ARCADIS Design & Consultancy for natural and built assets

‘WALLERAWANG BATTERY ENERGY STORAGE SYSTEM’

Biodiversity Development Assessment Report

OCTOBER 2021

Incorporating Hyder

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WALLERAWANG BATTERY ENERGY STORAGE SYSTEM

Biodiversity Development Assessment Report

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REVISIONS

Revision	Date	Description	Prepared by	Approved by
A	02/07/2021	First Draft BDAR	ML, JRk, KC	HT
B	03/09/2021	Second Draft BDAR	ML, KC	HT
C	13/10/2021	Final BDAR	ML, KC	HT

Certification under Section 6.15 of the Biodiversity Conservation Act 2016

As an accredited person (BAAS 17070) I certify that this report has been prepared on the basis of the requirements of (and information provided under) the Biodiversity Assessment Method as at 13 October 2021 and that this date is within 14 days of the date the report is so submitted.

Kate Carroll

Principal Ecologist

Arcadis

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GLOSSARY

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Term	Meaning
Acronyms	
BAM	Biodiversity Assessment Method
BC Act	NSW *Biodiversity Conservation Act 2016*
BC Reg	NSW *Biodiversity Conservation Regulation 2017*
BC (Savings and Transitional) Reg	NSW *Biodiversity Conservation (Savings and Transitional) Regulation 2017*
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
Study area	The area of land subject to the proposed development
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DP&E	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
DPIE (EES)	NSW Department of Planning, Industry and Environment (Environment, Energy and Science)
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FM Act	NSW *Fisheries Management Act 1994*
GDE	Groundwater Dependent Ecosystem
IBRA	Interim Biogeographically Regionalisation of Australia
MNES	Matters of National Environmental Significance
OEH	Former NSW Office of Environment and Heritage
PCT	Plant Community Type
SAII	Serious and Irreversible Impact
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
SSI	Stage Significant Infrastructure
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
VIS	Vegetation Information System

EXECUTIVE SUMMARY

Greenspot Wallerawang Pty Ltd (Greenspot) (the Proponent) is seeking development consent for the construction, operation and maintenance of a Battery Energy Storage System (BESS) within the buffer lands of the decommissioned Wallerawang Power Station site. The BESS will be up to 500 Megawatts (MW) and would provide up to 1,000 Megawatt hours (MWh) of battery storage capacity or up to 2 hours of storage duration. The Project is considered a State Significant Development (SSD) under Clause 8 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) and as a result triggers entry into the NSW Biodiversity Offset Scheme (BOS). On this basis, a Biodiversity Development Assessment Report (BDAR) has been prepared to support the Environmental Impact Statement (EIS) for the Project.

This BDAR is based on desktop research and detailed field surveys undertaken between February and April 2021.

The biodiversity impacts and offset requirements for the Project were calculated using the Biodiversity Assessment Method Calculator (BAMC) in accordance with the Biodiversity Assessment Method (BAM) (DPIE, 2020a).

The vegetation within the study area comprises three Plant Community Types (PCTs) and four vegetation zones within the Capertee Uplands subregion of the South Eastern Highlands Interim Biogeographic Regionalisation for Australia (IBRA) region. Two non-native vegetation communities that are not equivalent to a PCT are also present in the study area. Vegetation zones within the study area, their associated Plant Community Types and their calculated vegetation integrity scores are as follows:

Table 0-1 Vegetation zones within the study area and construction area

PCT ID	PCT Name	Vegetation zone	Vegetation integrity score	Extent in the study area (ha)	Extent in the construction area (ha)
677	Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands; South Eastern Highlands Bioregion	677_Good	46	1.70	0.91
677	Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands; South Eastern Highlands Bioregion	677_Moderate	23.9	0.70	0.24
732	Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion	732_Moderate	34.6	0.20	0
1299	Wetlands on alluvial valley floors of the South Eastern Highlands Bioregion	1299_Moderate	30.8	5.08	0
Other vegetation types		Exotic roadside vegetation	15.6	0.17	0.01
		Exotic cleared grassland	0.5	27.24	6.47
Total area native vegetation				**7.67**	**1.15**
Total area vegetation				**35.09**	**7.63**

None of the vegetation in the study area is equivalent to any Threatened Ecological Community (TEC) listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Two threatened flora species, *Eucalyptus aggregata* (listed as vulnerable under the BC Act and EPBC Act) and *Eucalyptus pulverulenta* (listed as vulnerable under the BC Act and EPBC Act) were recorded within the study area during targeted surveys. Forty-seven individuals of *Eucalyptus aggregata* are present within the construction area and would be removed as a result of the Project. No individuals of *Eucalyptus pulverulenta* would be removed. No additional threatened flora species are considered likely to occur in the study area.

Nine threatened fauna species were recorded during surveys; Large-eared Pied Bat, Grey-headed Flying-fox, White-bellied Sea-Eagle, Large Bent-winged Bat, Blue-billed Duck, Dusky Woodswallow, Eastern False Pipistrelle, Greater Broad-nosed Bat and Yellow-bellied Sheathtail-bat. All nine species are listed as vulnerable under the BC Act and Large-eared Pied Bat and Grey-headed Flying-fox are also listed as vulnerable under the EPBC Act. Targeted surveys did not detect any breeding sites for dual credit species and consequently, no species credit habitat is present for dual credit species. Large-eared Pied Bat is a species credit species and a species polygon has been created for species credit habitat within the study area. No additional threatened fauna species are considered likely to occur in the study area. One listed migratory species under the EPBC Act, Latham's Snipe, was recorded within the study area.

Significant impact criteria assessments under the EPBC Act concluded that the Project is unlikely to have a significant impact on any Matters of National Environmental Significance (MNES) including listed threatened species.

The Coxs River is located within the study area and is mapped as Key Fish Habitat (DPI, n.d.). The Project is unlikely to result in any impacts to the waterway.

Where impacts cannot be avoided, mitigation measures are proposed that would reduce adverse impacts on ecological values. These include preparation of a Flora and Fauna Management Plan (FFMP), appropriate sediment and erosion controls, avoiding and minimising removal of vegetation where practicable, site inductions, exclusion fencing, pre-clearance surveys and appropriate weed and hygiene protocols.

The offsets required for the Project were calculated using the BAMC; 30 ecosystem credits and 129 species credits are required to offset the impacts of the Project. Ecosystem credits comprise the following Plant Community Type:

- Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion (30 credits)

Species credits comprise the following species:

- *Eucalyptus aggregata* (94 credits)
- Large-eared Pied Bat (35 credits)

BAM (STAGE 1): BIODIVERSITY ASSESSMENT

1 INTRODUCTION

Arcadis has been engaged by Greenspot Wallerawang Pty Ltd to prepare this Biodiversity Development Assessment Report (BDAR) to inform the construction, operation, and maintenance of a Battery Energy Storage System (BESS), up to 500 Megawatts (MW) and would provide up to 1,000 Megawatt hours (MWh) of battery storage capacity or up to 2 hours of storage duration (the Project). This BDAR has been prepared by Kate Carroll, an Accredited Person (BAAS17070) under the New South Wales (NSW) *Biodiversity Conservation Act 2016* (BC Act).

1.1 The Project

1.1.1 Project background

The Project is considered critical in supporting the NSW Government's electricity strategy for a reliable, affordable, and sustainable electricity future that supports a growing economy. BESS facilities, such as the Project, would provide enabling infrastructure for expanding the renewable energy industry in NSW, particularly in the Central-West Orana Renewable Energy Zone (REZ), and is considered a critical element of the transformation of the NSW energy sector. The BESS also acts as a precursor to the 'Wallerawang 2845 Activity Hub' (the site now owned by Greenspot), providing a stable, reliable, and cost-effective energy source for the future redevelopment.

The Project would involve construction, operation and maintenance of a large-scale BESS. The Project would require about 30 hectares (ha) of land within the site and once complete would include:

- A large-scale BESS including battery enclosures, inverters and transformers
- 33/330 kV switchyard
- Transmission line connection between the BESS and the nearby TransGrid 330 kV Wallerawang substation
- Ancillary elements including site access from the Castlereagh Highway, internal access roads and parking, site office and amenities, stormwater and fire management infrastructure, utilities, signage, fencing, security systems and landscaping.

The Project would also include subdivision of the Project site to align with major project elements and ancillary upgrades to the existing Wallerawang 330 kV substation operated by TransGrid.

The new power supply connection from the BESS to the Wallerawang 330 kV substation would be established on land owned by Greenspot and/or TransGrid and no other third-party easements would be required.

1.1.2 Planning and assessment

The Project is considered to meet the definition of State Significant Development (SSD) under clause 8 of the *State Environmental Planning Policy (State and Regional Development) 2011*, as the Project would be for electricity generating works on land that is permitted with development consent under Clause 34 of the *State Environmental Planning Policy (Infrastructure) 2007* and have a Capital Investment Value greater than $30 million.

Development consent for the Project is therefore being sought in accordance with Part 4 of the *Environmental Planning and Assessment Act 1979*. Under the BC Act, the development triggers entry into the NSW Biodiversity Offset Scheme (BOS) and on this basis, a BDAR has been prepared.

This report has been prepared in accordance with the *Biodiversity Assessment Method 2020* (the BAM) (DPIE, 2020a) by an assessor that has been accredited under the BC Act. This report has been prepared to describe the biodiversity values present within the study area and consider the potential impacts of the Project in accordance with the aforementioned policy and legislation.

