vegetation during construction through temporary fencing of footprint during construction.	To minimise areas of impacted or damaged vegetation.	During and after construction	Contractor and proponent
Dust impact on native fauna during construction	Keep dust minimised through work site misting (water truck).	To ensure no significant dust affects fauna or flora.	During construction	Contractor

Table 7.5 Impact mitigation strategy

Impact	Action	Intended outcome	Timing	Responsibility
Erosion impacts on local wetland and waterways	Control stormwater and surface water flows during construction.	Minimise any sedimentation of waterways.	During construction	Contractor
Erosion impacts on local wetland and waterways	Design stormwater flows to minimise sedimentation and flash-flooding of wetland.	Minimise any sedimentation of waterways.	Design	Contractor and proponent
Causing significant changes to water levels of water bodies	Control stormwater and surface water flows during construction.	Minimise significant changes to water levels in water bodies. Maintain the current hydrology regime.	During and after construction	Contractor and proponent
Fauna strike by vehicles or plant	Impose speed limits on access roads and limit night works on access road. Conduct pre-clearance surveys and clearing supervision.	Limit number of animals struck by vehicles and plant. Limit fauna struck by plant during clearing.	During and after construction	Contractor and proponent
Introduction or increased presence of biosecurity issues eg exotic flora, fauna, pathogens.	Complete site hygiene measures for vehicles and staff. Use uncontaminated fill and landscaping products.	No biosecurity issues are introduced or encouraged in the project study area.	During and after construction	Contractor and proponent
Direct impacts on marginal foraging habitat for the Yellow-spotted Bell Frog and Green and Golden Bellfrog.	Incorporate frog habitat features into landscape design in areas of the subject land and adjacent areas that are bare of native vegetation from the access road to the north-west near PCT 1256 (Tableland Swamp Meadow). Habitat features should include ephemeral pond depressions, shelter habitat elements (eg large woody debris from clearing area) and tussock grass, sedge, and rush plantings.	Increased foraging and shelter habitat potential for frogs.	During and after construction	Contractor and proponent
Residual vegetation and habitat impact	Offsets will be provided in accordance with the BOS as outlined in Section 7.6.	These residual impacts will be compensated for through the implementation of a biodiversity offset strategy of obtaining appropriate and BCT approved credits.	During and after construction	Proponent



KEY

- Development footprint (Subject land)
- Project study area
- Major road
- Minor road
- Vehicular track
- Cadastral boundary

Plant community type (PCT) mapping

PCT 1191 | Snow Gum- Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion

- Regrowth
- DNG

PCT 1256 | Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion

- Moderate
- Poor

Serious and irreversible impact entities and potential habitats

- Potential habitat for the Yellow-spotted Tree Frog (PCT 1256)

Threatened ecological community

- Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions

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

0 250 500 m

GDA 1994 MGA Zone 55

N

Avoidance of PCTs, SAII entities and potential habitat

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Figure 7.1

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7.4 Serious and Irreversible Impacts

Additional impact assessment for threatened species and ecological communities that are also listed as candidate entities for Serious and Irreversible Impacts (SAII) has been undertaken in accordance with the criteria set out in Section 9.1 of the BAM (DPIE 2020).

7.4.1 Threatened ecological communities

Werriwa Tablelands Cool Temperate Grassy Woodland, listed as a critically endangered TEC under the BC Act, is associated with PCT 1191. The area within the subject land that is assessed is approximately 1.55 ha and exists in a highly modified, fragmented, and isolated condition lacking the canopy stratum.

Table 7.6 provides an assessment of the current status of Werriwa Tablelands Cool Temperate Grassy Woodland TEC, against the assessment criteria provided in Section 9.1.1 (2.) of the BAM (DPIE, 2020), and Table 7.7 provides an assessment of the impacts of the project on the TEC against the assessment criteria provided in Section 9.1.1 (4.) of the BAM (DPIE 2020).

Table 7.6 SAII assessment of current status for Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions

Factors affecting the status of the TEC	Description of factors affecting the status of the TEC
a) **Reduction in geographic distribution**; current total geographic extent of the TEC in NSW	Werriwa Tableland Cool Temperate Grassy Woodland has undergone a very large reduction in geographic distribution (TSSC 2019). The best estimate of the extent of occurrence (EOO) is 6,285 km^2, based on a minimum convex polygon enclosing likely occurrences of the community (OEH 2019). The best estimate of the area of occupancy (AOO) is a minimum occupancy threshold of 1% of five 10 X 10 m grid cells (the recommended scale for assessing AOO) (TSSC 2019).
Estimated reduction in geographic extent of the TEC since1970 (not including impacts of the proposal).	Approximately 80%–98 % reduction in pre-1750 distribution (TSSC 2019). No data is available for reductions since 1970. According to the OEH (2019), it was estimated that approximately 5% of the original distribution remained as of 2019.
b) **Reduction in ecological function** for the TEC using evidence that describes the degree of environmental degradation or disruption to biotic processes, indicated by:	
i. Change in community structure.	The Threatened Biodiversity Data Collection (TBDC) lists the following threats affecting the community structure of the TEC: • Anthropogenic climate change, including trends towards hotter, drier environments, resulting in adverse changes to the composition and structure of remnants. • Historic and ongoing clearing and degradation of remnants for agricultural, forestry, infrastructure, and residential development.
ii. Change in species composition.	The TBDC lists the following threats affecting the species composition of the TEC: • Application of fertilisers, which changes soil properties and thus changes the floral and faunal composition of the community.
iii. Disruption of ecological processes.	The TBDC lists the following threats causing disruption of ecological processes of the TEC: • Tree dieback from a variety of causes, including enrichment of the soil by stock dung and increased levels of insect attack due to loss of ecological function in the community. • Harvesting of firewood (either living or standing dead trees and material on the ground), resulting in the loss of habitat for a range of hollow-nesting, bark-dependant, and ground-living fauna species.

Table 7.6 SAII assessment of current status for Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions

Factors affecting the status of the TEC	Description of factors affecting the status of the TEC
iv. Invasion and establishment of exotic species.	The TBDC lists the following threats to the TEC resulting from invasion and establishment of exotic species: • Invasion by a range of weeds including noxious weeds (eg African Love-grass, Serrated Tussock, Chilean Needle-grass, St John's Wort), environmental weeds (eg Sweet Briar, Blackberry, English Hawthorn), aggressive pasture grasses (eg Phalaris, Cocksfoot and Paspalum) and escapes from horticulture or silviculture (eg Cotoneaster, Radiata Pine). • Invasion of remnants by feral animals, resulting in the loss or modification of habitat.
v. Degradation of habitat.	The TBDC lists threats to the TEC resulting in degradation of habitat, including those listed in this table under items (i) to (iv) and (vi). The TBDC also lists the following threat which, through its influence on land management practices, causes degradation of the TEC: • Ongoing heavy grazing and trampling by domestic livestock, which have the effect of changing the ground layer composition and the hydrology of sites, resulting in losses of plant species (simplification of the understorey and ground layer and suppression of overstorey) and erosion and other soil changes (including increased nutrient status). • Disturbance and clearance of remnants during road, rail and infrastructure maintenance and upgrades.
vi. Fragmentation of habitat.	The TBDC lists the following threats to the TEC resulting from invasion and establishment of exotic species: • Fragmentation and isolation of remnants, leading to genetic isolation of the community's component species.
c) **Evidence of restricted geographic distribution** based on the TEC's geographic range in NSW according to the:	
iii) Extent of occurrence.	The best estimate of the extent of occurrence (EOO) is 6,285 km^2, based on a minimum convex polygon enclosing likely occurrences of the community (TSSC 2019).
iv) Area of occupancy.	The best estimate of the area of occupancy (AOO) is 10 x 10 km grid cells, the scale recommended for assessing AOO by IUCN and applying a minimum occupancy threshold of 1% (TSSC 2019).
v) Number of threat-defined locations.	The BAM (DPIE 2020) defines threat-defined locations in terms of threatened species but does not mention TECs. According to the *Guidelines for the application of IUCN Red List of Ecosystems Categories and Criteria* (IUCN 2017), a threat-defined location is: • A geographically or ecologically distinct area in which a single threatening event can rapidly affect all occurrences of an ecosystem type. The IUCN definition is similar to that included in the BAM (DPIE 2020) and is considered to encompass the intent of the requirements of BAM (DPIE 2020) for TECs. Broad interpretation of threat-defined locations identifies two IBRA regions in which the TEC is known to occur, with subtly different climatic conditions and potentially different susceptibility to climate change and other threats, namely: • South Eastern highlands; and • South East Corner.
d) Evidence that the TEC is unlikely to respond to management.	There is no data under response to management in the TBDC. The ability of a degraded patch of the TEC to respond to management varies with its condition and level of connectivity with nearby or adjacent intact areas with high ecological functionality. For example, highly degraded derived native grassland areas which are isolated from ecologically intact areas, have low native species diversity, are weed infested and have elevated soil nutrient levels are unlikely to respond to standard management practices such as fencing and weed control; instead requiring a highly intensive, reconstructive approach if they are to approach the condition of natural remnants (Gibson-Roy, 2010). By comparison, diverse derived native grasslands, with low levels of weed invasion, little change to soil chemistry and contiguity with ecologically intact areas are very likely to respond well to basic management such as fencing, selective weeding and supplementary planting.

Table 7.7 SAII assessment of impact on Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions

Factors contributing to the impact		Project impact on factors
a)	**Impact on the geographic extent of the TEC**	
iii)	Total area of the TEC to be impacted by the proposal.	The project would affect 1.55 ha of the community (0.0155 km^2).
iv)	Impact as a percentage of the current geographic extent of the TEC in NSW.	The best estimate of the extent of occurrence (EOO) is 6,285 km^2. The project would result in loss of 1.55 ha of the TEC equating to approximately 0.00025% of the geographic extent of the TEC in NSW.
b)	**Contribution of impacts to further environmental degradation or the disruption of biotic processes of the TEC**	
i.	Reduction of patch size of remaining, but now isolated, areas of the TEC.	In relation to patches of the TEC that would not be entirely removed, the project would only affect already small, isolated, and fragmented patches. It will affect any large, structurally intact, or high condition areas of the TEC. All remaining patches would continue to have a similarly low level of connectivity to adjacent areas of the TEC in the surrounding landscape. The project would not isolate any areas of the TEC and is unlikely to reduce the patch size of remaining areas to an extent that could significantly reduce their already low long-term viability.
ii.	Impacts on connectivity and fragmentation of remaining areas of the TEC.	
	• Distance between isolated areas of the TEC.	The project would not isolate any areas of the TEC. All remaining patches would continue to have a similar level of connectivity to adjacent areas of the TEC in the surrounding landscape.
	• Estimated maximum dispersal distance for native flora species characteristic of the TEC.	According to Corlett (2009), typical maximum dispersal distances for different dispersal mechanisms are as follows: • No specialised mechanism — 0–10 m • Ant dispersal — 0–10 m • Wind (large-winged fruits) — 10–100 m • Rodents — 10–100 m • Small to medium-sized forest birds and arboreal mammals — 100 m–1 km • Flying foxes (large seeds) — 100 m–1 km • Large and open-country birds — 1 km–10 km • Wind (small plumed seeds) — 1 km–10 km • Terrestrial mammals — 1 km–10 km • Wind (tiny seeds/spores, and very small plumed seeds) — > 10 km • Flying foxes (small seeds) — > 10 km

Table 7.7 SAII assessment of impact on Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions

Factors contributing to the impact	Project impact on factors
	Eucalypts (including the Eucalyptus species characteristic of the tree growth form component of the TEC) have very limited seed dispersal capabilities, likely in the 0–10 range or 10–100 m range for any given event and species and are considered capable of migrating across landscapes only in the order of ~71–142 m in 71 years (Booth, 2017). In the shrub growth form category, two species Kangaroo Apple (*Solanum aviculare*) and Cherry Ballart (*Exocarpus cupressiformis*) are animal dispersed. These shrub species are likely to be able to be dispersed by birds by 1 to 10 km. Several of the characteristic grass species of the TEC, in the genera *Aristida, Austrostipa, Microlaerna* and *Themeda* are likely to be animal-dispersed and capable of dispersing between 1 and 10 km. are likely to be able to be dispersed by 1 to 10 km, by terrestrial mammals through entanglement in fur. Grasses in the genera *Chloris* and *Rytidosperma* are likely wind-dispersed, as are most species of forbs in the family Asteraceae. The wind-dispersed grasses are likely to be capable of dispersing between 1 and 10 km. The tiny spores of ferns (eg *Cheilanthes* spp.) and very small plumed seeds of many species of in the Asteraceae (daisy family) are likely to be capable of dispersing more than 10 km. Many of the forb and grass species that make up the ground layer of the TEC are likely to have no specialised dispersal mechanism or to be ant-dispersed and only capable of dispersal to distances of less than 10 m.
• Area to perimeter ratio for remaining areas of the TEC.	The project is likely to increase the edge to area ratio of remaining areas of the TEC in some locations and will reduce it in others. The project will not impact any large or structurally intact patches of the TEC. As the impacts of the project on the TEC are entirely at or near existing edges and all of the affected area is already highly fragmented, the increased edge length is unlikely to cause substantial degradation of remaining areas of the TEC.

iii. Condition of the TEC according to the vegetation integrity score for the relevant vegetation zones.

Vegetation Zone	Area (ha)	Vegetation integrity score
Regrowth	1.34	31.6
DNG	0.12	30.6
Planted	0.09	57

7.4.2 Threatened species

Section 9.1.2 of BAM (DPIE 2020) requires additional impact assessment for threatened species that are also listed as candidate entities for Serious and Irreversible Impacts (SAII).

The TBDC for the Regent Honeyeater and Swift Parrot both state that "ecosystem credit areas are unlikely to be potential serious and irreversible impacts". Only ecosystem credit areas could conceivably be impacted by the project as it is outside of important habitat map areas that define the species credit generating habitat for the species. No further SAII assessment is required for these species.

The Yellow-spotted Tree Frog is an SAII species, however no habitat (PCTs) associated with the species is found within the subject land, with only marginal potential foraging habitat present in the subject land. As potential habitat exists adjacent to the subject land, a SAII assessment was undertaken for the species under a precautionary approach.

Table 7.8 provides an assessment of the current status of Yellow-spotted Tree Frog against the assessment criteria provided in Section 9.1.2 (2.) of the BAM (DPIE, 2020), and Table 7.9 provides an assessment of the impacts of the

project on the Yellow-spotted Tree Frog against the assessment criteria provided in Section 9.1.2 (4.) of the BAM (DPIE, 2020).

There are no other species identified as being at risk of an SAII that require further assessment.

Table 7.8 SAII assessment of current status of the Yellow-spotted Tree Frog

Factors affecting the status of the species		Description of factors affecting the status of the species
a)	**Evidence of rapid decline presented by an estimate of the:**	
i.	decline in population of the species in NSW in the past 10 years or three generations (whichever is longer); or	There is no known extant population of the Yellow-spotted Bell Frog (NSW NPWS 2001 in TSSC 2018). The species was thought to have been rediscovered in 2009 in the southern tablelands near Yass (OEH 2015 in TSSC 2018). Individuals recorded were identified as Yellow-spotted Bell Frog as they morphologically resembled the taxonomic assessment by Thompson et al. (1996), (Voros et al. 2010 in in TSSC 2018). However, a genetic assessment of this newly discovered population found that these individuals clustered within the Southern Bell Frog (*Litoria raniformis*) inland group at a low level of sequence divergence (Voros et al. 2010 in in TSSC 2018). The Yellow-spotted Bell Frog may be extinct in the wild, however, there is a possibility that some individuals have remained undetected because of insufficient survey effort (NSW NPWS 2001; Hero et al. 2006 in in TSSC 2018). The species has not been recorded in the southern tablelands since 1980 and has not been recorded in the New England Tableland Bioregion since 1975 (Hero et al. 2006; NSW Scientific Committee 2009; Osborne et al. 1996 in in TSSC 2018). This indicates that the entire population of the species has undergone a very large and rapid reduction (NSW Scientific Committee 2009 in in TSSC 2018). The timing of the decline is uncertain but has been estimated to have occurred between 1978 and 1981 (Osborne et al. 1996 in in TSSC 2018). Generation length is not known with certainty but is estimated to be four to five years based on two similar Litoria species found in similar habitats, Green and Golden Bell Frog and Southern Bell Frog (Gillespie et al. 1995; NSW Scientific Committee 2008 in in TSSC 2018). Consequently, the appropriate time scale for this criterion is likely to be between 12 to 15 years (TSSC 2018). There is no data available regarding any recent decline of the species.
ii.	decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors, or parasites.	
b)	**evidence of small population size presented by:**	
i.	an estimate of the species' current population size in NSW;	There is no known extant population of the Yellow-spotted Bell Frog (NSW NPWS 2001 in in TSSC 2018). In 2004, the IUCN Red List of Threatened Species estimated that the population contains fewer than 50 mature individuals (Hero et al., 2004 in in TSSC 2018). The Yellow-spotted Bell Frog may be extinct in the wild, however, there is a possibility that some individuals have remained undetected as a result of insufficient survey effort (NSW NPWS 2001; Hero et al. 2006 in in TSSC 2018).
ii.	an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer); and	The species has not been recorded since 1980 and there is therefore no data available on the current rate of decline of the species.
iii.	where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations.	The species has not been recorded since 1980 and there is therefore no data available on the current size of the relevant subpopulation. There is no data available on the population dynamics of the species however the behaviour and breeding biology of the Yellow-spotted Bell Frog is presumed to be similar to other bell frog species (NSW NPWS 2001 in in TSSC 2018).

Table 7.8 SAII assessment of current status of the Yellow-spotted Tree Frog

Factors affecting the status of the species		Description of factors affecting the status of the species
c)	**Evidence of limited geographic range for the threatened species presented by:**	
i.	extent of occurrence;	The calculated extent of occurrence (EOO) is 4 km², and the area of occupancy (AOO) is 4 km² (unpublished data DoEE 2017 in TSSC 2018). These figures are based on the only sighting of this species since 1980. The EOO and the AOO were calculated using a 2x2 km grid cell method, based on the IUCN Red List Guidelines 2014 (TSSC 2018).
ii.	area of occupancy;	The best estimate of the area of occupancy (AOO) is 10 x 10 km grid cells, the scale recommended for assessing AOO by IUCN and applying a minimum occupancy threshold of 1% (TSSC 2018).
iii.	number of threat-defined locations; and	Given that the species has not been located in many years, despite significant effort, it is reasonable to assume that if extant, this species would likely only be present in one or two wetland locations (TSSC 2018).
iv.	whether the species' population is likely to undergo extreme fluctuations.	Insufficient data is available to determine whether the species' population is likely to undergo extreme fluctuations.
d)	**evidence that the species is unlikely to respond to management because:**	
i.	known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (eg species is clonal) on, a biodiversity stewardship site;	There are no data under response to management for this species in the TBDC. The behaviour and breeding biology of the Yellow-spotted Bell Frog is presumed to be similar to other bell frog species (NSW NPWS 2001 in in TSSC 2018). If threats could be adequately controlled, it would be likely to be able to increase in population or occupy new habitat.
ii.	the species is reliant on abiotic habitats which cannot be restored or replaced (eg karst systems) on a biodiversity stewardship site; or	The species is not known to be reliant on abiotic habitats which cannot be restored or replaced.
iii.	life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (eg frogs severely impacted by chytrid fungus).	The Yellow-spotted Bell Frog is believed to have been severely impacted by chytrid fungus in TSSC 2018. The ability to control key threatening processes at a biodiversity stewardship site is currently negligible.

Table 7.9 SAII assessment of impact on Yellow-spotted Tree Frog

Factors contributing to the impact		Project impact on factors
a)	**Impact on the species' population presented by:**	
i.	an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population; and	The species is not known to occur on the subject land and no estimate can be made of the number of individuals present in the subpopulation.
ii.	an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population; or	There are no population estimates for this species, but the inability to locate the species over multiple decades suggests that the remaining population if still extant, is very small and likely contains fewer than 250 mature individuals. In 2004, the IUCN Red List of Threatened Species estimated that the population contains fewer than 50 mature individuals (Hero et al., 2004). The species is not known to occur on the subject land and no estimate can be made of the number of individuals present in any subpopulation that may be present. No habitats (PCTS associated with the species) would be directly impacted by the proposal. Mitigation measures would ensure that potential indirect impacts are avoided. The project is unlikely to impact any individuals of the species or its habitat.
iii.	if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal.	
b)	**Impact on geographic range presented by:**	
i.	the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW;	No habitats (PCTS associated with the species) would be directly impacted by the proposal. Mitigation measures would ensure that potential indirect impacts are avoided. The proposal is unlikely to have any impact on the species' geographic range.
ii.	area of occupancy;	No habitats (PCTS associated with the species) would be directly impacted by the proposal. Mitigation measures would ensure that potential indirect impacts are avoided. The proposal is unlikely to have any impact on the species' geographic range.
iii.	the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); or impact will affect some individuals and habitat; or impact will affect some habitat, but no individuals of the species will be directly impacted;	No habitats (PCTS associated with the species) would be directly impacted by the proposal. Mitigation measures would ensure that potential indirect impacts are avoided. The project is unlikely to impact any individuals of the species or its habitat.

Table 7.9 SAII assessment of impact on Yellow-spotted Tree Frog

Factors contributing to the impact		Project impact on factors
iv.	to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens, and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.	No habitats (PCTS associated with the species) would be directly impacted by the proposal. The project would not alter fire regimes within the species' potential habitat adjacent to the subject land. Potential increases in localised erosion and sedimentation during construction are unlikely to result in significant changes to the species' habitat. Downstream habitat is already significantly affected by erosion, sedimentation, grazing and weed invasion and the project is unlikely to significantly alter habitat suitability for the species in this area. The project would not involve the movement of animals that could prey on or complete with the Yellow-spotted Tree Frog, nor materials that would be likely to contain pathogens or parasites that could cause disease in the species. The project would not fragment habitat for the species or cause substantial edge effects. Mitigation measures would ensure that significant potential indirect impacts are avoided. The project is unlikely to cause changes in threats affecting any remaining subpopulations and habitat of the species.

7.5 Impacts not requiring offsets

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

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

Table 7.10 provides a summary of the vegetation zones that do not trigger the above thresholds.

Table 7.10 Summary of impacts not requiring offsets – native vegetation

Vegetation zone	PCT	Name	Area (ha)	Vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Credits required
1	1191 Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion	1191_Exotic _DNG	0.15	0	0	-0	0

Figure 7.2 demonstrates the areas not requiring offsetting in accordance with Section 9.3 of BAM (DPIE 2020), which include:

- areas within the subject land that do not contain native vegetation do not need to be assessed for Ecosystem Credits; and
- areas of land that do not contain native vegetation must still be assessed for threatened species habitat in accordance with Chapter 5, and prescribed biodiversity impacts in accordance with Chapter 6 (DPIE 2021b).

7.6 Impacts requiring offset

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

i Impacts on native vegetation

Impacts to native vegetation requiring offsets include:

- Direct impacts on 1.55 ha of PCT 1191 – Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion, corresponding to the Werriwa Tablelands Cool Temperate Grassy Woodland TEC (Figure 7.2).

A summary of the ecosystem credits required for all vegetation zones, including changes in vegetation integrity score, are provided in Table 7.11. A total of 31 ecosystem credits are required to offset the residual impacts of the project. A biodiversity credit report is provided in Appendix B.

KEY

- Development footprint (Subject land)
- Project study area
- Major road
- Minor road
- Vehicular track
- Cadastral boundary
- Impacts not requiring offset
- Impacts requiring offset and impacts on SAII entitites

Plant community type (PCT) mapping

1191 | Snow Gum- Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion

- Native planted
- Exotic planted
- Regrowth
- DNG

\\emmsvr1\emm3\2020\200931- Woodlawn Veolia\GIS\02_Maps_TechStudies\BDAR\Biodiversity_20211014_01\Biodiversity_20220729_06.aprx

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

0 250 500 m

GDA 1994 MGA Zone 55

N

Impacts on SAII entities, impacts requiring offsets and impacts not requiring offsets

Woodlawn Advanced Energy Recovery Centre
Biodiversity development assessment report
Figure 7.2

EMM
creating opportunities

Table 7.11 Summary of ecosystem credits required for all vegetation zones

Vegetation zone number	PCT	Vegetation zone name	Area (ha)	Vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Biodiversity risk weighting	Credits required
1	Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion	1191_Planted	0.09	57	0.0	-57	2.5	3
2	Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion	1191_Regrowth	1.34	31.6	0.0	-31.6	2.5	26
3	Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion	1191_Exotic_DNG	0.15	0	0.0	0	2.5	0
4	Snow Gum – Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion	1191_DNG	0.12	30.6	0.0	-30.6	2.5	2

ii Impacts on threatened species

The project does not require any species credits as no candidate (species credit) species would be impacted. Impacts on predicted (ecosystem credit) species would be offset by the retirement of ecosystem credits as described under Section 7.6i.

7.7 Biodiversity offset strategy

Offsets will be provided in accordance with the BOS. Veolia may explore options to create and retire biodiversity credits for the project through establishment and management of a biodiversity stewardship site. However, due to the relatively small biodiversity credit requirement and timeframe constraints of the project, the offset liability for the project may be primarily or entirely met through a combination of the following methods:

- purchase and retirement of available like-for-like biodiversity credits from the biodiversity offsets trading market; and
- payment to the biodiversity conservation fund.

The ecosystem credits to be retired, can be retired using like for like community credits that occur within any IBRA subregion that is within 100 kms of the outer edge of the subject land, or within the Monaro, Bungonia, Crookwell, Kybeyan-Gourock, Murrumbateman, Snowy Mountains, and South East Coastal Ranges IBRA subregions. The biodiversity credit report is included within Appendix B.

8 Assessment of other relevant biodiversity legislation

8.1 Environment Protection and Biodiversity Conservation Act 1999

This chapter provides an assessment of the project's impacts specific to species and communities listed under the EPBC Act. A likelihood of occurrence assessment for protected matters is presented in Section 8.1.1. It is concluded that the project is not expected to result in significant impacts on EPBC Act listed biodiversity. The project will not result in a significant impact to any Matters of National Environmental Significance and referral of the project to the DCCEEW is not required.

8.1.1 Likelihood of occurrence assessment

i Threatened ecological communities

Two EPBC Act listed TECs were predicted to occur within the subject land by the Protected Matters Search Tool (PMST) (DAWE 2021b and DCCEEW 2022):

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland; and
- Natural Temperate Grassland of the South Eastern Highlands.

Table 8.1 assesses the likelihood of the TECs occurring in the subject land. None of the PCTs recorded in the subject land are consistent with the TECs predicted to occur from the PMST, and these TECs are not considered further.

Table 8.1 Likelihood of occurrence for listed ecological communities

Ecological community	EPBC Act Status	Habitat requirements	Likelihood of occurrence
White Box Yellow Box Blakely's Red Gum Woodland and Derived Native Grasslands	CE	Characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of White Box, Yellow Box or Blakely's Red Gum trees. Tree-cover is generally discontinuous and consists of widely spaced trees of medium height in which the canopies are clearly separated.	**Not recorded** The analysis of vegetation in the subject land did not indicate the presence of this community (DAWE 2006)
Natural Temperate Grassland of the South Eastern Highlands	CE	Characterised by a dominance of native perennial tussock grasses, the tallest stratum of which is typically up to 1.0 m in height, when present. There is usually a second, lower stratum of shorter perennial and annual grasses and forbs growing between the taller tussocks. The major dominant or co-dominant grass species are Kangaroo grass, Snowgrass, River Tussock Grass, Kneed Speargrass (*Austrostipa bigeniculata*), Corkscrew Speargrass, Red grass, various Wallaby grass species (*Rytidosperma* spp.), Blown grass (*Lachnagrostis filiformis*) and Wild Sorghum (*Sorghum leiocladum*).	**Not recorded** The analysis of vegetation in the subject land did not indicate the presence of this community. (DAWE 2006) (DEE 2016). See Section 4.3.5.

ii Threatened species

The PMST predicted that 14 flora and 30 fauna species listed under the EPBC Act could occur within the subject land. The likelihood of occurrence for these species is assessed in Table 8.2.

Table 8.2 Likelihood of occurrence for threatened species

Scientific Name	Common Name	EPBC Status	Source	Likelihood of occurrence
Plants				
Amphibromus fluitans	River Swamp Wallaby-grass	V	PMST,	Low. Not recorded during targeted surveys and not associated with recorded PCTs on site. Not associated with the IBRA sub-region.
Caladenia tessellata	Thick Lip Spider Orchid	E	PMST, BAM-C	Low. Not recorded in the subject land during targeted surveys.
Calotis glandulosa	Mauve Burr-daisy	V	PMST, BAM-C	Low. Not recorded in the subject land during targeted surveys.
Commersonia prostrata	Dwarf Kerrawang	E	PMST, BAM-C	Low. Not recorded in the subject land during targeted surveys.
Diuris aequalis	Buttercup Doubletail	E	PMST, BAM-C	Low. Not recorded in the subject land during targeted surveys.
Dodonaea procumbens	Trailing Hop-bush	V	PMST, BAM-C	Low. Outside of known distribution and not recorded during targeted surveys.
Eucalyptus aggregata	Black Gum	V	PMST, BAM-C	Low. Not recorded in the subject land during targeted surveys.
Eucalyptus macarthurii	Paddy's River Box, Camden Woollybutt	E	BAM-C	Low. Not recorded in the subject land during targeted surveys.
Lepidium hyssopifolium	Basalt Peppercress	E	PMST	Low. Not recorded during targeted surveys and not associated with recorded PCTs on site.
Leucochrysum albicans ssp. tricolor	Hoary Sunray	E	PMST, BAM-C	Low. Not recorded in the subject land during targeted surveys.
Pelargonium sp. Striatellum (G.W.Carr 10345)	Omeo Storksbill	E	PMST	Low. Not recorded during targeted surveys and not associated with recorded PCTs on site.

Table 8.2 Likelihood of occurrence for threatened species

Scientific Name	Common Name	EPBC Status	Source	Likelihood of occurrence
Pomaderris cotoneaster	Cotoneaster Pomaderris	E	PMST	Low. Subject land does not contain any remnant forested areas.
Pomaderris delicata	Pomaderris	CE	PMST	Low. Subject land does not contain Eucalyptus sieberi dry open forest with dense she-oak understorey.
Pomaderris pallida	Pale Pomaderris	V	PMST	Low. Subject land does not contain shrub communities surrounded by *Eucalyptus mannifera/macrorhyncha* or Callitris woodland.
Prasophyllum petilum	Tarengo Leek Orchid	E	PMST, BAM-C	Low. Subject land does not contain associated species.
Rutidosis leptorrhynchoides	Button Wrinklewort	E	PMST, BAM-C	Low. Not recorded during targeted surveys.
Senecio macrocarpus	Large-fruit Fireweed	V	PMST	Low. Outside of known distribution.
Swainsona recta	Small Purple Pea	E	PMST, BAM-C	Low. Targeted surveys failed to detect the species.
Thesium australe	Austral Toadflax	V	PMST, BAM-C	Low. Targeted surveys failed to detect the species.
Insects				
Synemon plana	Golden Sun Moth	CE	PMST	Low. Outside of DPIE modelled geographic distribution and not associated with PCTs in subject land.
Birds				
Anthochaera phrygia	Regent Honeyeater	CE	PMST, BAM-C	Low. No preferred feed trees or Box-Ironbark communities present. Species assessed for impact significance under a precautionary approach as it is predicted to occur by the BAM-C.

Table 8.2 Likelihood of occurrence for threatened species

Scientific Name	Common Name	EPBC Status	Source	Likelihood of occurrence
Botaurus poiciloptilus	Australasian Bittern	E	PMST, BAM-C	Low. Marginal disturbed areas of wetland habitat present. Species assessed for impact significance under a precautionary approach as potential habitat is found adjacent to the site.
Calidris ferruginea	Curlew Sandpiper	CE	PMST	Low. Unlikely to occur as suitable foraging habitat (intertidal mudflats, swamps, lakes, lagoons) are absent.
Callocephalon fimbriatum	Gang-gang Cockatoo	E	PMST, BAM-C	Low. No breeding habitat as the subject land does not contain eucalypts with hollows greater than 9 cm diameter (refer to section 5.3.1). Species assessed for impact significance (foraging habitat only) under a precautionary approach as it is predicted to occur by the BAM-C.
Falco hypoleucos	Grey Falcon	V	PMST	Low. Not associated with PCTs in subject land. Not associated with the sub-region
Grantiella picta	Painted Honeyeater	V	PMST	Low. Not associated with PCTs in subject land. Not associated with the sub-region
Hirundapus caudacutus	White-throated Needletail	V	PMST, BAM-C	**Moderate**. Unlikely to frequently use habitats onsite as native vegetation is heavily fragmented.
Lathamus discolor	Swift Parrot	CE	PMST	Low. Not associated with PCTs in subject land. Species assessed for impact significance under a precautionary approach as it is predicted to occur by the BAM-C.
Limosa lapponica baueri	Nunivak Bar-tailed Godwit	V	PMST	Low. Not associated with PCTs in subject land.
Numenius madagascariensis	Eastern Curlew	CE	PMST	Low. Not associated with PCTs in subject land.
Polytelis swainsonii	Superb Parrot	V	PMST	Low. Not associated with PCTs in subject land.