This BDAR has been prepared with consideration of the minimum requirements outlined in Table 25 of the BAM (DPIE, 2020a), as required by the NSW BOS. The level of survey and assessment conducted for this BDAR is considered adequate for the Project.

1.1.3 Construction activities

Site preparation activities are expected to include:

- Site preparation including clearing of vegetation and grubbing to remove tree stumps within the forestry area.
- Civil works for site leveling within the BESS area, 330 kV switchyard and ancillary areas. The site is anticipated to have a neutral cut and fill volume.
- Installation of temporary environmental controls such as water management infrastructure.
- Establishment of a temporary construction compound within the construction footprint including demountable offices and amenities, storage sheds (shipping containers) and fabrication area.
- Establishment of a laydown area for materials such as cable drums, fill, gravel, road base, etc.
- Construction of access tracks and fencing.
- Surveying and investigation of onsite conditions to implement the final design on-site.

Key construction activities are expected to include:

- Trenching and installation of cable from the battery to 33/330 kV switchyard.
- Installation of footings for battery enclosures, inverters, switch rooms and transformers, including pilings and concrete.
- Delivery, installation and fit out of the BESS including battery modules, inverters and MV transformers. BESS components are largely prefabricated and will be lifted directly into place from the delivery vehicle.
- Delivery, installation and fit out of transformers and switchgear for 33/330 kV switchyard.
- Construction of ancillary elements including, offices and amenities, installation of services, water and sewage management, fire systems and signage.
- Installation of permanent fencing and security systems.
- Testing and commissioning.
- Removal of construction equipment and materials and rehabilitation of construction areas (where applicable).

Construction of the Project would take place mostly within the construction area, except for the establishment of the new power supply connection from the BESS to the Wallerawang substation switchyard. Some other utilities connections may also be required within the study area, which would be confirmed as part of further design development during the preparation of the Environmental Impact Statement (EIS).

It is likely that some elements would be prefabricated offsite and transported to the Project via heavy vehicles, where they would then be installed.

The batteries would be containerised on areas of hardstand. Relevant hazardous substance management procedures and controls would be identified through design development and implemented in accordance with the relevant guidelines and legislation.

1.2 Project boundaries

1.2.1 BDAR study area

The BDAR study area (study area) encompasses approximately 61.58 hectares and is located immediately south of the former Wallerawang Power Station site (now decommissioned). The study area is defined as all areas which have been surveyed as part of this assessment and encompasses the construction area and the operational footprint. This is shown on **Figure 1-1**.

The central portion of the study area, the forestry area, is a commercial forest and covers an area of approximately 18.72 hectares. This is managed by Forestry Corporation of NSW and is subject to a Pine Plantation Deed. This area is referred to as the Forestry area throughout this report.

The eastern part of the study area is cleared grasslands. Other features include an area of planted native and exotic vegetation along the Castlereagh Highway and an unsealed access road along the southern boundary of the study area. The study area contains scattered patches of remnant native vegetation, and supports several aquatic habitats including the Coxs River, soaks, and drainage lines.

1.2.2 Subject land

Subject land is defined in the BAM (DPIE, 2020a) as land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal. For this assessment, subject land refers to the extent of the construction area and operational footprint for the Project. As the operational footprint is situated wholly within the construction area, the subject land boundary follows the construction area. This area is shown in **Figure 1-1.** The transmission line will be placed over the Coxs River and adjoining vegetation connecting the BESS and the nearby TransGrid 330 kV Wallerawang substation. There would be no impacts to this area underneath the transmission line and as a result is not included in the construction area of operational footprint. Therefore, it does not meet the definition for inclusion within the subject land.

1.2.3 Construction area

The area required for the construction of the BESS is shown in **Figure 1-1** and referred to as construction area throughout this report. All vegetation within the construction area is assumed to be removed as a result of the Project. The construction area covers a total area of 30.68 hectares.

1.2.4 Operational footprint

The operational footprint will be referred to as the operational area throughout this report. The operational area includes the operation of the BESS and associated infrastructure and ancillary components shown in **Figure 1-1.** The forestry area will make up the majority of the operation of the Project. The operational area covers a total area of 25.95 hectares.

1.2.5 Forestry area

The Forestry area consists of planted *Pinus radiata* (Radiata Pine) and is managed by Forestry Corporation of NSW. The Forestry area is scheduled for clearing in 2022 under a Pine Plantation Deed. Harvesting of this plantation would be conducted under a separate approval process. As a result, this area has been excluded from impact assessment associated with clearing. The Forestry area is shown in **Figure 1-1**.

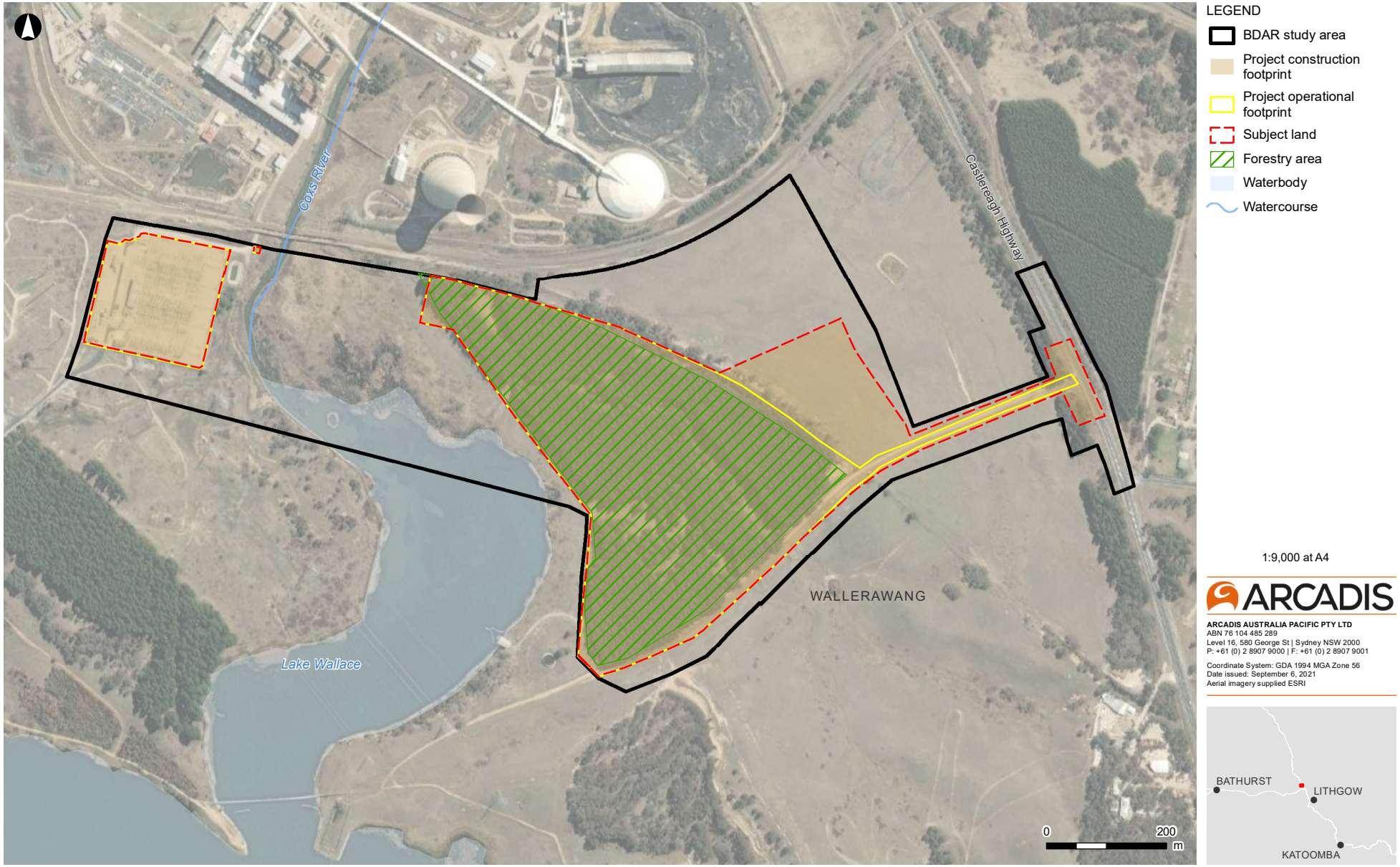

Figure 1-1 The Project

1.3 Project location

The study area is located directly north-east of the main township of Wallerawang and 12 kilometres north-west of Lithgow (**Figure 1-2, Figure 1-3**). The study area encompasses approximately 61.58 hectares and is positioned (in part or fully) across the following properties:

- Lot 3, Deposited Plan (DP) 1018958
- Lot 4, DP 1016725
- Lot 3, DP 1181412
- Lot 3, DP 1226927
- Lot 4, DP 1226927
- Lot 91, DP 1043967
- Castlereagh Highway road verge.

The study area is located within the City of Lithgow Local Government Area (LGA) and is zoned 'IN3 – Heavy Industrial' and 'SP2 – Electricity Generating Works' under the *Lithgow Local Environmental Plan 2014* (Lithgow LEP). Under the same LEP, remnant native vegetation to the east of the pine plantation is mapped as 'Biodiversity' on the Environmentally Sensitive Areas Map. Further, Lake Wallace and the Coxs River, located in the western portion of the site, are mapped as 'Sensitive Waterways' under the LEP, and are also mapped as Key Fish Habitat (DPI, n.d.). Areas of vulnerable groundwater have also been mapped (Lithgow LEP, 2014).