Table 8.2 Likelihood of occurrence for threatened species

Scientific Name	Common Name	EPBC Status	Source	Likelihood of occurrence
Pycnoptilus floccosus	Pilotbird	V	PMST	Low. The habitat within the subject land is not suitable for this ground-dwelling bird, due to past disturbance (eg. lack of dense shrub and ground layer vegetation) and high fragmentation of the small remnant woodland in the subject land.
Rostratula australis	Australian Painted-Snipe	E	PMST	Low. Marginal disturbed areas of wetland habitat present adjacent to the site. Species assessed for impact significance under a precautionary approach as potential habitat is found adjacent to the site.
Frogs				
Litoria aurea	Green and Golden Bell Frog	V	PMST, BAM-C	**Moderate.** Marginal foraging habitat features occur in the subject land. Species assessed for impact significance under a precautionary approach as potential habitat is found adjacent to the site.
Litoria castanea	Yellow-spotted Tree Frog	E	PMST, BAM-C	**Moderate.** Marginal foraging habitat features occur in the subject land. Species assessed for impact significance under a precautionary approach as potential habitat is found adjacent to the site.
Mammals				
Chalinolobus dwyeri	Large-eared Pied Bat	V	PMST	Low. Unlikely to occur as the subject land not proximal to suitable roosting habitat (cliffs) and not recorded during ultrasonic bat call surveys.
Dasyurus maculatus maculatus	Spotted-tail Quoll (SE mainland population)	E	PMST, BAM-C	Low. No suitable forested habitat occurs in the subject land. Species assessed for impact significance under a precautionary approach as it is predicted to occur by the BAM-C.
Petaurus volans	Greater Glider	V	PMST	Low. Not associated with PCTs in subject land.
Phascolarctos cinereus	Koala (NSW, QLD and ACT)	E	PMST, BAM-C	Low. The species was not recorded within the subject land during targeted SAT surveys. Habitat in subject land is marginal. Species assessed for impact significance under a precautionary approach as it is predicted to occur by the BAM-C.

Table 8.2 Likelihood of occurrence for threatened species

Scientific Name	Common Name	EPBC Status	Source	Likelihood of occurrence
Potorous tridactylus tridactylus	Long-nosed Potoroo	V	PMST	Low. Not associated with PCTs in subject land.
Pteropus poliocephalus	Grey-headed Flying-fox	V	PMST	Low. Unlikely to occur as there are no roosting camps in or adjacent to the subject land. Not associated with PCTs in subject land.
Dasyurus maculatus	Spotted-tailed Quoll	E	BAM-C	Low. Unlikely to occur as the subject land is highly modified and degraded. Species assessed for impact significance under a precautionary approach as it is predicted to occur by the BAM-C.
Reptiles				
Aprasia parapulchella	Pink-tailed Worm Lizard	V	PMST	Low. Not associated with PCTs in subject land.
Delma impar	Striped Legless Lizard	V	PMST	Low. Not associated with PCTs in subject land.

iii Migratory species

Twenty species listed as migratory under the EPBC Act were predicted to occur in the subject land based on database searches undertaken. Table 8.3 provides an assessment of the likelihood of these species utilising habitat within the subject land.

Table 8.3 Likelihood of occurrence for migratory species[1]

Scientific name	EPBC Status[1]	Source	Potential presence in subject land
Bar-tailed Godwit (*Limosa lapponica*)	MiW	PMST	Low. Unlikely to occur as suitable foraging habitat (intertidal mudflats, swamps, lakes, lagoons) are absent.
Black-faced Monarch (*Monarcha melanopsis*)	MiT	PMST	Low. Unlikely to use subject land due to highly modified and fragmented structure of vegetation
Common Sandpiper (*Actitis hypoleucos*)	MiW	PMST	Low. Unlikely to occur as suitable foraging habitat (intertidal mudflats, swamps, lakes, lagoons) are absent.
Curlew Sandpiper (*Calidris ferruginea*)	MiW **CE**	PMST	Low. Unlikely to occur as suitable foraging habitat (intertidal mudflats, swamps, lakes, lagoons) are absent.
Double-banded Plover (*Charadrius bicinctus*)	MiW	PMST	Low Unlikely to use subject land due to highly modified and fragmented structure of vegetation. Prefers coastal wetlands.
Eastern Curlew (*Numenius madagascariensis*)	MiW **CE**	PMST	Low. Unlikely to occur as suitable foraging habitat (intertidal mudflats, swamps, lakes, lagoons) are absent.
Fork-tailed Swift (*Apus pacificus*)	MiMa	PMST	Low. Unlikely to use habitats onsite as the species is almost exclusively aerial.
Greenshank (*Tringa nebularia*)	MiW	PMST	Low. Unlikely to occur as suitable foraging habitat (intertidal mudflats, swamps, lakes, lagoons) are absent.
Latham's Snipe (*Gallinago hardwickii*)	MiW	PMST	**Moderate** Species prefers low open freshwater wetlands with low dense vegetation, which do not occur in the subject land.
Little Curlew (*Numenius minutus*)	MiW	PMST	Low. Unlikely to occur as suitable foraging habitat (intertidal mudflats, swamps, lakes, lagoons) are absent.
Little Greenshank (*Tringa stagnatilis*)	MiW	PMST	Low. Unlikely to occur as suitable foraging habitat (intertidal mudflats, swamps, lakes, lagoons) are absent.

Table 8.3 Likelihood of occurrence for migratory species[1]

Scientific name	EPBC Status[1]	Source	Potential presence in subject land
Osprey (*Pandion haliaetus*)	MiW	PMST	Low. Unlikely to occur as suitable foraging habitat (intertidal mudflats, swamps, lakes, lagoons) are absent.
Pacific Golden Plover (*Pluvialis fulva*)	MiW	PMST	Low. Unlikely to occur as suitable foraging habitat (intertidal mudflats, swamps, lakes, lagoons) are absent.
Pectoral Sandpiper (*Calidris melanotos*)	MiW	PMST	Low. Unlikely to occur as suitable foraging habitat (intertidal mudflats, swamps, lakes, lagoons) are absent.
Red-necked Stilt (*Calidris ruficollis*)	MiW	PMST	Low. Unlikely to occur as suitable foraging habitat (intertidal mudflats, swamps, lakes, lagoons) are absent.
Rufous Fantail (*Rhipidura rufifrons*)	MiT	PMST	Low. Unlikely to occur as moist, dense forests are absent from the subject land.
Ruddy Turnstone (*Arenaria interpres*)	MiW	PMST	Low. Unlikely to occur as it is a coastal species
Satin Flycatcher (*Myiagra cyanoleuca*)	MiT	PMST	Low. Unlikely to occur as tall wet sclerophyll forests and rainforests are absent from the subject land.
Sharp-tailed Sandpiper (*Calidris acuminata*)	MiW	PMST	Low. Unlikely to occur as suitable foraging habitat (intertidal mudflats, swamps, lakes, lagoons) are absent.
White-throated Needletail (*Hirundapus caudacutus*)	MiT **V**	PMST, BAM-C	Moderate. May occur overhead only. Unlikely to use habitats onsite as native vegetation is heavily fragmented
Yellow Wagtail (*Motacilla flava*)	MiT	PMST	Low. Unlikely to occur as suitable foraging habitat (intertidal mudflats, swamps, lakes, lagoons) are absent.

Notes: 1. *MiMa – Migratory Marine; MiT – Migratory Terrestrial; MiW – Migratory Wetland*

8.1.2 Impact significance assessments

a Koala (*Phascolarctos cinereus*) – Endangered

Table 8.4 provides an assessment of significance for the removal of 1.55 ha of the potential habitat for the Koala, in accordance with the relevant assessment criteria for endangered species.

Table 8.4 Assessment of significance for Koala (*Phascolarctos cinereus*)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of a population of a species?	The activity may disturb Koala potential foraging and roosting habitat by up to 1.55 ha. Targeted surveys did not indicate current usage of the project study area by Koalas and local records of the species are scarce. The highly modified habitat prevalent in the subject land is likely to be at best marginal as habitat. The subject land is not at or near the limit of the species' range. Therefore, the proposed activity is unlikely to affect a population of Koala.
Would the action reduce the area of occupancy of a population?	A population of the Koala is not known to occur in the subject land. The proposed activity is unlikely to affect a population of Koala. It is unlikely to reduce the area of occupancy of a population of the species.
Would the action fragment an existing population into two or more populations?	Owing to the mobility of the species, the quality of the habitat and the location of the subject land within the species distribution area, the proposed activity is unlikely to affect a population of Koala. It is unlikely to fragment an existing population into two or more populations.
Would the action adversely affect habitat critical to the survival of a species?	No critical habitat has been listed for this species under the EPBC Act. Habitat critical to the survival of this species may also include areas not listed on the Register of Critical Habitat if they are necessary for: • activities such as foraging, breeding, roosting, or dispersal; • the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators); • to maintain genetic diversity and long-term evolutionary development; or • the reintroduction of populations or recovery of the species or ecological community (DoE 2013). The relatively small area of potential habitat likely to be affected by the works (1.55 ha) represents a small component of locally occurring resources that would be accessible to this species. Therefore, the removal of up to 1.55 ha of habitat is not considered critical to the survival of the Koala.
Would the action disrupt the breeding cycle of a population?	The potential habitat present in the subject land is of marginal suitability for the species. The proposed activity is therefore unlikely to affect a population of Koala. The activity is not considered likely to disrupt the breeding cycle of a population of the species.
Would the action modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The works may reduce potential Koala habitat by up to 1.55 ha. The works are not likely to cause the species to decline, due to: • the condition of habitat present; • availability of higher quality habitat in the broader locality; • the ability of the species to forage in fragmented landscapes (including agricultural landscapes); • the mobility of the species; and • the small extent of potential habitat likely to be impacted (1.55 ha).

Table 8.4 Assessment of significance for Koala (*Phascolarctos cinereus*)

Criteria	Discussion
Would the action result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat?	The existing landscape contains many invasive species that are directly or indirectly harmful to the species, either through predation, competition, or alteration of habitat. Given the small area of the proposed impact, it is unlikely that any further species invasions will be facilitated by the proposed activity. Therefore, the proposed impacts are considered unlikely to facilitate the spread of invasive species or their adverse impacts to the survival of the threatened species (either directly or indirectly).
Would the action introduce disease that may cause the species to decline?	Koalas are susceptible to Chlamydia, a sexually transmitted disease. In general, disease outbreaks occur when animals are stressed. Due to the small area to be impacted, in an area already impacted by similar land uses, the project will not increase the potential for a disease outbreak related to stress, if Koala were to be present within the project study area.
Would the action interfere substantially with the recovery of the species?	Aside from clearing a small amount of marginal habitat, the activity will not interfere with any of the identified recovery actions or otherwise interfere with the recovery of the species. Trees will be retained where possible. The works will not interfere substantially with any of the identified recovery actions for the Koala.
Conclusion	Based on the above assessment, the activity is unlikely to cause a significant impact to the Koala.

b White-throated Needletail (*Hirundapus caudacutus*) – Vulnerable

Table 8.5 provides an assessment of significance for the removal of 1.55 ha of the potential habitat for the White-throated Needletail, in accordance with the relevant assessment criteria for vulnerable species.

Table 8.5 Assessment of significance for White-throated Needletail (*Hirundapus caudacutus*)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of an important population of a species?	The activity may disturb White-throated Needletail potential foraging and roosting habitat by up to 1.55 ha. An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • key source populations either for breeding or dispersal; • populations that are necessary for maintaining genetic diversity; and/or • populations that are near the limit of the species range. The White-throated Needletail is a migratory species that exists as a series of interconnected subpopulations with animals moving between widely dispersed summer foraging areas in the southern hemisphere and breeding sites in the northern hemisphere. The concept of an important population is not readily applicable to this species. For the purposes of this assessment important habitat has been used to assess whether or not an impact on an 'important population' is likely. Important habitat for the White-throated Needletail is likely to include productive landscapes with intact native vegetation and high-flying insect activity, typically large wetlands, open forests and woodlands. The highly modified habitat prevalent in the subject land are likely to be marginal as habitat. The subject land is not at or near the limit of the species' range. Therefore, the proposed activity is unlikely to affect an important population of White-throated Needletail.
Would the action reduce the area of occupancy of an important population?	The proposed activity is unlikely to affect an important population of White-throated Needletail. It is unlikely to reduce the area of occupancy of an important population of the species.

Table 8.5 Assessment of significance for White-throated Needletail (*Hirundapus caudacutus*)

Criteria	Discussion
Would the action fragment an existing important population into two or more populations?	Owing to the mobility of the species, the quality of the habitat and the location of the subject land within the species distribution area, the proposed activity is unlikely to affect an important population of White-throated Needletail. It is unlikely to fragment an existing important population into two or more populations.
Would the action adversely affect habitat critical to the survival of a species?	No critical habitat has been listed for this species under the EPBC Act. Habitat critical to the survival of this species may also include areas not listed on the Register of Critical Habitat if they are necessary for: • activities such as foraging, breeding, roosting, or dispersal; • the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators); • to maintain genetic diversity and long-term evolutionary development; or • the reintroduction of populations or recovery of the species or ecological community (DoE 2013). The relatively small area of potential habitat likely to be affected by the works (1.55 ha) represents a small component of locally occurring resources that would be accessible to this species. Therefore, the removal of up to 1.55 ha of habitat is not considered critical to the survival of the White-throated Needletail.
Would the action disrupt the breeding cycle of an important population?	The species does not breed in Australia. The potential habitat in the subject land is of marginal suitability for the species. The proposed activity is therefore unlikely to affect an important population of White-throated Needletail. The activity is not considered likely to disrupt the breeding cycle of an important population of the species.
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The works may reduce potential White-throated Needletail habitat by up to 1.55 ha. The works are not likely to cause the species to decline, due to: • the condition of habitat present; • availability of higher quality habitat in the broader locality; • the ability of the species to forage in fragmented landscapes (including agricultural landscapes); • the mobility of the species; and • the small extent of potential habitat likely to be impacted (1.55 ha).
Would the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	The existing landscape contains many invasive species that are directly or indirectly harmful to the species, either through predation, competition, or alteration of habitat. Given the small area of the proposed impact, it is unlikely that any further species invasions will be facilitated by the proposed activity. Therefore, the proposed impacts are considered unlikely to facilitate the spread of invasive species or their adverse impacts to the survival of the threatened species (either directly or indirectly).
Would the action introduce disease that may cause the species to decline?	There are no diseases implicated in the decline of the species. The project is unlikely to result in the introduction of any pathogens to local animal populations.
Would the action interfere substantially with the recovery of the species?	No Recovery Plan or Listing Advice has been created for the White-throated Needletail. The following is a subset of the actions specified in the Conservation Advice, targeting actions relevant to the works which have not been specifically addressed above: • Support initiatives to improve habitat management at key sites in Australia. Aside from clearing a small amount of marginal habitat, the activity will not interfere with any of the identified recovery actions or otherwise interfere with the recovery of the species. Trees will be retained where possible. The works will not interfere substantially with any of the identified recovery actions for the White-throated Needletail.

Table 8.5 Assessment of significance for White-throated Needletail (*Hirundapus caudacutus*)

Criteria	Discussion
Conclusion	Based on the above assessment, the activity is unlikely to cause a significant impact to White-throated Needletail potential habitat.

c Spotted-tail Quoll (south-eastern mainland population) (*Dasyurus maculatus*) – Endangered

Table 8.6 provides an assessment of significance for the removal of 1.55 ha of the potential habitat for the *maculatus*), in accordance with the relevant assessment criteria for endangered species.

Table 8.6 Assessment of significance for Spotted-tail Quoll (*Dasyurus maculatus*)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of a population?	The activity may disturb Spotted-tail Quoll potential foraging habitat by up to 1.55 ha. The habitat affected is highly modified, consisting of planted eucalypts, wattle regrowth and derived native grassland. It is unlikely to provide any suitable den sites for the species. The Spotted-tail Quoll is a wide-ranging species with individuals occupying large home ranges and juveniles dispersing widely in search of new territories. Important habitat for the Spotted-tail Quoll is likely to include landscapes with intact native vegetation typically forested wetlands, open forests, and woodlands. The highly modified habitat prevalent in the subject land is likely to be at best marginal as habitat as it contains very few mature trees likely to support prey species and no likely dens sites such as large tree hollows and rock outcrops. Therefore, the proposed activity is unlikely to lead to a long-term decrease in the size of a population of Spotted-tail Quoll.
Would the action reduce the area of occupancy of the species?	The activity may disturb Spotted-tail Quoll potential marginal foraging habitat by up to 1.55 ha. This small loss of marginal habitat is unlikely to reduce the area of occupancy of the species.
Would the action fragment an existing population into two or more populations?	Owing to the mobility of the species, the quality of the habitat and the location of the site within the species distribution area, the proposed activity is unlikely to fragment an existing Spotted-tail Quoll population into two or more populations.
Would the action adversely affect habitat critical to the survival of a species?	No critical habitat has been listed for this species under the EPBC Act. Habitat critical to the survival of this species may also include areas not listed on the Register of Critical Habitat if they are necessary for: • activities such as foraging, breeding, roosting, or dispersal; • the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators); • to maintain genetic diversity and long-term evolutionary development; or • the reintroduction of populations or recovery of the species or ecological community (DoE 2013). The relatively small area of potential marginal habitat likely to be affected by the works (1.55 ha) represents a small component of locally occurring resources that would be accessible to this species. Therefore, the removal of up to 1.55 ha of habitat is not considered critical to the survival of the Spotted-tail Quoll.
Would the action disrupt the breeding cycle of a population?	The species is unlikely to breed in the disturbed and fragmented habitat in the subject land. The potential habitat present in the impact area is of marginal suitability for the species. The proposed activity is therefore unlikely to disrupt the breeding cycle of a population of Spotted-tail Quoll.

Table 8.6 Assessment of significance for Spotted-tail Quoll (*Dasyurus maculatus*)

Criteria	Discussion
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The works may reduce potential Spotted-tail Quoll habitat by up to 1.55 ha. The works are not likely to cause the species to decline, due to: • the condition of habitat present; • availability of higher quality habitat in the broader locality; • the ability of the species to forage in fragmented landscapes (including agricultural landscapes); • the mobility of the species; and • the small extent of potential habitat likely to be impacted (1.55 ha).
Would the action result in invasive species that are harmful an endangered species becoming established in the endangered species' habitat?	The existing landscape contains many invasive species that are directly or indirectly harmful to the species, either through predation, competition, or alteration of habitat. Given the small area of the proposed impact, it is unlikely that any further species invasions will be facilitated by the proposed activity. Therefore, the proposed impacts are considered unlikely to facilitate the spread of invasive species or their adverse impacts to the survival of the threatened species (either directly or indirectly).
Would the action introduce disease that may cause the species to decline?	There are no diseases implicated in the decline of the species. The project is unlikely to result in the introduction of any pathogens to local animal populations.
Would the action interfere substantially with the recovery of the species?	The overall objective of the National Recovery Plan for the Spotted-tail Quoll (DELWP 2016) is to reduce the rate of decline of the Spotted-tailed Quoll. The specific objectives of the plan, as related to project impacts, include: • 3. Reduce the rate of habitat loss and fragmentation on private land; and • 8. Reduce the frequency of Spotted-tailed Quoll road mortality. Given that only a very small area of marginal habitat would be impacted and with the implementation of mitigation measure to impose speed limits on access roads and limit night works on access road (refer to Table 7.5) the activity will not interfere with any of the identified recovery actions or otherwise interfere with the recovery of the species. The project has been designed to avoid native vegetation, with trees being retained where possible.
Conclusion	Based on the above assessment, the activity is unlikely to cause a significant impact to Spotted-tail Quoll.

d Regent Honeyeater (*Anthochaera phrygia*) – Critically Endangered

Table 8.7 provides an assessment of significance for the removal of 1.55 ha of the potential habitat for the Regent Honeyeater, in accordance with the relevant assessment criteria for critically endangered species.

Table 8.7 Assessment of significance for Regent Honeyeater (*Anthochaera phrygia*)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of a population?	The activity may disturb Regent Honeyeater potential foraging and roosting habitat by up to 1.55 ha. The habitat affected is highly modified, consisting of planted eucalypts, wattle regrowth and derived native grassland. The Regent Honeyeater is a nomadic species that exists as a series of interconnected subpopulations with animals moving between widely dispersed seasonal foraging areas. Important habitat for the Regent Honeyeater is likely to include productive landscapes with intact native vegetation typically forested wetlands, open forests, and woodlands. The highly modified habitat prevalent in the subject land is likely to be at best marginal as habitat. Therefore, the proposed activity is unlikely to lead to a long-term decrease in the size of a population of Regent Honeyeater.
Would the action reduce the area of occupancy of the species?	The activity may disturb Regent Honeyeater potential marginal foraging and roosting habitat by up to 1.55 ha. This small loss of marginal habitat is unlikely to reduce the area of occupancy of the species.
Would the action fragment an existing population into two or more populations?	Owing to the mobility of the species, the quality of the habitat and the location of the site within the species distribution area, the proposed activity is unlikely to fragment an existing Regent Honeyeater population into two or more populations.
Would the action adversely affect habitat critical to the survival of a species?	Habitat critical to the survival of the Regent Honeyeater includes (DoE 2016): • any breeding or foraging areas where the species is likely to occur, and • any newly discovered breeding or foraging locations. Habitat critical to the survival of this species may also include areas not listed on the Register of Critical Habitat if they are necessary for: • activities such as foraging, breeding, roosting, or dispersal; • the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators); • to maintain genetic diversity and long-term evolutionary development; or • the reintroduction of populations or recovery of the species or ecological community (DoE 2013). The relatively small area of potential marginal habitat likely to be affected by the works (1.55 ha) represents a small component of locally occurring resources that would be accessible to this species. Therefore, the removal of up to 1.55 ha of habitat is not considered critical to the survival of the Regent Honeyeater.
Would the action disrupt the breeding cycle of a population?	The species is unlikely to breed in the disturbed and fragmented habitat in the subject land. The potential habitat present in the impact area is of marginal suitability for the species. The proposed activity is therefore unlikely to disrupt the breeding cycle of a population of Regent Honeyeater.
Would the action modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The works may reduce potential Regent Honeyeater habitat by up to 1.55 ha. The works are not likely to cause the species to decline, due to: • the condition of habitat present; • availability of higher quality habitat in the broader locality; • the ability of the species to forage in fragmented landscapes (including agricultural landscapes); • the mobility of the species; and • the small extent of potential habitat likely to be impacted (1.55 ha).

Table 8.7 Assessment of significance for Regent Honeyeater (*Anthochaera phrygia*)

Criteria	Discussion
Would the action result in invasive species that are harmful an endangered species becoming established in the endangered species' habitat?	The existing landscape contains many invasive species that are directly or indirectly harmful to the species, either through predation, competition, or alteration of habitat. Given the small area of the proposed impact, it is unlikely that any further species invasions will be facilitated by the proposed activity. Therefore, the proposed impacts are considered unlikely to facilitate the spread of invasive species or their adverse impacts to the survival of the threatened species (either directly or indirectly).
Would the action introduce disease that may cause the species to decline?	There are no diseases implicated in the decline of the species. The project is unlikely to result in the introduction of any pathogens to local bird populations.
Would the action interfere substantially with the recovery of the species?	The overall objective of the National Recovery Plan for the Regent Honeyeater (DoE 2016) is to reverse the long-term population trend of decline and increase numbers to a level where there is a viable, wild breeding population, and to enhance the condition of habitat across its range to maximise survival and reproductive success. The specific objectives of the plan, as related to project impacts, include: • 1. Improve the extent and quality of Regent Honeyeater habitat Given that only a very small area of marginal habitat would be impacted, the activity will not interfere with the identified recovery action, which focusses on protecting intact (high quality) areas of Regent Honey eater breeding and foraging habitat (DoE 2016). The project has been designed to avoid native vegetation, with trees being retained where possible, within only marginal habitat being impacted.
Conclusion	Based on the above assessment, the activity is unlikely to cause a significant impact to Regent Honeyeater.

e Gang-gang Cockatoo (*Callocephalon fimbriatum*) (Endangered) and Swift Parrot (*Lathamus discolor)* (Critically Endangered)

Table 8.7 provides an assessment of significance for the removal of 1.55 ha of the potential foraging habitat for the Gang-gang Cockatoo and Swift Parrot, in accordance with the relevant assessment criteria for endangered and critically endangered species.

Table 8.8 Assessment of significance for Gang-gang Cockatoo and Swift Parrot

Criteria	Discussion
Would the action lead to a long-term decrease in the size of a population?	The activity may disturb Gang-gang Cockatoo and Swift Parrot potential foraging habitat by up to 1.55 ha. The habitat affected is highly modified, consisting of planted eucalypts, wattle regrowth and derived native grassland. There is no breeding habitat for the Gang-gang Cockatoo within the subject land, due to the absence of hollows. The Swift Parrot breeds in Tasmania. Important foraging habitat for both birds is likely to include productive landscapes with intact native vegetation typically forested wetlands, open forests, and woodlands. The highly modified habitat prevalent in the subject land is likely to be at best marginal as foraging habitat. Therefore, the proposed activity is unlikely to lead to a long-term decrease in the size of a population of Gang-gang Cockatoo or Swift Parrot.
Would the action reduce the area of occupancy of the species?	The activity may disturb Gang-gang Cockatoo and Swift Parrot potential marginal foraging habitat by up to 1.55 ha. This small loss of marginal foraging habitat is unlikely to reduce the area of occupancy of the species.

Table 8.8 Assessment of significance for Gang-gang Cockatoo and Swift Parrot

Criteria	Discussion
Would the action fragment an existing population into two or more populations?	Owing to the mobility of the species, the quality of the habitat and the location of the site within the species distribution area, the proposed activity is unlikely to fragment an existing population into two or more populations.
Would the action adversely affect habitat critical to the survival of a species?	Habitat critical to the survival of the Swift Parrot has been defined by the National Recovery Plan for the Swift Parrot *Lathamus discolor* (Birds Australia 2011) as: • those areas of priority habitat for which the Swift Parrot has a level of site fidelity or possess phenological characteristics likely to be of importance to the Swift Parrot, or are otherwise identified by the recovery team Habitat critical to the survival of the Gang-gang Cockatoo has been defined as (DAWE 2022): • 'all foraging habitat during both the breeding and non-breeding season'. As such, habitat within the subject land contains critical habitat for both species. The relatively small area of potential marginal foraging habitat likely to be affected by the works (1.55 ha) represents a small component of locally occurring resources that would be accessible to this species.
Would the action disrupt the breeding cycle of a population?	There is no breeding habitat for either species within the subject land. Therefore, the proposed activity will not disrupt the breeding cycle of a population of the Gang-gang Cockatoo or the Swift Parrot.
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The works may reduce potential foraging habitat by up to 1.55 ha. The works are not likely to cause the species to decline, due to: • the condition of habitat present; • availability of higher quality habitat in the broader locality; • the ability of the species to forage in fragmented landscapes (including agricultural landscapes); • the mobility of the species; and • the small extent of potential foraging habitat likely to be impacted (1.55 ha).
Would the action result in invasive species that are harmful an endangered species becoming established in the endangered species' habitat?	The existing landscape contains many invasive species that are directly or indirectly harmful to the species, either through predation, competition, or alteration of habitat. Given the small area of the proposed impact, it is unlikely that any further species invasions will be facilitated by the proposed activity. Therefore, the proposed impacts are considered unlikely to facilitate the spread of invasive species or their adverse impacts to the survival of the threatened species (either directly or indirectly).
Would the action introduce disease that may cause the species to decline?	Psittacine beak and feather disease (PBFD) is a common and potentially deadly disease that is widespread in wild populations of many Australian parrots and cockatoos, including the Gang-gang Cockatoo (DAWE 2022) and Swift Parrot (Birds Australia 2011). The potential impacts of the disease depend on environmental conditions and the general health of populations. The disease has the potential to impact Gang-gang Cockatoo and Swift Parrot populations if their health declines due to competition for food resources. It is not predicted that the proposed works would impact on the levels of PBFD directly as it already exists in wild populations, or indirectly, as the relatively small area of foraging habitat to be cleared will not cause significant stress to Gang-gang Cockatoo or Swift Parrot populations.

Table 8.8 Assessment of significance for Gang-gang Cockatoo and Swift Parrot

Criteria	Discussion
Would the action interfere substantially with the recovery of the species?	The objectives of the National Recovery Plan for the Swift Parrot (Birds Australia 2011), as related to project impacts, include: • 2. implement management strategies to protect and improve habitats and sites on all land tenures Given that only a very small area of marginal foraging habitat would be impacted, the activity will not interfere with the identified recovery action. The project has been designed to avoid native vegetation, with trees being retained where possible, with only marginal habitat being impacted. Whilst there is no recovery plan for the Gang-gang Cockatoo, the approved conservation advice outlines a number of recovery actions relevant to the proposed works including (DAWE 2022): • cease all land clearing of habitat critical to the survival of Gang-gang Cockatoo. The proposed activity will interfere with the recovery action listed above, due to the removal of up to 1.55 ha of foraging habitat. The extent of clearance is minimal, where no fragmentation of highly connected habitat will occur. The interference with this recovery action is unlikely to be significant.
Conclusion	Based on the above assessment, the activity is unlikely to cause a significant impact to Gang-gang Cockatoo and Swift Parrot.

f Green and Golden Bell Frog (*Litoria aurea*) – Vulnerable

Table 8.9 provides an assessment of significance for the impacts on the Green and Golden Bell Frog (*Litoria aurea*), in accordance with the relevant assessment criteria for Vulnerable species.

Table 8.9 Assessment of significance for Green and Golden Bell Frog (*Litoria aurea*)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of an important population of a species?	The Green and Golden Bell Frog has not been recorded within the subject land. Potential habitat comprising PCT1256 is located adjacent to the subject land but would not be directly impacted. However, if this species is present, given its inland location any population present may be considered an important population. The project would disturb an area of potential marginal habitat (in PCT1191 which is not associated with the species) of approximately 1.55 ha. Green and Golden Bell Frog potential habitat to be impacted includes grassland, regenerating woodland and a patch of planted trees adjacent to a highly modified waterway containing a wetland area with vegetation dominated by tall native grasses and sedges. Impacts to higher quality potential Green and Golden Bell Frog habitat (eg areas with standing water comprising potential breeding habitat) has been avoided through the design process. Only potential foraging and shelter habitat would be impacted. Waterbodies in the subject land will be protected from indirect impacts such as sedimentation and runoff during the construction and operation of the project. Only a small proportion of potential habitat would be disturbed. Restoration activities post-construction – such as recontouring to the site's previous micro landform and allowing vegetation to regrow over much of the impact area – means that there is unlikely to be a substantial permanent impact on the species' potential habitat in or adjacent to the subject land. Additionally, with the implementation of pre-clearance surveys, and clearing supervision, the risk of direct mortality to a significant number of individuals of the species is low. Therefore, the activity is considered unlikely to lead to a long-term decrease in the size of an important population of the species.
Would the action reduce the area of occupancy of an important population?	The small scale of disturbance of marginal habitat for the species that would occur is unlikely to reduce the area of occupancy of an important population of the species.