The Project Site is bounded by:

- The Main Western Railway Line and the former Wallerawang Power Station to the north
- Castlereagh Highway to the east
- Coxs River and the TransGrid Wallerawang 330 kV Substation to the west.
- Cleared grassland with patches of remnant vegetation to the south.

The buffer lands of the Former Wallerawang Power Station are largely rural in nature and have been modified by historic industrial and agricultural land uses. The buffer lands currently comprise cleared paddocks featuring exotic and native grasses and patches of remnant native vegetation.

The closest residential properties to the study area are located to the east of the Castlereagh Highway along Springvale Lane and about 150 metres (m) south-east of the site.

Surrounding land is predominantly mapped as 'RU1 – Primary Production' and 'SP2 – Electricity Generating Works' and includes a mixture of residential, industrial, buffer areas and rural land uses, as well as several abandoned open cut mines and operating underground coal mines. Most of the surrounding land is owned by Greenspot, EnergyAustralia, Australian Rail Track Corporation (ARTC), Transport for NSW (TfNSW) and private landowners.

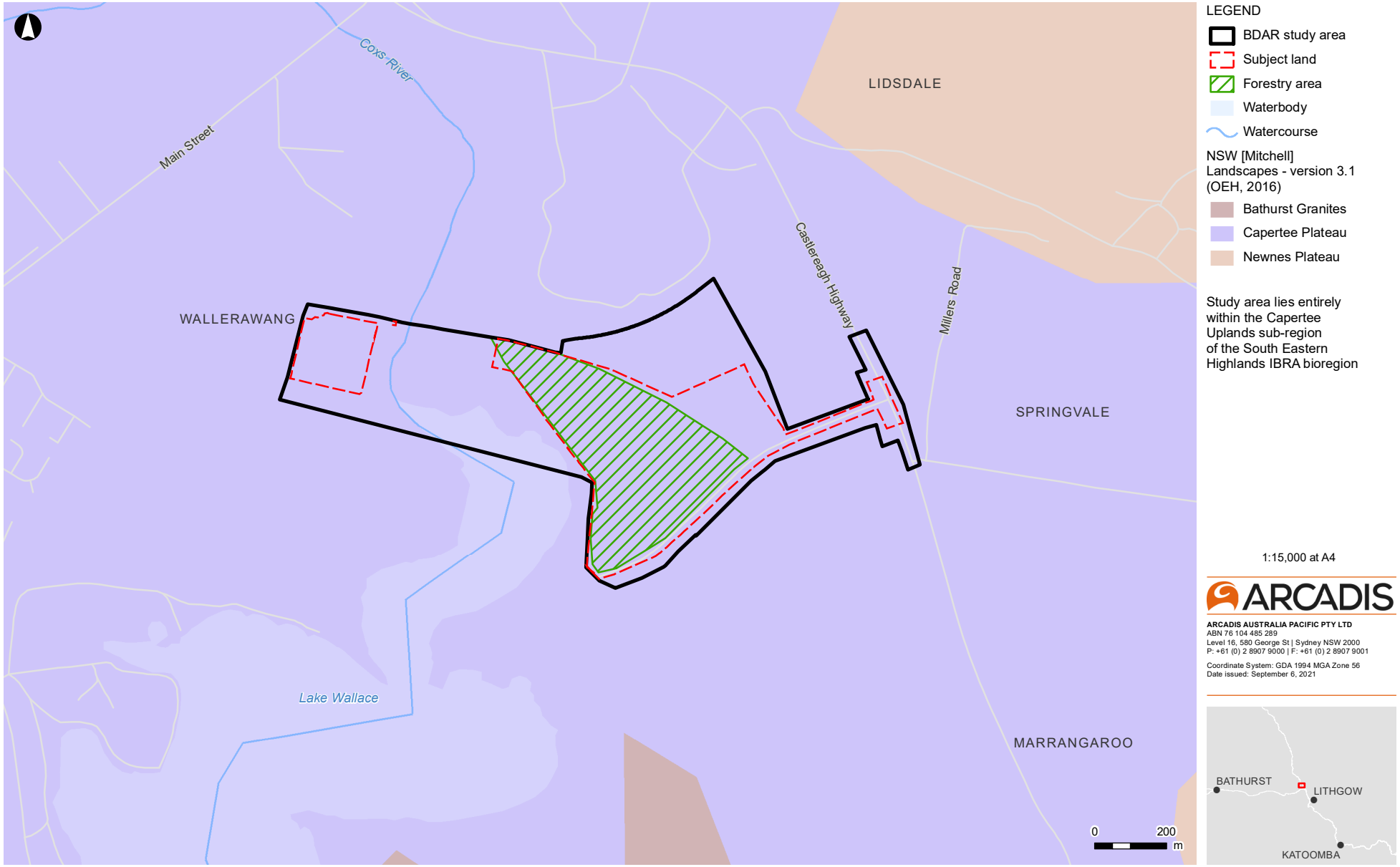

Figure 1-2 Site Map

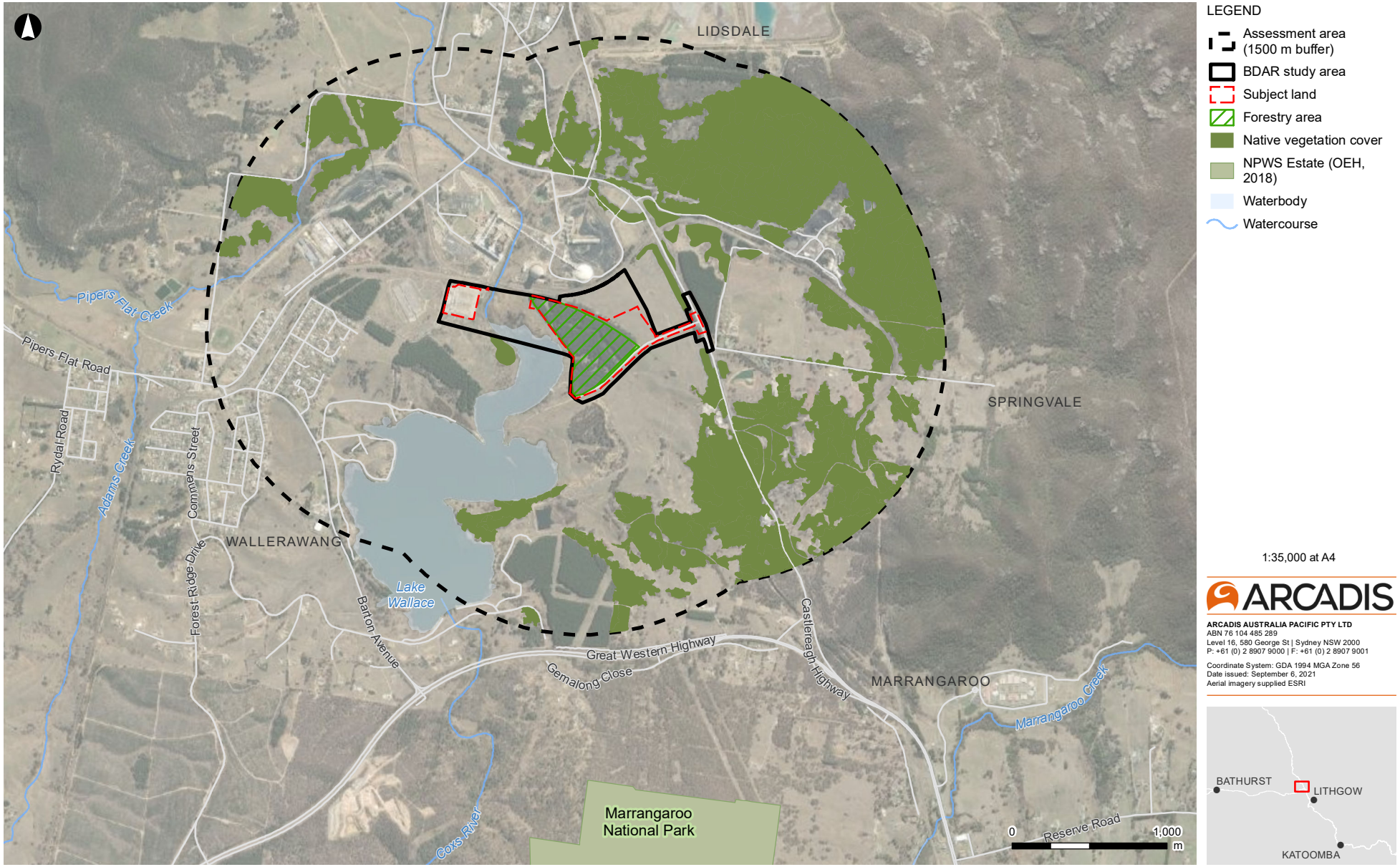

Figure 1-3 Location Map

1.4 Purpose of this report

This BDAR forms part of the EIS being prepared for 'The Wallerawang 9 Battery' and assesses the biodiversity impacts of the Project.

1.5 Personnel and qualifications

Table 1-1 below lists the personnel and their roles in preparation of this BDAR.