Table 8.9 Assessment of significance for Green and Golden Bell Frog (*Litoria aurea*)

Criteria	Discussion
Would the action fragment an existing important population into two or more populations?	Connectivity to frog populations means availability of largely vegetated, preferably permanently moist, waterways. The disturbance to habitat would only occur over a narrow (~30 m wide) area in marginal habitat for the species and is unlikely to significantly impact on the potential movement of the species. It is therefore unlikely to fragment any potential existing important population into multiple populations.
Would the action adversely affect habitat critical to the survival of a species?	No critical habitat has been listed for the Green and Golden Bell Frog under the EPBC Act. Habitat critical to the survival of this species may also include areas not listed on the Register of Critical Habitat if they are necessary for: • activities such as foraging, breeding, roosting, or dispersal; • the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators); • to maintain genetic diversity and long-term evolutionary development; or • the reintroduction of populations or recovery of the species or ecological community. Through the avoidance of potential breeding habitat and due to the small area of marginal habitat impacted, the project is unlikely to significantly impact foraging, breeding sheltering or dispersal habitat for the species. The relatively small area of marginal habitat likely to be affected by the project (1.55 ha) represents a small component of locally occurring resources that would be accessible to this species. The activity is therefore unlikely to have a significant adverse impact on critical habitat for the Green and Golden Bell Frog.
Would the action disrupt the breeding cycle of an important population?	Green and Golden Bell Frog breeding habitat comprises permanent, and ephemeral slow flowing streams and wetlands fringed by vegetation. The potential Green and Golden Bell Frog habitat impacted by the project is a highly modified wetland drainage line but may be utilised for breeding. Similar, more extensive, areas of habitat appear to exist downstream outside of the subject land. The disturbance of up to 1.55 ha of potential Green and Golden Bell Frog habitat is unlikely to substantially disrupt the breeding cycle of any populations of the species.
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The project would disturb an area of potential habitat by up to 1.55 ha. Given the marginal suitability of habitat to be directly impacted, availability of higher quality habitat in the broader locality, and the small extent likely to be impacted, the project is not considered likely to cause the Green and Golden Bell Frog to decline.
Would the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	The existing landscape contains many invasive species that are directly or indirectly harmful to the species, either through predation, competition, or alteration of habitat. Chytridiomycosis caused by Amphibian Chytrid Fungus has been implicated in severe population declines and species extinctions of frogs in the past 20 years (DEH 2006). Given the site hygiene measures that would be implemented, it is unlikely that any further species invasions will be facilitated by the project.
Would the action introduce disease that may cause the species to decline? Would the action interfere substantially with the recovery of the species?	The key impediments to the recovery of the Green and Golden Bell Frog are the ongoing impacts of Amphibian Chytrid Fungus *Batrachochytrium dendrobatidis* and habitat loss. Given that only a very small are of habitat would be impacted and with the implementation of biosecurity and site hygiene measures, the risk of spreading Amphibian Chytrid Fungus to uninfected water bodies or frog populations is considered to be low. The project is therefore unlikely to introduce disease or interfere substantially with the recovery of the species.
Conclusion	Based on the above assessment, the disturbance of 1.55 ha of potential marginal Green and Golden Bell Frog habitat is unlikely to significantly impact upon the species.

g Yellow-spotted Tree Frog (*Litoria castanea*) – Critically Endangered

Table 8.10 provides an assessment of significance for the impacts on the Yellow-spotted Tree Frog (*Litoria castanea*), in accordance with the relevant assessment criteria for Critically Endangered species.

Table 8.10 Assessment of significance for Yellow-spotted Tree Frog (*Litoria castanea*)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of a population?	The Yellow-spotted Tree Frog has not been recorded within the subject land. Potential habitat comprising PCT1256 is located adjacent to the subject land but would not be directly impacted. The project would disturb an area of potential marginal habitat (in PCT1191 which is not associated with the species) of approximately 1.55 ha. Yellow-spotted Tree Frog potential habitat to be impacted includes grassland, regenerating woodland and a patch of planted trees adjacent to a highly modified waterway containing a wetland area with vegetation dominated by tall native grasses and sedges. Impacts to higher quality potential Yellow-spotted Tree Frog habitat (eg areas with standing water comprising potential breeding habitat) has been avoided through the design process. Only potential foraging and shelter habitat would be impacted. Waterbodies adjacent to the subject land will be protected from indirect impacts such as sedimentation and runoff during the construction and operation of the project. Only a small proportion of potential habitat would be disturbed. Restoration activities post-construction – such as recontouring to the site's previous micro landform and allowing vegetation to regrow over much of the impact area – means that there is unlikely to be a substantial permanent impact on the species' potential habitat in or adjacent to the subject land. Additionally, with the implementation of pre-clearance surveys, and clearing supervision, the risk of direct mortality to a significant number of individuals of the species is low. Therefore, the activity is considered unlikely to lead to a long-term decrease in the size of a population of the species.
Would the action reduce the area of occupancy of the species?	The small scale of disturbance of marginal habitat for the species that would occur is unlikely to reduce the area of occupancy of a population of the species.
Would the action fragment an existing population into two or more populations?	Connectivity to frog populations means availability of largely vegetated, preferably permanently moist, waterways. The disturbance to habitat would only occur over a narrow (~30 metres wide) area in marginal habitat for the species and is unlikely to significantly impact on the potential movement of the species. It is therefore unlikely to fragment any potential existing population into multiple populations.
Would the action adversely affect habitat critical to the survival of a species?	No critical habitat has been listed for the Yellow-spotted Tree Frog under the EPBC Act. Habitat critical to the survival of this species may also include areas not listed on the Register of Critical Habitat if they are necessary for: • activities such as foraging, breeding, roosting, or dispersal; • the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators); • to maintain genetic diversity and long-term evolutionary development; or • the reintroduction of populations or recovery of the species or ecological community. Through the avoidance of potential breeding habitat and due to the small area of marginal habitat impacted, the project is unlikely to significantly impact foraging, breeding sheltering or dispersal habitat for the species. The relatively small area of marginal habitat likely to be affected by the project (1.55 ha of vegetation that is not of a type associated with the species) represents a small component of locally occurring resources that would be accessible to this species. The activity is therefore unlikely to have a significant adverse impact on critical habitat for the Yellow-spotted Tree Frog.

Table 8.10 Assessment of significance for Yellow-spotted Tree Frog (*Litoria castanea*)

Criteria	Discussion
Would the action disrupt the breeding cycle of a population?	Yellow-spotted Tree Frog breeding habitat comprises permanent and ephemeral slow flowing streams and wetlands fringed by vegetation. Due to the minimisation of impacts these species will have no water body habitat impacted. The potential Yellow-spotted Tree Frog habitat impacted by the project is a highly modified wetland drainage line but may be utilised for breeding. Similar, more extensive, areas of habitat appear to exist downstream outside of the subject land. The nil disturbance of potential Yellow-spotted Tree Frog habitat is unlikely to substantially disrupt the breeding cycle of any populations of the species.
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The project would disturb an area of potential habitat by up to 1.55 ha. Given the marginal suitability of habitat to be directly impacted, availability of higher quality habitat in the broader locality, and the small extent likely to be impacted, the project is not considered likely to cause the Yellow-spotted Tree Frog to decline.
Would the action result in invasive species that are harmful an endangered species becoming established in the endangered species' habitat?	The existing landscape contains many invasive species that are directly or indirectly harmful to the species, either through predation, competition, or alteration of habitat. Chytridiomycosis caused by Amphibian Chytrid Fungus has been implicated in severe population declines and species extinctions of frogs in the past 20 years (DEH 2006). Given the site hygiene measures that would be implemented, it is unlikely that any further species invasions will be facilitated by the project.
Would the action interfere with the recovery of the species?	Currently, there is no National Recovery plan for the Yellow-spotted Tree Frog. The key impediments to the recovery of the Yellow-spotted Tree Frog are the ongoing impacts of Amphibian Chytrid Fungus *Batrachochytrium dendrobatidis* and habitat loss. Given that only a very small are of habitat would be impacted and with the implementation of biosecurity and site hygiene measures, the risk of spreading Amphibian Chytrid Fungus to uninfected water bodies or frog populations is considered to be low. The project is therefore unlikely to interfere substantially with the recovery of the species.
Would the action introduce disease that may cause the species to decline?	
Conclusion	Based on the above assessment, the disturbance of 1.55 ha of potential marginal Yellow-spotted Tree Frog habitat is unlikely to significantly impact upon the species.

h Australian Painted Snipe (*Rostratula australis*) and Australasian Bittern (*Botaurus poiciloptilus*) - Endangered

Table 8.11 provides an assessment of significance for the removal of 1.55 ha of potential habitat for Australian Painted Snipe, in accordance with the relevant assessment criteria for Endangered species.

Table 8.11 Assessment of significance for Australian Painted Snipe and Australasian Bittern

Criteria	Discussion
Would the action lead to a long-term decrease in the size of a population?	Migration patterns of the Australian Painted Snipe are poorly known but it is likely to be possibly dispersive or migratory, particularly in the southern part of its range. The Australasian Bittern was previously thought to be largely sedentary but recent studies have shown extensive movements. Over hundreds of kilometres, in between wetlands in southeast Australia (DAWE 2021c). As the area of habitat on the subject land is disturbed and part of a relatively small narrow area of wetland distant from any known breeding areas, it is only likely to be used infrequently and sporadically. The removal of 1.55 ha of potential foraging habitat is considered unlikely to lead to a long-term decrease in the population of the species.
Would the action reduce the area of occupancy of the species?	As the species are only likely to utilise the habitat of the subject land infrequently and sporadically, and the area to be removed is small, the activity is unlikely to reduce area of occupancy of the species.
Would the action fragment an existing population into two or more populations?	Owing to the mobility of the Australian Painted Snipe and Australasian Bittern, the project is unlikely to fragment any populations potentially present.
Would the action adversely affect habitat critical to the survival of a species?	No critical habitat has been listed for either species under the EPBC Act. Habitat critical to the survival of the species may also include areas not listed on the Register of Critical Habitat if they are necessary for: • activities such as foraging, breeding, roosting, or dispersal; • the long-term maintenance of the species (including the maintenance of species essential to the survival of the species); • to maintain genetic diversity and long-term evolutionary development; or • the reintroduction of populations or recovery of the species or ecological community (DEWHA 2013a) Australian Painted Snipe breeding habitat requirements appear to be quite specific, comprising shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby. Nest records are all, or nearly all, from or near small islands in freshwater wetlands provided that these islands are a combination of very shallow water, exposed mud, dense low cover and sometimes some tall dense cover (DAWE 2021c). The habitat of the subject land consists of grassland and brushland of varying density but lacks islands or substantial mudflats. It does not contain the combination of features associated with the species' breeding habitat. The Australasian Bittern nests adjacent to relatively deep, densely vegetated freshwater swamps and pools, building its nests under dense cover over shallow water, typically in vegetation that is up to 2.5 m tall. The species are unlikely to breed in the disturbed habitat of the subject land that does not contain the combination of features associated with the species' breeding habitats. As this habitat affected is highly modified and structurally simple, it is considered to be marginal, and the activity is unlikely to adversely affect habitat critical to the survival of the Australian Painted Snipe or Australasian Bittern.
Would the action disrupt the breeding cycle of a population?	As described above, the species are unlikely to breed in the disturbed habitat of the subject land and are only likely to occur there infrequently and sporadically. Due to changes in project design no potential habitat will be impacted, hence it is unlikely to be important habitat for the species and is unlikely to disrupt the breeding cycle of any population of the species.
Would the action modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	The project would reduce available marginal foraging habitat, likely to be used only on an infrequent and sporadic basis, habitat by up to 1.55 ha. Given the condition of habitat present, availability of higher quality habitat in the broader locality, and the extent likely to be impacted, the project is not considered likely to cause the species to decline.

Table 8.11 Assessment of significance for Australian Painted Snipe and Australasian Bittern

Criteria	Discussion
Would the action result in invasive species that are harmful an endangered species becoming established in the endangered species' habitat?	The existing landscape contains many invasive species that are directly or indirectly harmful to the species, either through predation, competition, or alteration of habitat. Given the small size and nature of the proposed impact, and proposed site hygiene measures during construction, it is unlikely that any further species invasions will be facilitated by the proposed activity. Therefore, the impacts of the activity are considered unlikely to facilitate the spread of invasive species or their adverse impacts to the survival of the threatened species (either directly or indirectly).
Would the action introduce disease that may cause the species to decline?	There are no diseases that are known to be a threat to the species. As the project does not include the movement of animals or materials likely to be infected with bird pathogens, it is unlikely to introduce disease that may cause the species to decline.
Would the action interfere with the recovery of the species?	Existing plans that are relevant to the recovery of the species include: • Draft National Recovery Plan for the Australian Painted Snipe *Rostratula australis* (DAWE 2019); • Threat abatement plan for predation by the European red fox (DAWE 2008); and • Threat abatement plan for predation by feral cats (DAWE 2015a). Aside from clearing and disturbance to a small amount of potential foraging habitat, the activity will not interfere with any of the identified recovery and threat abatement actions or otherwise interfere with the recovery of the species.
Conclusion	Based on the above assessment, the impact on potential Australian Painted Snipe and Australasian Bittern habitat by 1.55 ha is unlikely to significantly impact upon the species.

i Latham's Snipe (*Gallinago hardwickii*) - Migratory

Latham's Snipe has been historically recorded approximately 20 kms south-east of the subject land in 2017 (DPIE 2021c).

Latham's Snipe breeds in Japan and in far eastern Russia during the northern summer and then migrates to Australia, where it remains for the duration of the northern winter. Latham's Snipe is a non-breeding visitor to south-eastern Australia, migrates through northern Australia to reach non-breeding areas located further south. The species has been recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia. The range extends inland over the eastern tablelands in south-eastern Queensland to west of the Great Dividing Range in NSW. The species is widespread in Tasmania and is found in all regions of Victoria except for the north-west. Most birds spend the non-breeding period at sites located south of the Richmond River in NSW.

The size of the Latham's Snipe population that visits Australia is estimated at 25,000 to 100,000 birds. Previous population estimates have ranged from 15,000 breeding birds to 37,000 breeding birds. The actual population size is difficult to estimate and is poorly known. In Australia, Latham's Snipe occurs in a single, dispersed non-breeding population.

Latham's Snipe occurs in permanent and ephemeral wetlands up to 2,000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (eg swamps, flooded grasslands, or heathlands, around bogs and other water bodies). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity.

The *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (DoE 2013) defines important habitat for migratory species as areas periodically occupied by an ecologically significant proportion of the population, habitat critical to the species life cycle, habitat at the edge of their range or within an area where they are declining. The Industry Guidelines for avoiding, assessing, and mitigating impacts on EPBC Act listed migratory shorebird species (DoE 2015) defines important habitat for Latham's Snipe as areas that have

previously been identified as internationally important for the species, or areas that support at least 18 individuals of the species.

Only one site in Australia, Seaford Swamp in Victoria is recognised as an internationally important wetland for the species (Bamford et al 2008). The internationally important habitat occurs outside the subject land.

An assessment of significance (Table 8.12) was prepared for Latham's Snipe in relation to the project, in accordance with the assessment criteria for migratory species (DoE 2013a).

Table 8.12 Assessment of significance for Latham's Snipe in the subject land

Criteria	Discussion
1. Substantially modify important habitat.	The only identified important sites for Latham's Snipe (based on the DoE guidelines), are six sites located in Victoria, Tasmania, and South Australia. The *Industry Guidelines for avoiding, assessing, and mitigating impacts on EPBC Act listed migratory shorebird species* (DAWE 2015) defines important habitat for Latham's Snipe as areas that have previously been identified as internationally important for the species, or areas that support at least 18 individuals of the species. The nearest record of this species is more than 16 km to the south-east of the subject land. Therefore, the subject land does not contain important habitat for Latham's Snipe and will not reduce the national extent of important sites.
2. Result in invasive species.	Vegetation clearing and stormwater modification are likely to lead to weed invasion in surrounding habitat, unless adequately mitigated. Measures to control weeds in retained habitats of the subject land will be in the utilisation of detention ponds and avoiding use of non-impact areas during construction. As a ground-dwelling bird, Latham's Snipe are vulnerable to predation from the introduced Red Fox (*Vulpes vulpes*). These species can spread into undisturbed areas when new access roads and tracks are created. As the project will not create new tracks through undisturbed areas, it is unlikely to result in the spread of the Red Fox.
3. Disrupt lifecycle of ecologically significant proportion of population.	Latham's Snipe are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture. The project study area does not contain any record of the species, and the most suitable vegetation (the wetland) has been avoided through project redesign. The vegetation to be impacted is considered sub optimal (Latham's Snipe will use pasture) and therefore, the lifecycle of an ecologically significant proportion of Latham's Snipe will not be disrupted.
Conclusion	The project is unlikely to result in a significant impact on Latham's Snipe as: • the area does not contain important habitat for the species; and • an ecologically significant proportion of the population will not be disrupted.

8.2 Environmental Planning and Assessment Act 1979

8.3 Biosecurity Act 2015

Goulburn Mulwaree Council area is covered by the *Goulburn Mulwaree Council Local Weed Management Plan* (GMC 2019) which builds upon the *South East Regional Strategic Weed Management Plan 2017–2022* (SELLS 2017).

No prohibited matters were recorded in the subject land (GMC 2019). A single juvenile individual Blackberry, which is a priority weed of the Goulburn Mulwaree Council LGA, was recorded in the project study area in the native planted corridor. Blackberry is a priority weed for all of NSW and is regulated with a general biosecurity duty to prevent, eliminate, or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated, or minimised, so far as is reasonably practicable. The species must not be imported into NSW or sold. In addition, there is a regional recommended measure for land managers in the central tablelands to mitigate the risk of new weeds being introduced to, and spread from, their land. The plant should not be bought, sold, grown, carried, or released into the environment. Conservation areas, natural environments and primary production lands should be protected, and ensured that they are free of Blackberry.