Table 1-1: Relevant personnel

Personnel	Qualifications	Experience/Role
Kate Carroll	Bachelor of Science (Honours) (Ecology)	Kate has led and delivered biodiversity assessments for a range of projects, with a focus on linear infrastructure, including road, rail, renewable energy, gas, urban development and waste during the past 13 years as an environmental consultant. With over 19 years of experience in ecological surveys, Kate has extensive knowledge of the flora and fauna of New South Wales. Kate is an Accredited Assessor for the Biodiversity Assessment Method (BAM) under the *Biodiversity Conservation Act 2016*.
Meredith Leal	Bachelor of Environmental Management/Arts (Ecology)	Meredith Leal is an Ecologist with four years of ecological consulting experience and has delivered biodiversity assessments for a range of projects across NSW. She has undertaken extensive flora and fauna surveys including targeted threatened flora surveys, identification of Plant Community Types and Threatened Ecological Communities, and targeted threatened fauna surveys. Meredith has completed numerous technical biodiversity reports under the BAM and is informed in current biodiversity acts and legislation.
Jessica Rooke	Bachelor of Advanced Science (Honours) (Ecology)	Jessica Rooke is an Ecologist with over three years of consulting experience and over seven years' experience in ecological assessment. She has worked on a variety of ecological deliverables for clients and has been heavily involved in large, complex projects across NSW. She is highly skilled in targeted searches for threatened flora and fauna species, particularly microchiropteran bats (microbats), birds and frogs, and has experience setting up specialised trapping equipment and analysing ultrasonic calls. Jessica has prepared numerous technical biodiversity reports, is proficient in the BAM and knowledgeable in current biodiversity acts and legislation.

1.6 Sources of information used

Publicly available documents sourced and considered as part of this assessment include:

- Biodiversity Assessment Methodology Calculator (BAMC) (DPIE, 2021e)
- Biodiversity Assessment Methodology (BAM) (DPIE, 2020a)
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities working draft (DEC, 2004)
- NSW Surveying threatened plants and their habitats (DPIE, 2020b)
- Survey Guidelines for Australia's Threatened Birds (CoA, 2010a), Mammals (CoA, 2011) and Bats (CoA, 2010b)
- 'Species credit' threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method (OEH, 2018)

- State Vegetation Type Map: Central Tablelands Region Version 1.0. VIS_ID 4778 (DPIE, 2017)
- Key Fish Habitat Mapping (DPI, n.d.)
- NSW Soil and Land Information eSPADE (DPIE, 2021c).

In addition, database searches were undertaken by Arcadis in February 2021 to identify State and Commonwealth records of threatened entities and Commonwealth Matters of National Environmental Significance (MNES) that occur or have the potential to occur within 10 kilometres of the study area. Databases and reports interrogated for this purpose are listed below in **Table 1-2**.

Table 1-2: Database searches carried out by Arcadis in February 2021

Database	Purpose of search	Date of database search
NSW BioNet Wildlife Atlas (DPIE, 2021a) *Managed by the NSW Department of Planning, Industry and Environment (DPIE) Environment, Energy and Science (EES) branch (formerly the Office of Environment and Heritage (OEH))*	Used to compile a list of threatened species records listed under the BC Act to within 10 km of the study area (Appendix D, Appendix E).	9 February 2021
Protected Matters Search Tool (DAWE, 2021) *Managed by the Commonwealth Department of Agriculture, Water and the Environment (DAWE)*	Used to compile a list of potentially occurring MNES listed under the EPBC Act to within 10 km of the study area (Appendix C).	9 February 2021
NSW BioNet Vegetation Information System (VIS) Classification database (DPIE, 2021b) *Managed by DPIE (EES)*	Provides information on Plant Community Types (PCTs) and their relationship to a vegetation formation and vegetation class (managed and maintained in the Vegetation Information Systems (VIS) Classification database).	Referenced throughout
NSW BioNet Threatened Species Data Collection (DPIE, 2021g) *Managed by DPIE (EES)*	Contains information for all listed threatened species, populations, and communities.	Referenced throughout
NSW WeedWise (DPIE, 2021f) *Managed by NSW Department of Primary Industries (DPI)*	Identifies species listed as priority weeds for a LGA and their control requirements.	11 June 2021
Fisheries NSW Spatial Data Portal (DPI, 2021a) *Managed by NSW DPI*	Maps threatened fish species distribution in NSW.	11 June 2021
NSW DPI's register of critical habitat (DPI, 2021b) *Managed by NSW DPI*	To identify any critical habitat for threatened fish in proximity to the site.	11 June 2021

1.7 Legislative context and SEARs

Field surveys and the preparation of this assessment have been undertaken in accordance with, or with reference to, the legislative acts and guidelines listed within this section. All work was carried out under the appropriate licenses, including scientific licenses as required under Section 2 of the BC Act (license number SL100646) and in accordance with the Animal Ethics Committee (AEC) (licence TRIM 13/339).

The Secretary's Environment Assessment Requirements (SEARs), which set out the requirements of the EIS, were issued on 18 March 2021 for the Wallerawang 9 Battery (SSD-14540514). SEARs relating to biodiversity, and where they are addressed within this report, are listed below in **Table 1-3.**

Table 1-3: SEARs (Biodiversity) for the Wallerawang 9 Battery (SSD-14540514)

Agency Requirement	Details	Where addressed within this report
DPIE	• An assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the BC Act, the BAM and documented in a BDAR, unless BCD and DPIE determine the proposed development is not likely to have any significant impacts on biodiversity values	This report
	• The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM	Section 7
	• An assessment of the likely impacts on listed aquatic threatened species, populations or ecological communities, scheduled under the *Fisheries Management Act 1994*, and a description of the measures to minimise and rehabilitate impacts	Section 8.5 and Section 9
	• If an offset is required, details of the measures proposed to address the offset obligation.	Section 11
Biodiversity, Conservation and Science (BCS)	Clause 6.31 of the *Biodiversity Conservation Regulation 2017* (BC Reg) provides that when the BAM is amended, a BAR may be prepared based on the prior version of the BAM for the following designated periods: • 12 months for a BDAR in respect of SSD/SSI or standard biocertification • 12 months or longer if approved by the Minister for a BDAR in respect of strategic biocertification • 6 months for BARs in respect of all other development or stewardship applications. A BAR prepared under these arrangements must state that it has been prepared based on the prior version.	This BDAR has been prepared in accordance with the current version of BAM (2020)
	Biodiversity 1. Biodiversity impacts related to the proposed project are to be assessed in accordance with Section 7.9 of the BC Act, the BAM and documented in a BDAR. The BDAR must include information in the form detailed in the BC Act (Section 6.12), BC Reg (Section 6.8) and BAM, unless the Department determine that the proposed development is not likely to have any significant impacts on biodiversity values	This report
	2. The BDAR must document the application of the avoid, minimise, and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM	Sections 7 - 11

Agency Requirement	Details	Where addressed within this report
	3. The BDAR must include details of the measures proposed to address the offset obligation as follows: • The total number and classes of biodiversity credits required to be retired for the development/project • The number and classes of like-for-like biodiversity credits proposed to be retired • The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules • Any proposal to fund a biodiversity conservation action • Any proposal to conduct ecological rehabilitation (if a mining project) • Any proposal to make a payment to the Biodiversity Conservation Fund. If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.	Section 11
	4. The BDAR must be submitted with all spatial data associated with the survey and assessment as per Appendix 11 of the BAM	To be submitted with this report
	5. The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under Section 6.10 of the BC Act	This BDAR has been prepared by Kate Carroll an accredited person under the Biodiversity Conservation Act 2016 (Accreditation number 17070)
	6. Address the impacts of the project on effects to downstream water-dependent fauna and flora including Groundwater Dependent Ecosystems (GDEs).	Section 8.5, Section 0
DPI	DPI have requested a Weed Management Plan (WMP).	To be prepared as part of post-approval documentation

1.7.1 *Environment Protection and Biodiversity Conservation Act 1999*

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places, defined in the EPBC Act as MNES. MNES identified in the Act include:

- World heritage properties
- National heritage places
- Wetlands of international importance (listed under the Ramsar Convention)
- Threatened species and communities

- Migratory species protected under international agreements
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mines).

In accordance with Sections 67 and 67A of the EPBC Act, any works that have the potential to result in an impact on any MNES or on Commonwealth land are considered 'controlled actions' and require a referral to the Federal Minister for the Environment for approval. Consideration of the potential for the proposed Wallerawang BESS development to result in a significant impact to MNES has been addressed in Section 5 of this report.

1.7.2 *Biodiversity Conservation Act 2016*

The purpose of the BC Act is to maintain a healthy, productive, and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development.

The BC Act seeks to establish a framework for assessment and offsetting of development impacts as well as investment in biodiversity conservation, specifically:

- The NSW BOS (established under Part 6 of the BC Act)
- The BAM (established under Section 6.7 of the BC Act).

Entry to the NSW BOS is triggered by developments, projects and activities that meet one or more of the following thresholds for significant impacts:

- Local development assessed under Part 4 of the NSW EP&A Act that triggers the BOS threshold or is likely to significantly affect threatened species based on the 'Test of significance' outlined in Section 7.3 of the BC Act
- SSD and State Significant Infrastructure (SSI) projects, unless the Secretary of the DPIE and the environment agency head determine that the project is not likely to have a significant impact
- Biodiversity certification proposals
- Clearing of native vegetation in urban areas and areas zoned for environmental conservation that exceeds the BOS threshold and does not require development consent
- Clearing of native vegetation that requires approval by the Native Vegetation Panel under the *Local Land Services Act 2013*
- Activities assessed and determined under Part 5 of the EP&A Act (generally, proposals by government entities) if proponents choose to 'opt in' to the Scheme.

Under the NSW BOS, an accredited assessor must apply the BAM in assessing the proposed impacts of the development. The purpose of the BAM is to assess certain impacts on threatened species and Threatened Ecological Communities (TECs), and their habitats, and the impact on biodiversity values, where required under the BC Act.