8.4 Water Management Act 2000

Groundwater will be intercepted for the project and therefore it represents an aquifer interference activity (EMM 2021). Relevant to this biodiversity assessment, an assessment of the impacts on groundwater dependent ecosystems is provided in Chapter 6, while a full assessment of aquifer interference impacts is provided in the Groundwater Assessment (Appendix O to the EIS).

9 Conclusion

This BDAR has been prepared in accordance with BAM (DPIE 2020), and biodiversity-related SEARs issued by DPIE (detailed in Section 1.4).

Under the BAM (DPIE 2020), the project requires 31 ecosystem credits to offset impacts on native PCTs and ecosystem credit species. The offset liability for the project will be met by Veolia in accordance with the BOS (detailed in Section 7.7).

One candidate TEC that has potential to be at risk of Serious and Irreversible Impact (SAII) has been identified as occurring in the subject land: Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions. One candidate species that has potential to be at risk of SAII, the Yellow-spotted Tree Frog, is considered to have potential to occur adjacent to the subject land.

An SAII assessment of the project impacts against criteria set out in Section 9.1 of the BAM (DPIE 2020) has been undertaken.

The BDAR has also considered impacts on species and ecological communities listed under the EPBC Act (Section 8.1). The project is not expected to result in significant impacts on EPBC Act listed biodiversity matters.

Biodiversity impacts due to the project are not significant and have been minimised during design of the project. Potential impacts will be managed through the implementation of management measures, and offsetting in accordance with the BOS for residual impacts that cannot be avoided.

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Appendix A

Vegetation integrity assessment field datasheets

EMM
creating opportunities

BAM Site – Field Survey Form

Plot ID:	1	**Date:**	21/06/21	**Project number:**	J200931	**Plot dimensions:**	20x20
Datum:	GDA94	**Easting:**	733,656	**Recorders:**	KV, EM		
Zone:	55	**Northing:**	6,118,284	**IBRA region:**	Monaro	**Midline bearing:**	90
Plant Community Type:	1191: Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion			**Condition class:**	DNG	**PCT confidence:**	medium
Vegetation Class:	Subalpine Woodlands			**EEC:**	no	**EEC confidence:**	medium

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

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

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

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

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

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

Physiography and site features

Pasture

Plot Disturbance

Grazing

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

Project name:	J200931				
Recorders:	KV, EM	**Plot ID:**	1	**Date:**	21/06/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Phalaris spp.	80	200	no	E
	Trifolium spp. (A Clover)	10	100	no	E
	Acetosella vulgaris (Sheep Sorrel)	1	30	no	HTE
Grass & grasslike (GG)	*Rytidosperma pallidum (Redanther Wallaby Grass; Silvertop Wallaby Grass)*	0.1	5	no	N
	Taraxacum officinale (Dandelion)	2	20	no	E
	Cirsium vulgare (Spear Thistle)	3	15	no	E
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	10	no	E
	Brassica x napus (Rape)	1	1	no	E

BAM Site – Field Survey Form

Plot ID:	2	**Date:**	21/06/21	**Project number:**	J200931	**Plot dimensions:**	50x20
Datum:	GDA94	**Easting:**	735,278	**Recorders:**	KV, EM		
Zone:	55	**Northing:**	6,117,351	**IBRA region:**	Monaro	**Midline bearing:**	40

Plant Community Type:	1191: Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion	**Condition class:**	Regenerating	**PCT confidence:**	medium
Vegetation Class:	Subalpine Woodlands	**EEC:**	no	**EEC confidence:**	low

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

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	0
	Grasses etc.:	2
	Forbs:	2
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	30
	Shrubs:	0
	Grasses etc.:	5
	Forbs:	0.3
	Ferns:	0
	Other:	0.1
High Threat Weed cover:		0.3

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	4
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	2		
20 – 29 cm:	5	Tree hollow count	0
10 – 19 cm:	9		
5 – 9 cm:	7		
< 5 cm:	13		

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

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

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

Physiography and site features

Soil disturbance, 50% + bare soil

Plot Disturbance

Quarry disturbance

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

Project name:	J200931				
Recorders:	KV, EM	**Plot ID:**	2	**Date:**	21/06/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Acacia dealbata (Silver Wattle)*	30	40	no	N
Grass & grasslike (GG)	*Rytidosperma pallidum (Redanther Wallaby Grass; Silvertop Wallaby Grass)*	3	30	no	N
	Plantago lanceolata (Lamb's Tongues)	1	50		E
Grass & grasslike (GG)	*Juncus usitatus*	2	40	no	N
	Phalaris aquatica (Phalaris)	10	100	no	E
	Brassica x napus (Rape)	0.1	10		E
Forb (FG)	*Chrysocephalum apiculatum (Common Everlasting)*	0.2	50		N
	Acetosella vulgaris (Sheep Sorrel)	0.3	100		HTE
Other (OG)	*Amyema miquelii (Box Mistletoe)*	0.1	10		N
	Solanum nigrum (Black-berry Nightshade)	0.1	5		E
Forb (FG)	*Einadia nutans (Climbing Saltbush)*	0.1	3		N
	Conyza spp. (A Fleabane)	0.1	5		E

BAM Site – Field Survey Form

Plot ID:	3	**Date:**	21/06/21	**Project number:**	J200931	**Plot dimensions:**	20x20
Datum:	GDA94	**Easting:**	735,400	**Recorders:**	KV, EM		
Zone:	55	**Northing:**	6,117,519	**IBRA region:**	Monaro	**Midline bearing:**	43
Plant Community Type:	1256: Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion			**Condition class:**	Moderate	**PCT confidence:**	medium
Vegetation Class:	Montane Bogs and Fens			**EEC:**	no	**EEC confidence:**	low

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

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	3
	Forbs:	1
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	68
	Forbs:	40
	Ferns:	0
	Other:	0
High Threat Weed cover:		0

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

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

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

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

Physiography and site features

Freshwater drainage line

Plot Disturbance

Historical clearing

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

Project name:	J200931				
Recorders:	KV, EM	**Plot ID:**	3	**Date:**	21/06/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Phragmites australis (Common Reed)*	60	1000	no	N
Grass & grasslike (GG)	*Schoenus apogon (Fluke Bogrush)*	3	2000	no	N
Grass & grasslike (GG)	*Carex bichenoviana*	5	3000	no	N
	Plantago coronopus (Buck's-horn Plaintain)	10	2000		E
Forb (FG)	*Selliera radicans (Swamp Weed)*	40	5000	no	N

BAM Site – Field Survey Form

Plot ID:	4	**Date:**	06/10/21	**Project number:**	J200931	**Plot dimensions:**	50x20
Datum:	GDA94	**Easting:**	735,540	**Recorders:**	KV		
Zone:	55	**Northing:**	6,117,546	**IBRA region:**	Monaro	**Midline bearing:**	140
Plant Community Type:	1191: Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion			**Condition class:**	DNG	**PCT confidence:**	medium
Vegetation Class:	Subalpine Woodlands			**EEC:**	no	**EEC confidence:**	low

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

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	2
	Grasses etc.:	5
	Forbs:	5
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	5
	Shrubs:	6
	Grasses etc.:	8
	Forbs:	41
	Ferns:	0
	Other:	0
High Threat Weed cover:		1

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**		
80 + cm:	0	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	0
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	**Tree hollow count**	0
10 – 19 cm:	3		
5 – 9 cm:	11		
< 5 cm:	30		

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

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	5	10	10	15	15
Average litter cover (%):	11				

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

Physiography and site features

Low flat area in front of native plantings and beside Typha wetlands

Plot Disturbance

Previously cleared for powerlines and road. Some Acacia dealbata regrowth

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

Project name:	J200931				
Recorders:	KV	**Plot ID:**	4	**Date:**	06/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	*Brachyscome dentata*	5	300	no	N
Forb (FG)	*Chrysocephalum apiculatum (Common Everlasting)*	30	1000	no	N
Grass & grasslike (GG)	*Chloris truncata (Windmill Grass)*	2	100	no	N
Grass & grasslike (GG)	*Rytidosperma pallidum (Redanther Wallaby Grass; Silvertop Wallaby Grass)*	1	50	no	N
Tree (TG)	*Acacia dealbata (Silver Wattle)*	5	50	no	N
Shrub (SG)	*Cassinia aculeata (Dolly Bush)*	5	36	no	N
Grass & grasslike (GG)	*Rytidosperma caespitosum (Ringed Wallaby Grass)*	3	50	no	N
	Acetosella vulgaris (Sheep Sorrel)	1	30	no	HTE
Shrub (SG)	*Acacia baileyana (Cootamundra Wattle)*	1	2	no	N
	Plantago lanceolata (Lamb's Tongues)	0.5	200	no	E
	Taraxacum officinale (Dandelion)	0.1		no	E
Grass & grasslike (GG)	*Lomandra multiflora subsp. multiflora (Many-flowered Mat-rush)*	1	7	no	N
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	1	30	no	N
Forb (FG)	*Vittadinia muelleri (A Fuzzweed)*	3	50		N
Forb (FG)	*Asperula ambleia (Stiff Woodruff)*	2	50	no	N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	1	30	no	N

BAM Site – Field Survey Form

Plot ID:	5	**Date:**	06/10/21	**Project number:**	J200931	**Plot dimensions:**	50x20
Datum:	GDA94	**Easting:**	735,524	**Recorders:**	KV		
Zone:	55	**Northing:**	6,117,525	**IBRA region:**	Monaro	**Midline bearing:**	160
Plant Community Type:	1191: Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion			**Condition class:**	Planted	**PCT confidence:**	medium
Vegetation Class:	Subalpine Woodlands			**EEC:**		**EEC confidence:**	

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

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	3
	Grasses etc.:	4
	Forbs:	5
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	35.1
	Shrubs:	1.3
	Grasses etc.:	16.2
	Forbs:	2.4
	Ferns:	0
	Other:	0
High Threat Weed cover:		0.2

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	8
80 + cm:	4		
50 – 79 cm:	3		
30 – 49 cm:	5		
20 – 29 cm:	3	Tree hollow count	0
10 – 19 cm:	6		
5 – 9 cm:	15		
< 5 cm:	16		

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

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	60	80	25	15
Average litter cover (%):	37				

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

Physiography and site features

Planted mature native corridor

Plot Disturbance

Woodpile, plot fully within fenced area

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

Project name:	J200931				
Recorders:	KV	**Plot ID:**	5	**Date:**	06/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus bicostata (Eurabbie)*	35	8	no	N
Tree (TG)	*Acacia dealbata (Silver Wattle)*	0.1	4	no	N
Shrub (SG)	*Acacia baileyana (Cootamundra Wattle)*	1	3	no	N
Shrub (SG)	*Cassinia aculeata (Dolly Bush)*	0.2	6	no	N
	Holcus lanatus (Yorkshire Fog)	50	700	no	E
	Plantago lanceolata (Lamb's Tongues)	0.2	100	no	E
Forb (FG)	*Taraxacum spp. (Dandelion)*	0.1	30	no	N
Forb (FG)	*Chrysocephalum apiculatum (Common Everlasting)*	2	500	no	N
Shrub (SG)	*Ozothamnus ferrugineus (Tree Everlasting)*	0.1	5	no	N
Grass & grasslike (GG)	*Carex breviculmis*	15	800	no	N
Grass & grasslike (GG)	*Aristida vagans (Threeawn Speargrass)*	0.1	50	no	N
	Acetosella vulgaris (Sheep Sorrel)	0.2	50	no	HTE
Forb (FG)	*Oxalis perennans*	0.1	20	no	N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	1	100	no	N
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	0.1	20	no	N
Forb (FG)	*Euchiton involucratus (Star Cudweed)*	0.1	45	no	N
Grass & grasslike (GG)	*Echinopogon caespitosus (Bushy Hedgehog-grass)*	0.1	20	no	N

BAM Site – Field Survey Form

Plot ID:	6	**Date:**	06/10/21	**Project number:**	J200931	**Plot dimensions:**	50x20
Datum:	GDA94	**Easting:**	735,484	**Recorders:**	KV		
Zone:	55	**Northing:**	6,117,465	**IBRA region:**	Monaro	**Midline bearing:**	340
Plant Community Type:	1191: Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion			**Condition class:**	Regenerating	**PCT confidence:**	medium
Vegetation Class:	Subalpine Woodlands			**EEC:**		**EEC confidence:**	

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

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	1
	Grasses etc.:	4
	Forbs:	5
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	25
	Shrubs:	0.5
	Grasses etc.:	5.4
	Forbs:	1.4
	Ferns:	0
	Other:	0
High Threat Weed cover:		0.5

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**		
80 + cm:	0	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	17
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	**Tree hollow count**	0
10 – 19 cm:	18		
5 – 9 cm:	57		
< 5 cm:	26		

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

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	20	1	5	5	5
Average litter cover (%):	7.2				

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

Physiography and site features

Gentle slope

Plot Disturbance

Acacia regrowth with many dead standing and fallen Acacias

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

Project name:	J200931				
Recorders:	KV	**Plot ID:**	6	**Date:**	06/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Acacia dealbata (Silver Wattle)*	25	36	no	N
Shrub (SG)	*Cassinia aculeata (Dolly Bush)*	0.5	4	no	N
Forb (FG)	*Chrysocephalum apiculatum (Common Everlasting)*	1	300	no	N
	Holcus lanatus (Yorkshire Fog)	5	100	no	E
	Plantago lanceolata (Lamb's Tongues)	1	400	no	E
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	3	100	no	N
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	0.1	50	no	N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	2	300	no	N
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	50	no	N
Forb (FG)	*Burchardia umbellata (Milkmaids)*	0.1	3	no	N
Forb (FG)	*Brachyscome dentata*	0.1	15	no	N
Grass & grasslike (GG)	*Aristida vagans (Threeawn Speargrass)*	0.2	50	no	N
	Pinus radiata (Radiata Pine)	0.5	1	no	HTE
Grass & grasslike (GG)	*Lomandra multiflora subsp. multiflora (Many-flowered Mat-rush)*	0.2	35	no	N

BAM Site – Field Survey Form

Plot ID:	7	**Date:**	06/10/21	**Project number:**	J200931	**Plot dimensions:**	50x20
Datum:	GDA94	**Easting:**	735,452	**Recorders:**	KV		
Zone:	55	**Northing:**	6,117,508	**IBRA region:**	Monaro	**Midline bearing:**	65
Plant Community Type:	1191: Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion			**Condition class:**	DNG	**PCT confidence:**	medium
Vegetation Class:	Subalpine Woodlands			**EEC:**	no	**EEC confidence:**	low

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

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	0
	Grasses etc.:	5
	Forbs:	6
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0.5
	Shrubs:	0
	Grasses etc.:	53.1
	Forbs:	3.5
	Ferns:	0
	Other:	0
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	17		

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

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	30	10	10	5	10
Average litter cover (%):	13				

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

Physiography and site features

Gently sloping grassland adjacent to wetland. Includes fallen fenceline

Plot Disturbance

Recent erosion.Minor regrowth of Acacia dealbata under 70cm

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

Project name:	J200931				
Recorders:	KV	**Plot ID:**	7	**Date:**	06/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Holcus lanatus (Yorkshire Fog)	2	100	no	E
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	50	50	no	N
	Plantago lanceolata (Lamb's Tongues)	3	200	no	E
Grass & grasslike (GG)	*Aristida vagans (Threeawn Speargrass)*	1	30	no	N
Forb (FG)	*Crassula sieberiana (Australian Stonecrop)*	0.2	200	no	N
Forb (FG)	*Chrysocephalum apiculatum (Common Everlasting)*	1	60	no	N
	Gamochaeta spp.	1	50	no	E
Forb (FG)	*Acaena novae-zelandiae (Bidgee-widgee)*	1	80	no	N
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	40	no	N
Forb (FG)	*Plantago debilis (Shade Plantain)*	1	15	no	N
Forb (FG)	*Asperula ambleia (Stiff Woodruff)*	0.2	50	no	N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	1	30	no	N
Tree (TG)	*Acacia dealbata (Silver Wattle)*	0.5	3		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	1	200	no	N
Grass & grasslike (GG)	*Juncus continuus*	0.1	2	no	N

BAM Site – Field Survey Form

Plot ID:	8	**Date:**	08/10/21	**Project number:**	J200931	**Plot dimensions:**	50x20
Datum:	GDA94	**Easting:**	735,241	**Recorders:**	KV		
Zone:	55	**Northing:**	6,117,672	**IBRA region:**	Monaro	**Midline bearing:**	285
Plant Community Type:	1191: Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion			**Condition class:**	Planted	**PCT confidence:**	medium
Vegetation Class:	Subalpine Woodlands			**EEC:**	no	**EEC confidence:**	medium

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

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	2
	Grasses etc.:	5
	Forbs:	10
	Ferns:	1
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	15
	Shrubs:	15.1
	Grasses etc.:	18.2
	Forbs:	2.2
	Ferns:	0.1
	Other:	0.1
High Threat Weed cover:		5.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	21
80 + cm:	2		
50 – 79 cm:	8		
30 – 49 cm:	4		
20 – 29 cm:	4	Tree hollow count	0
10 – 19 cm:	11		
5 – 9 cm:	24		
< 5 cm:	29		

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

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	30	10	40	60	50
Average litter cover (%):	38				

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

Physiography and site features

Area of mature planted native trees within 2 layers of fencing. Between Collector Rd and wetland drainage line

Plot Disturbance

Many dead or senescencing Eucalyptus

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

Project name:	J200931				
Recorders:	KV	**Plot ID:**	8	**Date:**	08/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Shrub (SG)	*Acacia baileyana (Cootamundra Wattle)*	15	17	no	N
Tree (TG)	*Eucalyptus bicostata (Eurabbie)*	15	7	no	N
	Pinus radiata (Radiata Pine)	5	12	no	HTE
	Holcus lanatus (Yorkshire Fog)	10	500	no	E
	Conyza spp. (A Fleabane)	0.1	7	no	E
Shrub (SG)	*Solanum aviculare (Kangaroo Apple)*	0.1	4	no	N
	Trifolium spp. (A Clover)	1	100	no	E
Grass & grasslike (GG)	*Austrostipa spp. (A Speargrass)*	1	50	no	N
	Sonchus oleraceus (Common Sowthistle)	0.1	3		E
	Moraea collina	0.1	15	no	E
Forb (FG)	*Plantago gaudichaudii (Narrow Plantain)*	0.2	100	no	N
Forb (FG)	*Taraxacum spp. (Dandelion)*	0.2	100	no	N
	Gamochaeta spp.	0.1	40	no	E
Other (OG)	*Amyema gaudichaudii*	0.1	1	no	N
	Stellaria media (Common Chickweed)	0.1	27	no	E
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	0.1	14	no	N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	15	500	no	N
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.2	50	no	N
Forb (FG)	*Einadia nutans (Climbing Saltbush)*	0.1	3		N
	Acetosella vulgaris (Sheep Sorrel)	0.1	6	no	HTE
	Plantago lanceolata (Lamb's Tongues)	0.2	80	no	E
Forb (FG)	*Viola betonicifolia (Native Violet)*	0.1	17	no	N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	1	30	no	N
Forb (FG)	*Hydrocotyle spp.*	1	40	no	N
Fern (EG)	*Cheilanthes distans (Bristly Cloak Fern)*	0.1	24	no	N
Forb (FG)	*Chrysocephalum apiculatum (Common Everlasting)*	0.1	60	no	N
Grass & grasslike (GG)	*Schoenus apogon (Fluke Bogrush)*	0.2	100	no	N
Forb (FG)	*Crassula sieberiana (Australian Stonecrop)*	0.1	75	no	N
Forb (FG)	*Oxalis perennans*	0.1	8	no	N
Grass & grasslike (GG)	*Juncus spp. (A Rush)*	1	4	no	N

BAM Site – Field Survey Form

Plot ID:	9	**Date:**	07/10/21	**Project number:**	J200931	**Plot dimensions:**	20x20
Datum:	GDA94	**Easting:**	735,467	**Recorders:**	KV		
Zone:	55	**Northing:**	6,117,582	**IBRA region:**	Monaro	**Midline bearing:**	115
Plant Community Type:	1256: Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion			**Condition class:**	Poor	**PCT confidence:**	medium
Vegetation Class:	Montane Bogs and Fens			**EEC:**	no	**EEC confidence:**	low

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

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	4
	Forbs:	3
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	25
	Forbs:	25.6
	Ferns:	0
	Other:	0
High Threat Weed cover:		0

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

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

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

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

Physiography and site features

Wetland and damp areas

Plot Disturbance

Low Bund 10m south of plot

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

Project name:	J200931				
Recorders:	KV	**Plot ID:**	9	**Date:**	07/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Phragmites australis (Common Reed)*	10	200	no	N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	10	50	no	N
	Holcus lanatus (Yorkshire Fog)	20	100	no	E
Forb (FG)	*Selliera radicans (Swamp Weed)*	25	500	no	N
	Cicendia quadrangularis	3	200	no	E
Grass & grasslike (GG)	*Carex breviculmis*	1	500	no	N
Forb (FG)	*Wurmbea spp.*	0.1	2	no	N
Forb (FG)	*Plantago gaudichaudii (Narrow Plantain)*	0.5	50	no	N
	Cirsium vulgare (Spear Thistle)	0.1	1	no	E
Grass & grasslike (GG)	*Schoenus apogon (Fluke Bogrush)*	4	500	no	N

BAM Site – Field Survey Form

Plot ID:	10	**Date:**	07/10/21	**Project number:**	J200931	**Plot dimensions:**	50x20
Datum:	GDA94	**Easting:**	735,447	**Recorders:**	KV		
Zone:	55	**Northing:**	6,117,329	**IBRA region:**	Monaro	**Midline bearing:**	55
Plant Community Type:				**Condition class:**	Poor	**PCT confidence:**	medium
Vegetation Class:				**EEC:**	no	**EEC confidence:**	low

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

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	1
	Forbs:	0
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	0.1
	Forbs:	0
	Ferns:	0
	Other:	0
High Threat Weed cover:		60

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**		
80 + cm:	0	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	8
50 – 79 cm:	0		
30 – 49 cm:	38		
20 – 29 cm:	5	**Tree hollow count**	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	1		

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

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	80	60	90	90	90
Average litter cover (%):	82				

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

Physiography and site features

Planted pine corridor

Plot Disturbance

No disturbance

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

Project name:	J200931				
Recorders:	KV	**Plot ID:**	10	**Date:**	07/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Pinus radiata (Radiata Pine)	60	33	no	HTE
	Holcus lanatus (Yorkshire Fog)	0.1	2	no	E
Grass & grasslike (GG)	*Carex breviculmis*	0.1	7	no	N

BAM Site – Field Survey Form

Plot ID:	11	**Date:**	08/10/21	**Project number:**	J200931	**Plot dimensions:**	20x20
Datum:	GDA94	**Easting:**	735,379	**Recorders:**	KV		
Zone:	55	**Northing:**	6,117,538	**IBRA region:**	Monaro	**Midline bearing:**	235
Plant Community Type:	1256: Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion			**Condition class:**	Poor	**PCT confidence:**	medium
Vegetation Class:	Montane Bogs and Fens			**EEC:**	no	**EEC confidence:**	low

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

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	0
	Grasses etc.:	3
	Forbs:	4
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0.5
	Shrubs:	0
	Grasses etc.:	3.3
	Forbs:	51.2
	Ferns:	0
	Other:	0
High Threat Weed cover:		0.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	12
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:			

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

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	1	5	0	0	0
Average litter cover (%):	1.2				

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

Physiography and site features

Area between Phragmites and bund.

Plot Disturbance

No disturbance

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

Project name:	J200931				
Recorders:	KV	**Plot ID:**	11	**Date:**	08/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Plantago lanceolata (Lamb's Tongues)	1	300	no	E
Forb (FG)	*Selliera radicans (Swamp Weed)*	50	1000	no	N
Forb (FG)	*Plantago gaudichaudii (Narrow Plantain)*	1	800	no	N
	Cicendia quadrangularis	1	900	no	E
	Holcus lanatus (Yorkshire Fog)	10	40	no	E
Tree (TG)	*Acacia dealbata (Silver Wattle)*	0.5	12	no	N
	Medicago spp. (A Medic)	0.2	75	no	E
Grass & grasslike (GG)	*Echinopogon spp. (A Hedgehog Grass)*	0.1	100	no	N
Forb (FG)	*Wurmbea dioica subsp. dioica (Early Nancy)*	0.1	1	no	N
Forb (FG)	*Taraxacum spp. (Dandelion)*	0.1	7	no	N
Grass & grasslike (GG)	*Schoenus apogon (Fluke Bogrush)*	3	900	no	N
Grass & grasslike (GG)	*Typha domingensis (Narrow-leaved Cumbungi)*	0.2	50	no	N
	Paspalum dilatatum (Paspalum)	0.1	13	no	HTE

BAM Site – Field Survey Form

Plot ID:	12	**Date:**	07/10/21	**Project number:**	J200931	**Plot dimensions:**	50x20
Datum:	GDA94	**Easting:**	735,430	**Recorders:**	KV		
Zone:	55	**Northing:**	6,117,384	**IBRA region:**	Monaro	**Midline bearing:**	255
Plant Community Type:	1191: Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion			**Condition class:**	Regenerating	**PCT confidence:**	medium
Vegetation Class:	Subalpine Woodlands			**EEC:**	no	**EEC confidence:**	medium

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

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	3
	Grasses etc.:	6
	Forbs:	8
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	20
	Shrubs:	0.4
	Grasses etc.:	30.8
	Forbs:	17.7
	Ferns:	0
	Other:	0
High Threat Weed cover:		1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	7
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	0
10 – 19 cm:	1		
5 – 9 cm:	8		
< 5 cm:	43		

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

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	50	15	1	1
Average litter cover (%):	14.4				

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

Physiography and site features

Higher slope, between pine plantation and internal tracks

Plot Disturbance

Minimal. Some weed incursion

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

Project name:	J200931				
Recorders:	KV	**Plot ID:**	12	**Date:**	07/10/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Pinus radiata (Radiata Pine)	1	1		HTE
Tree (TG)	*Acacia dealbata (Silver Wattle)*	20	33	no	N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	30	100	no	N
	Arctotheca calendula (Capeweed)	0.5		no	E
	Plantago lanceolata (Lamb's Tongues)	0.5	200	no	E
Forb (FG)	*Selliera radicans (Swamp Weed)*	15	500	no	N
	Cicendia quadrangularis	0.2	100	no	E
Forb (FG)	*Oxalis perennans*	0.1	50	no	N
Shrub (SG)	*Acacia echinula (Hedgehog Wattle)*	0.1	1	no	N
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	1	40	no	N
	Moraea collina	0.1	16	no	E
Grass & grasslike (GG)	*Aristida vagans (Threeawn Speargrass)*	0.2	24	no	N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	0.1	40	no	N
	Trifolium spp. (A Clover)	1	12	no	E
Forb (FG)	*Plantago gaudichaudii (Narrow Plantain)*	0.2	100	no	N
Forb (FG)	*Chrysocephalum apiculatum (Common Everlasting)*	0.2	50	no	N
Shrub (SG)	*Ozothamnus ferrugineus (Tree Everlasting)*	0.2	2	no	N
	Lysimachia arvensis (Scarlet Pimpernel)	0.1	4	no	E
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	20	no	N
Forb (FG)	*Cymbonotus preissianus (Austral Bear's Ear)*	1	3	no	N
Forb (FG)	*Taraxacum spp. (Dandelion)*	0.1	14	no	N
	Conyza spp. (A Fleabane)	0.1	2	no	E
Shrub (SG)	*Cassinia aculeata (Dolly Bush)*	0.1	1	no	N
	Briza minor (Shivery Grass)	0.1	15	no	E
Grass & grasslike (GG)	*Schoenus apogon (Fluke Bogrush)*	0.1	50	no	N
Grass & grasslike (GG)	*Paspalum distichum (Water Couch)*	0.1	15	no	N
Grass & grasslike (GG)	*Cynodon dactylon (Common Couch)*	0.3	60	no	N

Appendix B
BAM Biodiversity Credit Reports

EMM
creating opportunities

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00026112/BAAS19031/21/00026113

Proposal Name
Woodlawn Veolia

BAM data last updated *
16/06/2022

Assessor Name
Erin Lowe

Assessor Number
BAAS18135

BAM Data version *
54

Proponent Names

Report Created
23/08/2022

BAM Case Status
Finalised

Assessment Revision
5

Assessment Type
Major Projects

Date Finalised
23/08/2022

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

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions	Critically Endangered Ecological Community	1191-Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion

Species
Nil

BAM Biodiversity Credit Report (Like for like)

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami / Glossy Black-Cockatoo

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
1191-Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion	Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions	1.7	0	31	31

BAM Biodiversity Credit Report (Like for like)

1191-Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions This includes PCT's: 679, 797, 802, 803, 804, 1100, 1101, 1191, 1197, 1199, 1229	-	1191_Planted	No	3	Monaro, Bungonia, Crookwell, Kybeyan-Gourock, Monaro, Murrumbateman, Snowy Mountains and South East Coastal Ranges. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions This includes PCT's: 679, 797, 802, 803, 804, 1100, 1101, 1191, 1197, 1199, 1229	-	1191_Regrowth	No	26	Monaro, Bungonia, Crookwell, Kybeyan-Gourock, Monaro, Murrumbateman, Snowy Mountains and South East Coastal Ranges. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions This includes PCT's: 679, 797, 802, 803, 804, 1100, 1101, 1191, 1197, 1199, 1229	-	1191_Exotic_DNG	No	0	Monaro, Bungonia, Crookwell, Kybeyan-Gourock, Monaro, Murrumbateman, Snowy Mountains and South East Coastal Ranges. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions This includes PCT's: 679, 797, 802, 803, 804, 1100, 1101, 1191, 1197, 1199, 1229	-	1191_DNG	No	2	Monaro, Bungonia, Crookwell, Kybeyan-Gourock, Monaro, Murrumbateman, Snowy Mountains and South East Coastal Ranges. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like credit retirement options

Appendix C

Protected Matters Search Results

(PMST_SDQ7F6 – 31/07/2022)

EMM
creating opportunities

Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

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

Report created: 31-Jul-2022

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	44
Listed Migratory Species:	20

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	30
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:	None
Regional Forest Agreements:	1
Nationally Important Wetlands:	2
EPBC Act Referrals:	5
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

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

Ramsar Site Name	Proximity	Buffer Status
Banrock station wetland complex	800 - 900km upstream from Ramsar site	In buffer area only
Hattah-kulkyne lakes	600 - 700km upstream from Ramsar site	In buffer area only
Riverland	700 - 800km upstream from Ramsar site	In buffer area only
The coorong, and lakes alexandrina and albert wetland	800 - 900km upstream from Ramsar site	In buffer area only

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
Natural Temperate Grassland of the South Eastern Highlands	Critically Endangered	Community likely to 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	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat likely 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 likely 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
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pycnoptilus floccosus Pilotbird [525]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Rostratula australis](#)			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
FISH			
[Macquaria australasica](#)			
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area	In feature area
FROG			
[Litoria aurea](#)			
Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat may occur within area	In feature area
[Litoria castanea](#)			
Yellow-spotted Tree Frog, Yellow-spotted Bell Frog [1848]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
INSECT			
[Synemon plana](#)			
Golden Sun Moth [25234]	Vulnerable	Species or species habitat likely to 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
[Petauroides volans](#)			
Greater Glider (southern and central) [254]	Endangered	Species or species habitat may occur within area	In feature area
[Petaurus australis australis](#)			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)](#)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Pteropus poliocephalus](#) Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
PLANT			
[Amphibromus fluitans](#) River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Caladenia tessellata](#) Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat may occur within area	In feature area
[Calotis glandulosa](#) Mauve Burr-daisy [7842]	Vulnerable	Species or species habitat may occur within area	In feature area
[Commersonia prostrata](#) Dwarf Kerrawang [87152]	Endangered	Species or species habitat likely to occur within area	In feature area
[Diuris aequalis](#) Buttercup Doubletail [21588]	Endangered	Species or species habitat known to occur within area	In feature area
[Dodonaea procumbens](#) Trailing Hop-bush [12149]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Eucalyptus aggregata](#) Black Gum [20890]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Lepidium aschersonii](#) Spiny Pepper-cress [10976]	Vulnerable	Species or species habitat may occur within area	In feature area
[Lepidium hyssopifolium](#) Basalt Pepper-cress, Peppercress, Rubble Pepper-cress, Pepperweed [16542]	Endangered	Species or species habitat likely to occur within area	In feature area
[Leucochrysum albicans subsp. tricolor](#) Hoary Sunray, Grassland Paper-daisy [89104]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pelargonium sp. Striatellum (G.W.Carr 10345)			
Omeo Stork's-bill [84065]	Endangered	Species or species habitat known to occur within area	In buffer area only
Pomaderris cotoneaster			
Cotoneaster Pomaderris [2043]	Endangered	Species or species habitat may occur within area	In buffer area only
Pomaderris delicata			
[67208]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
Pomaderris pallida			
Pale Pomaderris [13684]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Prasophyllum petilum			
Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within area	In feature area
Rutidosis leptorhynchoides			
Button Wrinklewort [67251]	Endangered	Species or species habitat likely to occur within area	In feature area
Senecio macrocarpus			
Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Swainsona recta			
Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat may occur within area	In buffer area only
Thesium australe			
Austral Toadflax, Toadflax [15202]	Vulnerable	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 likely to occur within area	In feature area
Delma impar			
Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Listed Migratory Species			[Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat may occur within area	In buffer area only
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area	In buffer area only
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area	In buffer area only
Charadrius bicinctus Double-banded Plover [895]		Species or species habitat known to occur within area	In buffer area only
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area	In feature area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat may occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Species or species habitat known to occur within area	In buffer area only
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area	In buffer area only
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area	In buffer area only