The proposed Wallerawang 9 Battery is considered to meet the definition of an SSD and development consent is being sought in accordance with Part 4, Division 4.7 of the EP&A Act. On this basis, the project would trigger entry into the BOS and would therefore need to be supported by a BDAR, prepared in accordance with the requirements of the BAM (DPIE, 2020a) as outlined in the corresponding sub-section below.

1.7.3 *Fisheries Management Act 1994*

The NSW *Fisheries Management Act 1994* (FM Act) provides for the protection, conservation, and recovery of threatened species defined under the Act. It also makes provision for the management of threats to threatened species, populations, and ecological communities, as well as the general protection of fish and fish habitat.

Consideration of entities listed under the FM Act, and potential impacts as a result of the proposed Wallerawang 9 Battery development, have been addressed in Sections 2.6 and 0 of this report.

1.7.4 *Biosecurity Act 2015*

The primary objective of the *Biosecurity Act 2015* 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. Division 2 of the *Biosecurity Act 2015* defines local control authorities for weeds. Schedule 1 of the *Biosecurity Act 2015* outlines special provisions relating to weeds, including the duty of land occupiers to control and manage weeds.

Section 2.5 of this report outlines weeds of significance recorded within the study area.

1.7.5 Biodiversity Assessment Method requirements

The BAM (DPIE, 2020a) is the assessment manual that outlines how an accredited person assesses impacts on biodiversity at study areas. The BAM provides:

- A consistent method for the assessment of biodiversity on a proposed development or major project, or clearing site
- Guidance on how a proponent can avoid and minimise potential biodiversity impacts
- The number and class of biodiversity credits that need to be offset to achieve a standard of 'no net loss' of biodiversity.

An accredited assessor must document the results of the BAM in a BDAR. The BDAR identifies how the proponent proposes to avoid and minimise impacts, any potential impact that could be characterised as serious and irreversible (according to specified principles) and the offset obligation required to offset the likely biodiversity impacts of the development or clearing proposal, expressed in biodiversity credits.

The requirements for a BDAR are listed in Appendix 10 (Table 25 and Table 26) of the BAM. **Table 1-4** below identifies where each requirement has been met within this report.

Table 1-4: Minimum information requirements for a BDAR (DPIE, 2020a)

Biodiversity Assessment Method Requirement		Where addressed in this BDAR
Section	**Information to be included**	
Introduction	Identification of study area footprint, including: • Operational footprint • Construction footprint indicating clearing associated with temporary construction facilities and infrastructure.	Section 1.1
	General description of study area.	Section 1.1
	Sources of information used in the assessment, including reports and spatial data.	Section 1.6
Landscape features	Identification of site context components and landscape features, including: • general description of subject land topographic and hydrological setting, geology and soils • percent native vegetation cover in the assessment area • IBRA bioregions and subregions • rivers and streams classified according to stream order • wetlands within, adjacent to and downstream of the site	Section 2

Biodiversity Assessment Method Requirement		Where addressed in this BDAR
Section	**Information to be included**	
	• connectivity of different areas of habitat • karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features • areas of outstanding biodiversity value occurring on the subject land and assessment area • any additional landscape features identified in any SEARs for the proposal • NSW (Mitchell) landscape on which the subject land occurs	
Native vegetation	Identify native vegetation extent within the study area, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery.	Section 3
	Provide justification for all parts of the subject land that do not contain native vegetation	Section 3.7
	Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area	Section 3.1
	Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	Section 3.2
	Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data	N/A
	Describe PCTs within the study area.	Section 3.4
	Perform a vegetation integrity assessment of the study area.	Section 3.5
Threatened species	Identify ecosystem credit species associated with PCTs on the study area.	Section 4
	Identify species credit species on the study area.	Section 4
	From the list of candidate species credit species, identify: • species assumed present within the subject land (if relevant) • species present within the subject land on the basis of being identified on an important habitat map for a species • species for which targeted surveys are to be completed to determine species presence species for which an expert report is to be used to determine species presence	Section 4
	Present the outcomes of species credit species assessments from: • threatened species survey • expert reports (if relevant)	Section 4.3
	Where survey has been undertaken include detailed information on survey method, effort and timing and justification of this method, effort and timing in relation to the requirements in the TBDC or the Department's taxa-specific survey guides. Information on survey personnel, relevant experience and any limitations on the surveys must also be provided.	Section 4.2

Biodiversity Assessment Method Requirement		Where addressed in this BDAR
Section	**Information to be included**	
	Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map).	Section 4.3
	Identify the biodiversity risk weighting for each species credit species identified as present within the subject land	Section 4.3
Prescribed impacts	Identify potential prescribed biodiversity impacts on threatened entities.	Section 6
Avoid and minimise impacts	Demonstration of efforts to avoid and minimise impact on biodiversity values.	Section 7
	Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design.	Section 7
	Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal.	Section 7
Assessment of impacts	Determine the impacts on native vegetation and threatened species habitat.	Section 8.1
	Assessment of indirect impacts on vegetation and threatened species and their habitat.	Section 8.2
	Assessment of prescribed biodiversity impacts.	Section 8.3
Mitigation and management of impacts	Identification of measures to mitigate or manage impacts.	Section 9
Impact summary	Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts.	Section 8.1.4
	Identification of impacts requiring offsets.	Section 10.1
	Identification of impacts not requiring offsets.	Section 10.2
	Identification of areas not requiring further assessment.	Section 10.3
	Ecosystem credits and species credits that measure the impact of the development on biodiversity values.	Section 10.1
Biodiversity credit report	Description of credit classes for ecosystem credits and species credits at the development or clearing site.	Section 11

1.7.6 State Environmental Planning Policy (Koala Habitat Protection) 2021

On 1 March 2020, the *State Environmental Planning Policy (Koala Habitat Protection) 2019* came into effect, repealing the former *State Environmental Planning Policy No. 44 – Koala Habitat Protection* (SEPP 44). On 7 October 2020, the NSW Government announced further amendments to the *State Environmental Planning Policy (Koala Habitat Protection) 2019*. In November 2020, the NSW Government announced plans to revert to operations under the former SEPP 44. However, as of 17 March 2021, a new policy the *State Environmental Planning Policy (Koala Habitat Protection) 2021* (Koala SEPP 2021) came into effect, repealing all former policies.

The Koala SEPP 2021 reinstates the policy framework of the Koala Habitat Protection SEPP (2019) and includes 83 LGAs in NSW. At the time of writing this BDAR, the Koala SEPP 2021:

- Applies to all zones in Metropolitan Sydney (Blue Mountains, Campbelltown, Hawkesbury, Ku-Ring-Gai, Liverpool, Northern Beaches, Hornsby, Wollondilly) and the Central Coast LGAs
- In all other identified LGAs, Koala SEPP 2021 does not apply to land zoned 'RU1 – Primary Production', 'RU2 – Rural Landscape' or 'RU3 – Forestry'. For all RU1, RU2 and RU3 zoned land outside of the Sydney Metropolitan Area and the Central Coast, Koala SEPP 2020 continues to apply. This is an interim measure while new land management and private native forestry codes are developed in line with the NSW government's announcement on 8 March 2021.

The Koala Habitat Protection SEPP aims to "encourage the conservation and management of areas of natural vegetation that provide habitat for Koalas to support a permanent free-living population over their present range and reverse the current trend of Koala population decline". The specific principles of the Koala SEPP 2021 are to:

- Help reverse the decline of koala populations by ensuring koala habitat is properly considered during the development assessment process
- Provide a process for councils to strategically manage koala habitat through the development of Koala Plans of Management (KPOMs).

The study area is located within the City of Lithgow LGA and is zoned 'IN3 – Heavy Industrial' and 'SP2 – Electricity Generating Works'. As this land is not zoned RU1, RU2, or RU3, the Koala SEPP 2021 applies (however, not to all zones as outlined above).

The City of Lithgow LGA is located within the Central and Southern Tablelands Koala Management Area (KMA). The study area is over one hectare and does not have an approved KPOM. As such, Part 2 Clause 11 of the Koala SEPP 2021 applies to the study area:

9 Development assessment process – no approved Koala Plan of Management for land

1) *This clause applies to land to which this Policy applies if the land:*
    a) has an area of at least one hectare (including adjoining land within the same ownership), and
    b) does not have an approved Koala Plan of Management applying to the land.
2) *Before a council may grant consent to a development application for consent to carry out development on the land, the council must assess whether the development is likely to have any impact on koalas or koala habitat.*
3) *If the council is satisfied that the development is likely to have low or no impact on koalas or koala habitat, the council may grant consent to the development application.*
4) *If the council is satisfied that the development is likely to have a higher level of impact on koalas or koala habitat, the council must, in deciding whether to grant consent to the development application, take into account a koala assessment report for the development.*
5) *However, despite subclauses (3) and (4), the council may grant development consent if the applicant provides to the council:*
    a) information, prepared by a suitably qualified and experienced person, the council is satisfied demonstrates that the land subject of the development application:
        i. does not include any trees belonging to the koala use tree species listed in Schedule 2 for the relevant koala management area, or
        ii. is not core koala habitat, or
    b) information the council is satisfied demonstrates that the land subject of the development application:
        i. does not include any trees with a diameter at breast height over bark of more than 10 centimetres (cm), or
        ii. includes only horticultural or agricultural plantations.
6) *In this clause koala assessment report, for development, means a report prepared by a suitably qualified and experienced person about the likely and potential impacts of the development on koalas or koala habitat and the proposed management of those impacts.*

Within the Koala SEPP 2021, definitions are provided for ‘core Koala habitat’ and ‘Koala habitat’. These definitions are as follows:

core koala habitat means—

(a) an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or

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

koala habitat means –

Koala habitat however described in a plan of management under this Policy or a former Koala SEPP and includes core koala habitat.

A total of 39 ‘Koala use tree species’ have been identified in the Koala SEPP 2021 for the Central and Southern Tablelands KMA, of which five species were recorded in the study area for this assessment. While the study area contains potential habitat, no Koalas were present during the time of assessment (see Section 4.3.2). In addition, while one Koala has been documented on the study area within the last 18 years (record from 2004), the individual was recorded in the Forestry area. As such, the study area does not contain ‘core Koala habitat’ or ‘highly suitable Koala habitat’, as defined in the Koala SEPP 2021, and a Koala assessment report does not need to be drafted to accompany the development. Survey methods and results for detecting Koala and potential core Koala habitat are included in Section 4.2 and Section 4.3 below.

2 LANDSCAPE CONTEXT

The following sections describe the landscape features as applicable to the study area.

2.1 IBRA bioregions and subregions

The Interim Biogeographic Regionalisation for Australia (IBRA) bioregion and subregion associated with the study area and the 1500 metre landscape assessment area are mapped above in **Figure 1-2** and **Figure 1-3**. The study area is located within the South Eastern Highlands IBRA bioregion and the Capertee Uplands IBRA subregion.

2.2 Native vegetation cover

Regional vegetation mapping (DPIE, 2017) has been used for the purposes of mapping native vegetation within the 1500 metre buffer area (**Figure 1-3**). Recent aerial imagery was used to validate and refine the native vegetation extent within the 1500 metre buffer, where required. The area of native vegetation cover within the buffer area is outlined below in **Table 2-1**.

Table 2-1: Native vegetation within the study area and 1500 metre buffer

Location	Extent (ha)	Native vegetation extent (ha)	Per cent native vegetation cover
1500 metre buffer area	1431.37	395.14	27.61

2.3 NSW Landscape regions (Mitchell Landscapes)

The study area is located within the Capertee Plateau Mitchell Landscape (SB Capertee Cpt) (DPIE, 2016) (**Figure 1-2**). The Capertee Plateau Mitchell Landscape is characterised by wide valleys, low rolling hills below sandstone cliffs on Permian conglomerates, sandstones, and shales with coal at the base of the Sydney Basin and exposure of underlying Devonian shale, siltstone, or quartzite (DPIE, 2016). In general, elevation is between 800 metres and 1000 metres, with local relief 100 metres to 120 metres. Valleys contain flat top mountains formed as pinnacles or remnant pieces of plateau, with boulder debris and clay matrices below cliffs. Shoulder slopes typically comprise stone pillars above steep canyons on tributary streams falling into gorges. Low-lying areas contain swampy streamlines with organic sands. Soils are shallow stony texture-contrast profiles, usually gritty and well-drained over tough yellow or grey poorly drained clays. Red brown structured loams on basalt are also common.

Open valleys typically contain woodlands of Rough-barked Apple (*Angophora floribunda*), Red Stringybark (*Eucalyptus macrorhyncha*), Red Box (*Eucalyptus polyanthemos*), Yellow Box (*Eucalyptus melliodora*) and Blakely's Red Gum (*Eucalyptus blakelyi*) with shrubby understorey and wallaby grass (*Austrodanthonia* sp.). Scribbly Gum (*Eucalyptus sclerophylla*), Red Stringybark, Red Box and Broad-leaved Ironbark (*Eucalyptus fibrosa ssp. fibrosa*) are common on talus slopes, while Silvertop Ash (*Eucalyptus sieberi*) and Sydney Peppermint (*Eucalyptus piperita*) are dominant on sandstone peaks (DPIE, 2016).

2.4 Cleared areas

The study area covers an area of approximately 61.58 hectares of which 27.24 hectares comprise of cleared areas. As these areas are dominated by exotic vegetation and do not conform with a PCT as listed in the VIS database, they have been categorised as cleared land. These areas are described further in Section 3.7.

2.5 Weeds and feral fauna

Of the 26 exotic species recorded in the study area, two are listed as Priority Weeds (DPIE, 2021f) under the NSW *Biosecurity Act 2015* for the Central Tablelands region, which includes the City of

Lithgow LGA. Of these species, one is also listed as Weeds of National Significance (WoNS) (DPIE, 2021f) (see below **Table 2-2**).

In addition, seven species recorded within the study area are recognised as High Threat Weeds (**Table 2-2**). High Threat Weeds are exotic species which are likely to have a significantly detrimental effect on native vegetation and are used when determining vegetation condition.

Weed species were located in all vegetation zones across the study area, with particularly high abundance in non-PCT vegetation zones.

Table 2-2: Exotic plant species recorded in the study area

Scientific name	Common name	Listed as a WoNS?	Listed as a HTW?	Priority Weed category
Agrostis stolonifera	Creeping Bent	No	No	N/A
Centaurium erythraea	Common Centaury	No	No	N/A
Cirsium vulgare	Spear Thistle	No	No	N/A
Conyza bonariensis	Flaxleaf Fleabane	No	No	N/A
Cyperus eragrostis	Umbrella Sedge	No	Yes	N/A
Echium plantagineum	Patterson's Curse	No	No	N/A
Eragrostis curvula	African Lovegrass	No	Yes	N/A
Hypericum perforatum	St. Johns Wort	No	Yes	N/A
Hypochaeris glabra	Smooth Catsear	No	No	N/A
Hypochoeris radicata	Catsear	No	No	N/A
Lotus uliginosus	Birds-foot Trefoil	No	No	N/A
Paspalum dilatatum	Paspalum	No	Yes	N/A
Pennisetum clandestinum	Kikuyu Grass	No	No	N/A
Phalaris aquatica	Phalaris	No	No	N/A
Pinus radiata	Radiata Pine	No	Yes	N/A
Plantago lanceolata	Lamb's Tongues	No	No	N/A
Pyracantha angustifolia	Orange Firethorn	No	Yes	N/A

Scientific name	Common name	Listed as a WoNS?	Listed as a HTW?	Priority Weed category
Rubus fruticosus sp. agg.	Blackberry complex	Yes	Yes	**Prohibition on dealings** Must not be imported into the State or sold **Regional Recommended Measure** Land managers should mitigate the risk of new weeds being introduced to their land. Land managers should mitigate spread from their land. The plant should not be bought, sold, grown, carried or released into the environment.
Rumex acetosella	Sheep Sorrel	No	No	N/A
Rumex crispus	Curled Dock	No	No	N/A
Salix fragilis	Crack Willow	No	No	**Prohibition on dealings** Must not be imported into the State or sold
Scabiosa atropurpurea	Pincushion	No	No	N/A
Setaria parviflora		No	No	N/A
Setaria pumila	Pale Pigeon Grass	No	No	N/A
Trifolium subterraneum	Subterranean Clover	No	No	N/A
Verbascum thapsus	Great Mullein	No	No	N/A

Feral fauna refers to significant pest animals as described by DPIE, including Feral Cat (*Felis catus*), Feral Deer (e.g. *Cervus timorensis*), Feral Goat (*Capra hircus*), Feral Pig (*Sus scrofa*), European Rabbit (*Oryctolagus cuniculus*), European Red Fox (*Vulpes vulpes*), Wild Dog (*Canis familiaris*), Wild Horse (*Equus caballus*) and Cane Toad (*Rhinella marina*). Two introduced feral fauna species, the European Rabbit and European Red Fox, were recorded within the study area during current surveys. In addition, five introduced (exotic) fauna, the Common Blackbird (*Turdus merula*), Common Starling (*Sturnus vulgaris*), House Sparrow (*Passer domesticus*), Red-whiskered Bulbul (*Pycnonotus jocosus*) and House Mouse (*Mus musculus*) were recorded.

2.6 Rivers and streams

The study area is located within the Warragamba Catchment which stretches north of Lithgow to the head of the Coxs River and south of Goulburn along the Mulwaree River. In total, the Catchment covers an area of 9,050 square kilometres. The study area also receives water as part of the Fish River water supply scheme (WaterNSW, n.d.).

The Coxs River, a perennial river part of the Hawkesbury-Nepean system, is located within the western extent of the study area (**Photograph 1**). Within the study area, the Coxs River is a sixth order stream according to the Strahler stream classification system. It descends 931 metres over its 155 kilometre course, rising in Gardiners Gap, flowing through the Megalong Valley, and reaching its confluence with the Warragamba River to form Lake Burragorang. Various recreation and leisure activities occur on and surrounding the Coxs River; it is renowned particularly for trout fishing. Within the study area, the Coxs River is impounded at Lake Wallace to form a cooling source for the former Wallerawang Power Station, and downstream at Lake Lyall where it is used for water supply. The

Coxs River is mapped both as a 'Sensitive Waterway' under the Lithgow LEP and Key Fish Habitat (DPI, n.d.). Areas of vulnerable groundwater have also been mapped (Lithgow LEP, 2014). While evidence of heightened salinity and heavy metal deposits within the Coxs River have been documented, it remains environmentally significant due to its high biodiversity values (Bowmer, Eberach, Murphy, & Harris, 2007), (Young, et al., 2000), (Judge, 2013).

Lake Wallace is an artificial impoundment of the Coxs River that lies above Wallerawang Dam and is located within the western extent of the study area (**Photograph 2**). Lake Wallace is mapped both as a 'Sensitive Waterway' under the Lithgow LEP and Key Fish Habitat (DPI, n.d.). Areas of vulnerable groundwater have also been mapped (Lithgow LEP, 2014).