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 Name	State	Buffer Status
Commonwealth Land - Australian Telecommunications Commission [12341]	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 known to occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area	In buffer area only
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 known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to 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
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Chalcites osculans as Chrysococcyx osculans			
Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In feature area
Charadrius bicinctus			
Double-banded Plover [895]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Charadrius ruficapillus			
Red-capped Plover [881]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Gallinago hardwickii			
Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area overfly marine area	In feature area
Haliaeetus leucogaster			
White-bellied Sea-Eagle [943]		Breeding likely to occur within area	In feature area
Himantopus himantopus			
Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area overfly marine area	In buffer area only
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
Limosa lapponica			
Bar-tailed Godwit [844]		Species or species habitat may occur within area	In buffer area only
Merops ornatus			
Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat may occur within area overfly marine area	In buffer area only
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known 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

Scientific Name	Threatened Category	Presence Text	Buffer Status
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area overfly marine area	In buffer area only

Extra Information

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

RFA Name	State	Buffer Status
Southern RFA	New South Wales	In buffer area only

Nationally Important Wetlands [Resource Information]

Wetland Name	State	Buffer Status
Lake Bathurst	NSW	In buffer area only
Lake George	NSW	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Jupiter Wind Farm, Tarago, NSW	2015/7518	Controlled Action	Completed	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
INDIGO Central Submarine Telecommunications Cable	2017/8127	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 buffer area only
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Caveat

1 PURPOSE

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

The report contains the mapped locations of:

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

2 DISCLAIMER

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

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

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

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

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

4 LIMITATIONS

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

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

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

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

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

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

Acknowledgements

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

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-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

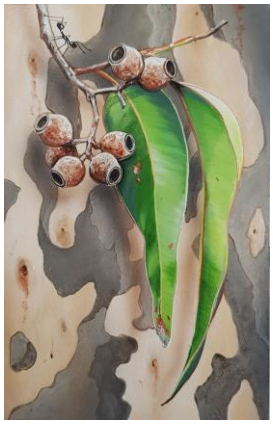
The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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

Department of Agriculture Water and the Environment
GPO Box 858
Canberra City ACT 2601 Australia
+61 2 6274 1111

Appendix D
Acoustic Bat Call Analysis

EMM
creating opportunities



CORYMBIA ECOLOGY

Amy Rowles
415 Parishs Rd, Hilldale, NSW, 2420
Mob: 0418451488
Email: amy@corymbiaecology.com.au
ABN 61854031078

BAT CALL ANALYSIS RESULTS

EMM – Tarago- 5-7/10/2021

6336 files (4117 noise)

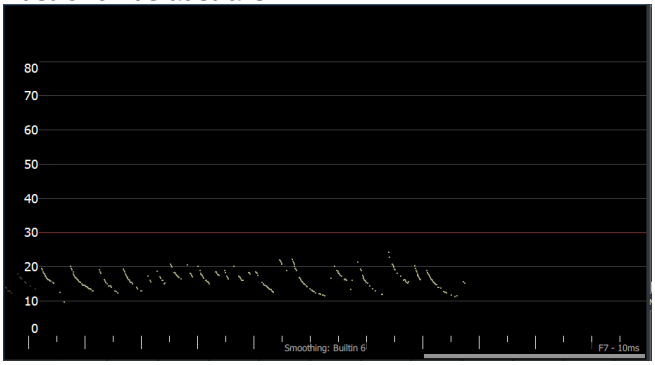
Species	ID Confidence	Notes
Austronomus australis	D	
Mormopterus (Ozimops) ridei (previously species 2)	D	One pass only
Chalinolobus gouldii	Pr	
Chalinolobus morio	D	
Nyctophilus sp	E	
Nyctophilus sp. / Myotis macropus	E	One pass only
Vespadelus darlingtoni	D	High activity levels
Vespadelus regulus	Po	
Vespadelus vulturnus	Po	
Miniopterus orianae oceanensis	Pr	

Note: only calls identified a definite should be entered in Bionet

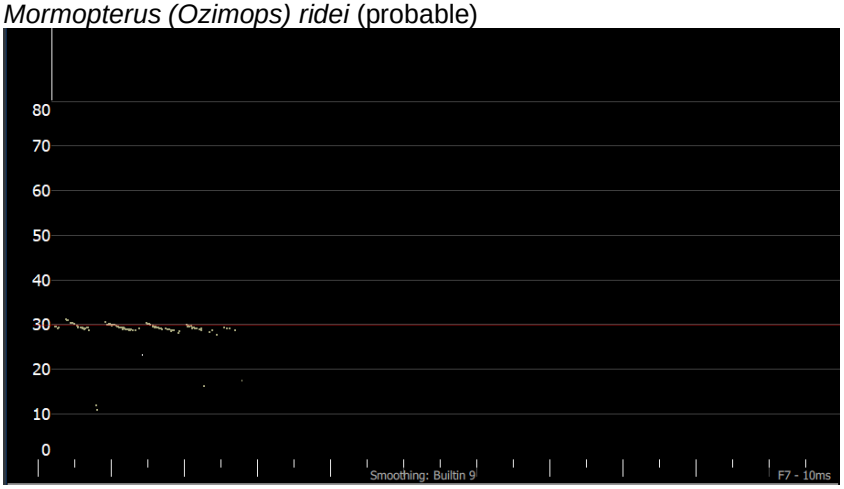
- D – definite; Pr – probable; Po – possible; E-either.
- Calls were analysed using Anabat Insight.
- Example calls presented below are displayed in this report at F7.
- Analysis was completed on the 12 October 2021.
- The following resources were consulted during analysis:
  - Pennay M., Law B., and Reinhold L. (2004) Bat Calls of NSW. DEC of NSW.
  - Corben C. (2009) Anabat Techniques Workshop, Titley Scientific.
  - Personal experience analysing calls and collection of reference calls in NSW
  - Anabat Insight Workshop (2019), Titley Scientific and Balance Environmental.

Examples of calls for definite and probable identified species

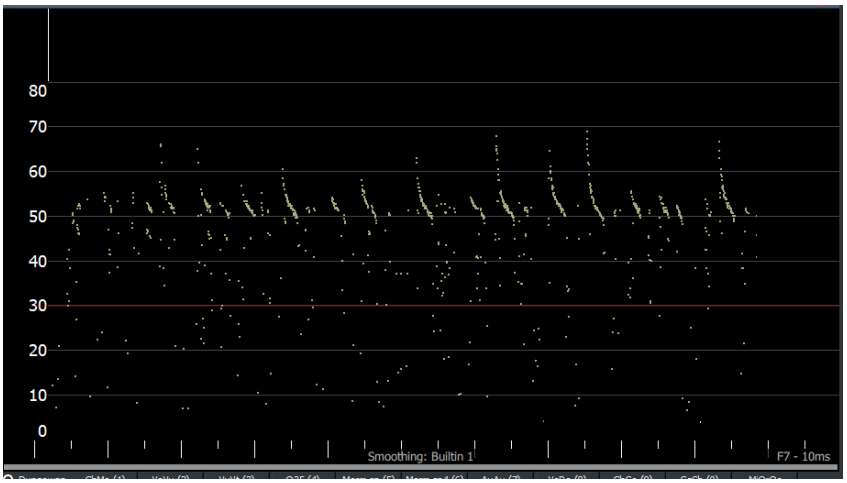
Austronomus australis



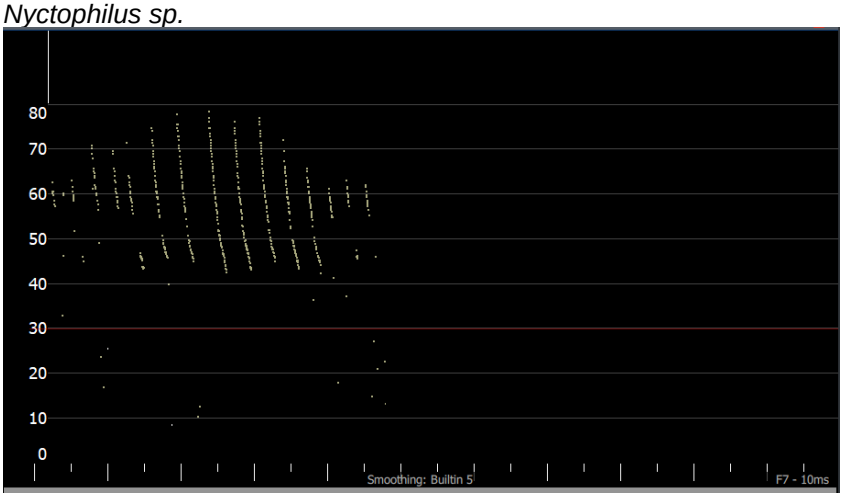
Mormopterus (Ozimops) ridei (probable)



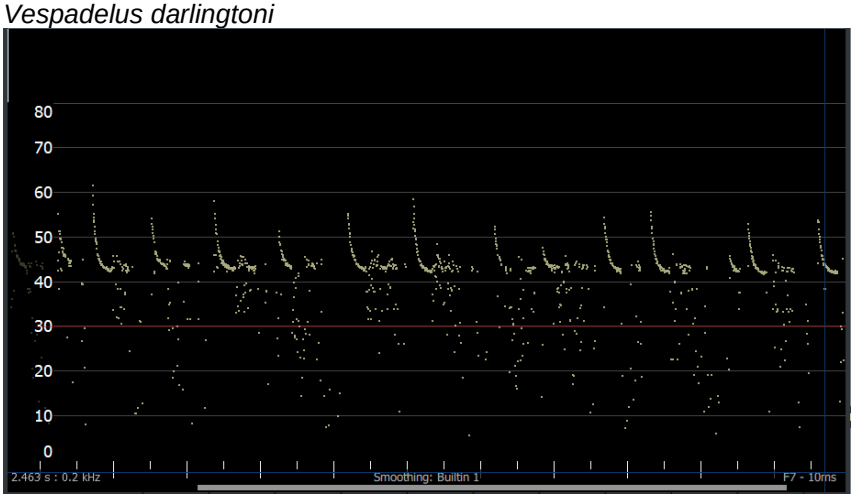
Chalinolobus morio



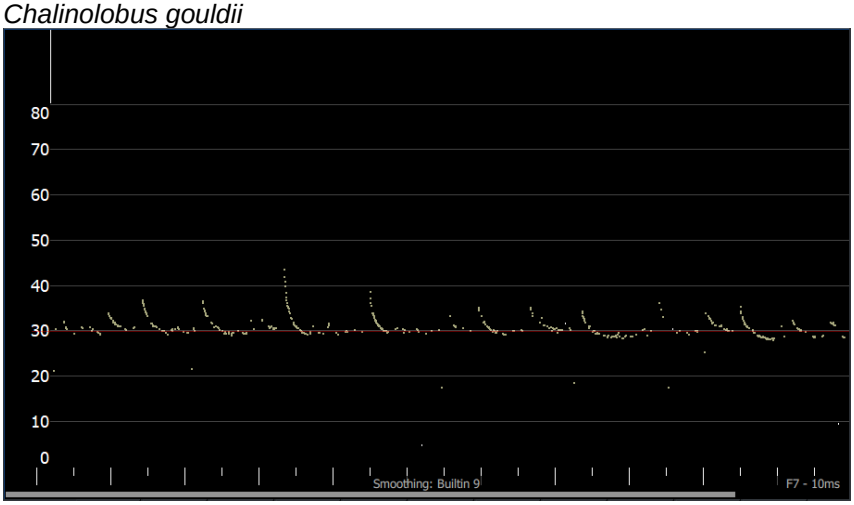
Nyctophilus sp.



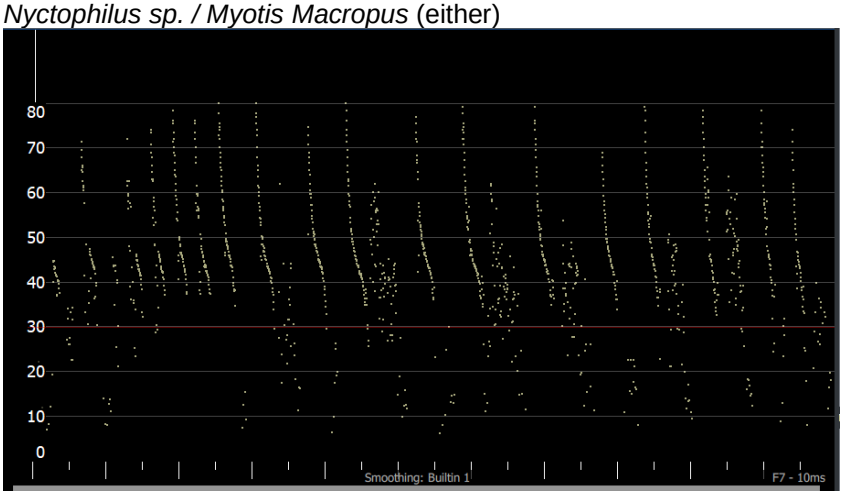
Vespadelus darlingtoni



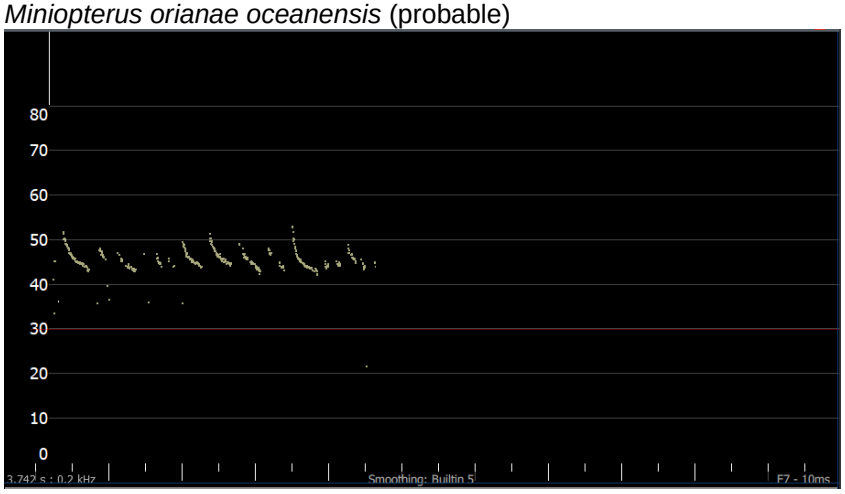
Chalinolobus gouldii



Nyctophilus sp. / Myotis Macropus (either)



Miniopterus orianae oceanensis (probable)



Australia

SYDNEY
Ground floor 20 Chandos Street
St Leonards NSW 2065
T 02 9493 9500

NEWCASTLE
Level 3 175 Scott Street
Newcastle NSW 2300
T 02 4907 4800

BRISBANE
Level 1 87 Wickham Terrace
Spring Hill QLD 4000
T 07 3648 1200

CANBERRA
Level 2 Suite 2.04
15 London Circuit
Canberra City ACT 2601

ADELAIDE
Level 4 74 Pirie Street
Adelaide SA 5000
T 08 8232 2253

MELBOURNE
Suite 8.03 Level 8 454 Collins Street
Melbourne VIC 3000
T 03 9993 1900

PERTH
Suite 9.02 Level 9 109 St Georges Terrace
Perth WA 6000

Canada

TORONTO
2345 Younge Street Suite 300
Toronto ON M4P 2E5

VANCOUVER
60 W 6th Ave Suite 200
Vancouver BC V5Y 1K1

linkedin.com/company/emm-consulting-pty-limited

emmconsulting.com.au