2.7 Wetlands

The study area does not support any wetlands, including wetlands listed under the *State Environment Planning Policy (Coastal Management) 2018* (Coastal Management SEPP) or important wetlands listed in the Directory of Important Wetlands in Australia (DIWA). No wetlands of international importance (Ramsar) are located within or near the study area.

2.8 Aquatic habitat

The Coxs River is a sixth order stream present within the study area as outlined above in Section 2.6. Lake Wallace is also present within the western extent of the study area and adjoins the Coxs River. Both waterways are mapped as Key Fish Habitat (DPI, n.d.). The Fisheries NSW Spatial Data Portal (DPI, 2021a) records the freshwater fish community status as poor within the Coxs River and very poor within Lake Wallace. No threatened freshwater fish distributions are located within the Coxs River or Lake Wallace within the study area (DPI, 2021a).

Previously studies have recorded six fish species inhabiting Lake Wallace, including the native Flathead Gudgeon (*Philypnodon grandiceps*) and Australian Bass (*Macquaria novemaculeata*). The Macquarie Perch (*Macquaria australasica*), listed as endangered under the FM Act and EPBC Act, is known from downstream, however has not been recorded in the study area. This is likely due to fragmentation preventing upstream spawning, and competition from Brown Trout (*Salmo trutta*) and Rainbow Trout (*Oncorhynchus mykiss*) stocked in the Lake and Coxs River for recreational fishing (The Ecology Lab, 2007).

Both Lake Wallace and the Coxs River provide habitat for threatened and/or migratory birds, some recorded during the current surveys (**Appendix B)**. In addition, numerous common frogs, birds, and reptiles were recorded inhabiting these areas (**Appendix B**). The study area also supports several soaks, drainage lines, and flooded areas. This includes two unnamed ephemeral waterways within the Forestry area of the study area which have a dense cover of the exotic shrub *Rubus fruticosus subsp. aggregate* (Blackberry) and remain dry for long periods of time (**Photograph 3**). These areas of aquatic habitat provide suitable sheltering, dispersal, foraging and/or breeding habitat for amphibians, and foraging/roosting habitat for birds (**Photograph 4**). Therefore, while they provide habitat for common fauna species, they are not considered to be areas of high value fauna habitat.

Photograph 1: Coxs River impounded at Lake Wallace within the study area. Open areas of water and vegetation instream and along banks provides suitable habitat for a range of common, threatened and/or migratory fauna.

Photograph 2: Lake Wallace within the study area, supporting suitable habitat for several threatened and migratory bird species.

Photograph 3: Ephemeral waterway within the Forestry area with high cover of *Rubus fruticosus subsp. aggregate*

Photograph 4: Flooded areas within the study area providing suitable habitat for common amphibians.

2.9 Connectivity features

The BAM (DPIE, 2020a) defines connectivity as a *measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation*. Patches of remnant vegetation within the study area have been fragmented and exist in narrow, isolated bands along the Castlereagh Highway, east of the pine plantation, and adjacent to the Coxs River/lake Wallace in the western extent of the site. The Castlereagh Highway (adjacent to the eastern boundary), existing infrastructure of the old

Wallerawang Power Station (adjacent to the northern boundary), cleared areas (including in the eastern extent of the study area), and surrounding rural and residential development provide potential barriers to habitat connectivity and likely restrict connectivity to more mobile fauna (e.g. birds and bats).

2.10 Areas of geological significance and soil hazard features

The study area does not contain any areas of geological significance, including crevices, cliffs, karst, or caves. The nearest areas of geological significance lie approximately 700 metres to the west of the site, on the Newnes Plateau.

The study area is situated on three soil landscape types 'Lithgow', 'Cullen Bullen' and 'Disturbed Terrain' (DPIE, 2021c). The Lithgow soil landscape type predominately covers the area between the Castlereagh Highway and western edge of the pine plantation, while the Cullen Bullen soil landscape covers areas around the Coxs River/Lake Wallace, and Disturbed Terrain is in the northern extent of the study area, adjacent to the former Wallerawang Power Station. **Table 2-3** below summarises landscape, soil, and hazard features of each soil landscape type within the study area.

Table 2-3: Summary of soil landscape types within the study area and their and associated descriptions

Soil landscape type	Landscape	Soils	Hazards
Lithgow	Flat to undulating rises and broad valley floors on Illawarra Coal Measures and the Berry Formation. Local relief to 20 m. Slopes <10%. Elevation approximately 800 – 1000 m. Localised rock outcrop. Extensively cleared open-forest and open-woodland.	Moderately deep (<120 cm) Red Podzolic Soils, Yellow Podzolic Soils and Yellow Leached Earths on upper slopes and well-drained areas. Moderately deep to deep (>170 cm) Solods/Yellow Solodic Soils on lower slopes and in areas of poor drainage.	Hardsetting topsoils, high run-on, localised mine subsidence district, localised rock fall hazard, localised high potential aluminium toxicity.
Cullen Bullen	Rolling low hills and rises on Illawarra Coal Measures and the Berry Formation. Slopes 10 – 25%, local relief <50 m, elevation 550 – 1050 m. Localised rock outcrop. Extensively cleared open-forest and open-woodland.	Shallow to moderately deep (<100 cm) Yellow Podzolic Soils and Yellow Earths on crests; moderately deep (<100 cm) Yellow Podzolic Soils, Soloths and Yellow Leached Earths on upper and midslopes. Moderately deep to deep (50 – 150 cm) Yellow Solodic Soils and Yellow Podzolic Soils on lower slopes near and along narrow (<20 m) drainage lines. Shallow (<80 cm) Yellow Earths and Lithosols associated with low scarps.	Hardsetting topsoils, high water erosion hazard, localised mine subsidence district, high run-on, rock outcrop, localised rock fall hazard and localised high foundation hazard.
Disturbed Terrain	Varies from level plains to undulating terrain and has been disturbed by human activity to a depth of at least 100 cm. The original soil has been removed, greatly disturbed, or buried. Most of	N/A	Dependent on nature of fill material and may include mass movement hazard (subsidence), soil impermeability leading to poor drainage, low fertility and toxic material. Care must be taken

Soil landscape type	Landscape	Soils	Hazards
	these areas have been levelled to slopes of <5%. Landfill includes a wide variety of soil, rock, building and waste material. The original vegetation has been completely cleared.		when these sites are developed. A survey at a suitable scale as well as geotechnical analysis should be undertaken. Advice from local councils should be sought concerning individual areas of disturbed terrain.

2.11 Areas of Outstanding Biodiversity Value (AOBVs)

Areas of Outstanding Biodiversity Value (AOBVs), as defined under the BC Act, are currently limited to areas previously declared as critical habitat under the TSC Act. No AOBVs occur within or surrounding the study area. The closest AOBV to the study area is the Wollemi Pine declared area (critical habitat of the critically endangered Wollemi Pine in Wollemi National Park), approximately 56 kilometres north-east of the study area.

3 NATIVE VEGETATION

3.1 Regional vegetation mapping

The regional vegetation mapping dataset *State Vegetation Type Map: Central Tablelands Region Version 1.0. VIS_ID 4778* (DPIE, 2017) provides classification of native vegetation types across the Central Tablelands, including the vegetation within and surrounding the study area.

This vegetation mapping does not identify any Plant Community Types (PCTs) as being present within the study area, instead classifying all areas as non-native. Within 600 metres of the study area four PCTs have been mapped. These include:

- Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands; South Eastern Highlands Bioregion (PCT 677)
- Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills; South Eastern Highlands Bioregion (PCT 731)
- Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion (PCT 732)
- Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands; South Eastern Highlands Bioregion (PCT 1093)

Regional vegetation mapping of the study area and immediately surrounding area is shown in **Figure 3-1.**

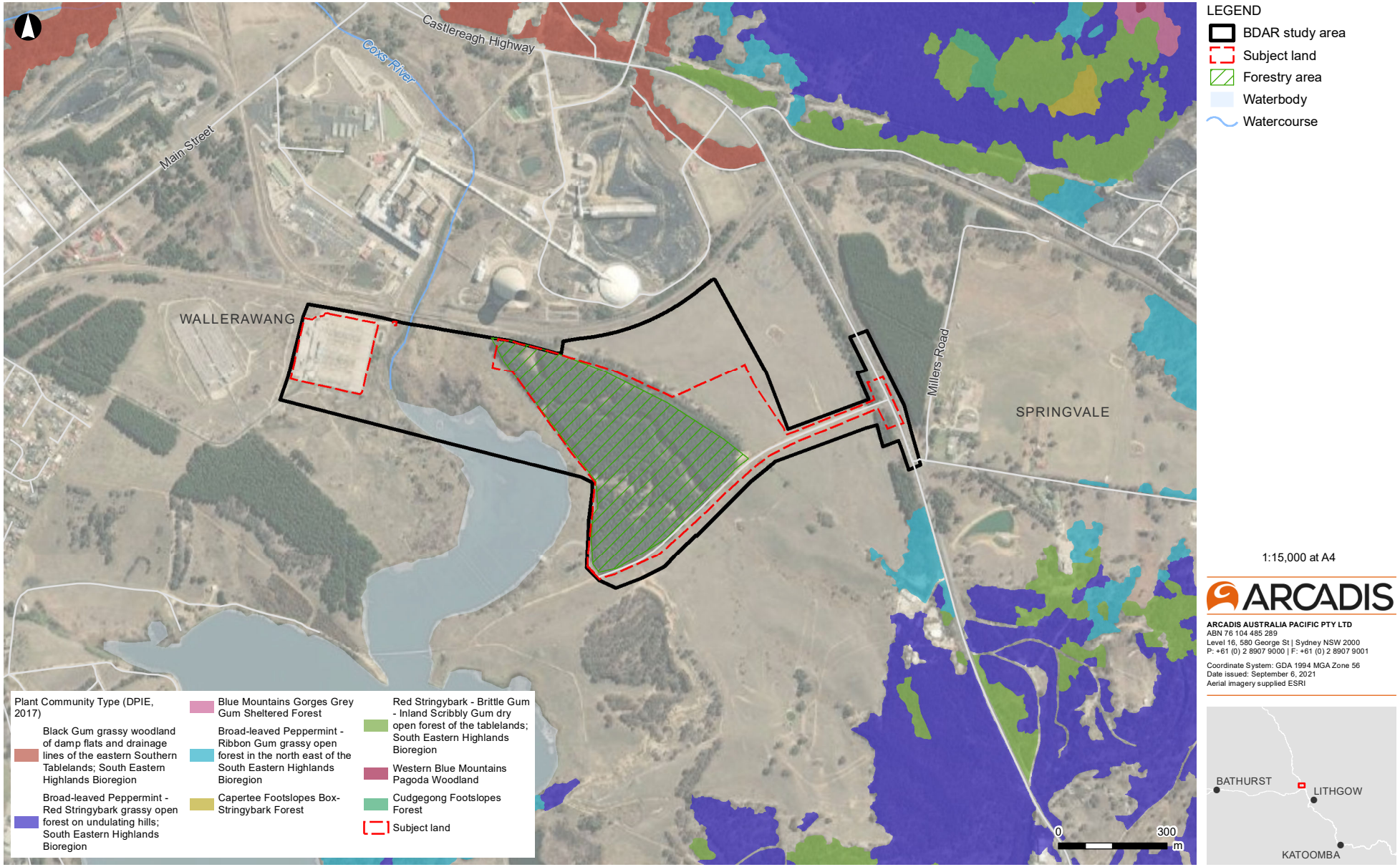

Figure 3-1 Regional Vegetation Mapping (DPIE, 2017)

3.2 Survey method

3.2.1 Survey timing

Field surveys of the study area were carried out by Arcadis ecologists

over six days between February and April 2021.

Weather conditions were mild and mostly clear throughout the survey period with minimal rainfall during the time of surveys. There was a large amount (>150 mm) of rainfall prior to surveys at the end of March, however this did not limit survey effort. Weather records from Marrangaroo (Defence) (station 063308), the closest weather station approximately 4 kilometres from the study area, for the surveyed dates are detailed below in **Table 3-1**.

Table 3-1: Weather conditions during survey periods (BOM, 2021)

Date	Temperature		Rain	Accumulated rainfall one week prior to date	Maximum wind gust	
	Min (°C)	Max (°C)	(mm)	(mm)	Direction	Speed (km/h)
11 February 2021	12.4	25.8	0.0	10.2	NNW	19
5 March 2021	8.0	23.2	0.0	5.0	ENE	26
24 March 2021	14.2	20.8	6.2	161.6	W	46
25 March 2021	12.4	20.5	0.0	156.8	SW	41
15 April 2021	4.5	18.8	0.0	0.0	W	30
16 April 2021	4.1	17.7	0.0	0.0	SE	24

3.2.2 Vegetation mapping and PCT identification

Vegetation was classified and mapped during surveys with reference to regional vegetation mapping of the area (DPIE, 2017).

During this assessment, the vegetation was initially stratified based on the composition of the canopy and vegetation structure (key elements in PCT assignment). It was then compared to recognised and accepted PCTs, as described in the BioNet Vegetation Information System (VIS) Classification database (DPIE, 2021b). The identification of PCTs and vegetation types in the study area was predominantly based on:

- Structure and species composition consistent with descriptions in the VIS Classification database and other published references
- Characteristic tree species present
- Previous regional mapping as an equivalent vegetation type
- Landscape position.

3.2.3 BAM vegetation integrity plots

Seven vegetation integrity plots were used to sample the vegetation of the study area. This quantitative site survey was conducted in accordance with the methodology described in the BAM as

summarised in **Table 3-2** below. **Figure 3-2** illustrates the plot layout of nested 20 metres by 50 metres, 20 metres by 20 metres and 1 metre by 1 metre sub-quadrats used for the assessment of condition attributes at the plot site.

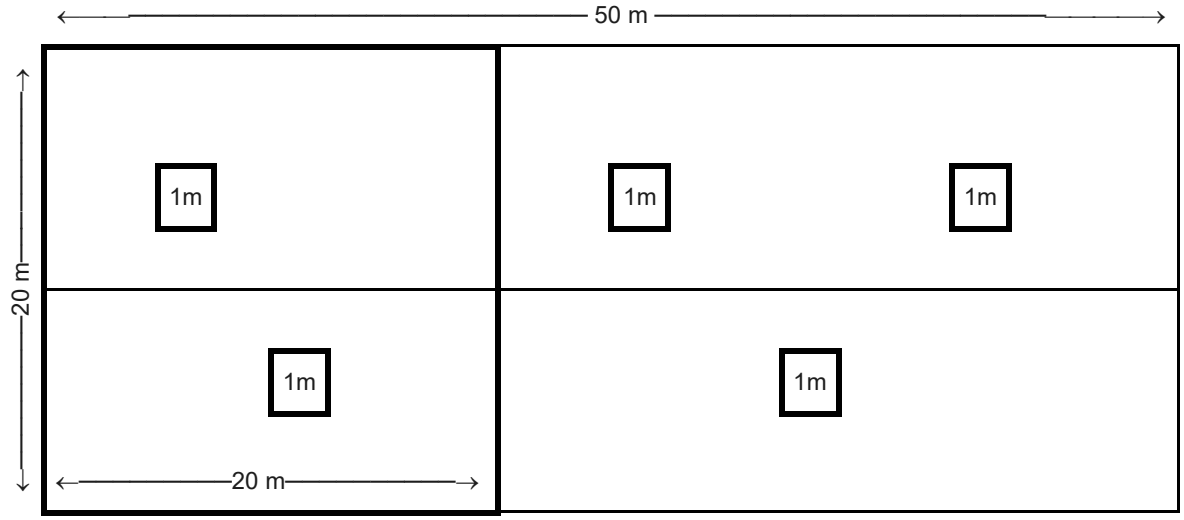

Figure 3-2 Schematic diagram illustrating the vegetation plot layout

Flora species identified in the vegetation plot are listed in the flora species inventory provided in **Table 3-2**. The location of the vegetation plots are shown in **Figure 3-3**.

Table 3-2: Data collected from vegetation integrity plots

Attribute	Data collected
Location	Geographic co-ordinates (easting and northing; grid type MGA 94, Zone 56) – collected using GPS
Native and exotic species richness and cover	All plant species identified within the 20-metre x 20-metre nested quadrat were recorded. The cover (percentage of area of quadrat covered) and abundance of each species present was estimated. The growth form, stratum/layer and whether each species was native, exotic, or a high threat weed was recorded.
Number of trees with hollows	The number of living and dead trees with hollows within the 50-metre x 20-metre quadrat was recorded. A hollow was only recorded if: (a) the entrance could be seen; (b) the estimated entrance width was at least five centimetres; (c) the hollow appeared to have depth; (d) the hollow was at least one metre above the ground; and the (e) the centre of the tree was located within the sampled quadrat.
Tree stem size diversity and number of large trees	Tree stem size diversity was recorded by measuring the diameter at breast height (dbh) (i.e. 1.3 metres from the ground) of living trees (greater than five centimetres dbh) within each 50-metre x 20-metre quadrat. For multi-stemmed living trees, only the largest stem was included in the count. The number of large trees was determined by counting all trees with a dbh greater than the specified dbh of large trees for each vegetation formation, as noted in the VIS Classification Database (DPIE, 2021b).
Evaluation of regeneration:	Presence/absence of overstorey species present at the site that were regenerating (defined as seedlings or saplings with a dbh less than or equal to five centimetres).

Attribute	Data collected
Total length of fallen logs	Cumulative total of logs within each 50-metre x 20-metre quadrat with a diameter of at least 10 centimetres and a length of at least 0.5 metres.
Litter cover	Estimation of the average percentage groundcover of litter (i.e. leaves, seeds, twigs, branchlets and branches with a diameter less than 10 centimetres which is detached from a living plant) from within five sub-plots that measured one metre x one metre square spaced evenly on either side of the 50 metre central transect.

3.3 Survey effort

Native vegetation within the study area was classified into PCTs and then separated into vegetation zones based on broad condition classes. The size of each vegetation zone determines the sampling effort required, as outlined in Table 3.1 of the BAM. **Table 3-3** below provides a summary of the vegetation zones present within the study area and subject land and the sampling effort that was applied. A total of seven BAM plots were completed.

Table 3-3: Comparison of number of transects/plots required and completed per Vegetation Zone

Vegetation Zone	Vegetation zone area study area (ha)	Vegetation zone area subject land (ha)	BAM plot requirements	Number of plots completed
677_Good	1.7	0.91	1	1
677_Moderate	0.7	0.24	1	1
723_Good	0.2	0	0	1
1299_Moderate	5.08	0	0	2
Cleared exotic grassland	27.24	6.47	N/A	1
Exotic roadside vegetation	0.17	0.01	N/A	1
Total				**7**

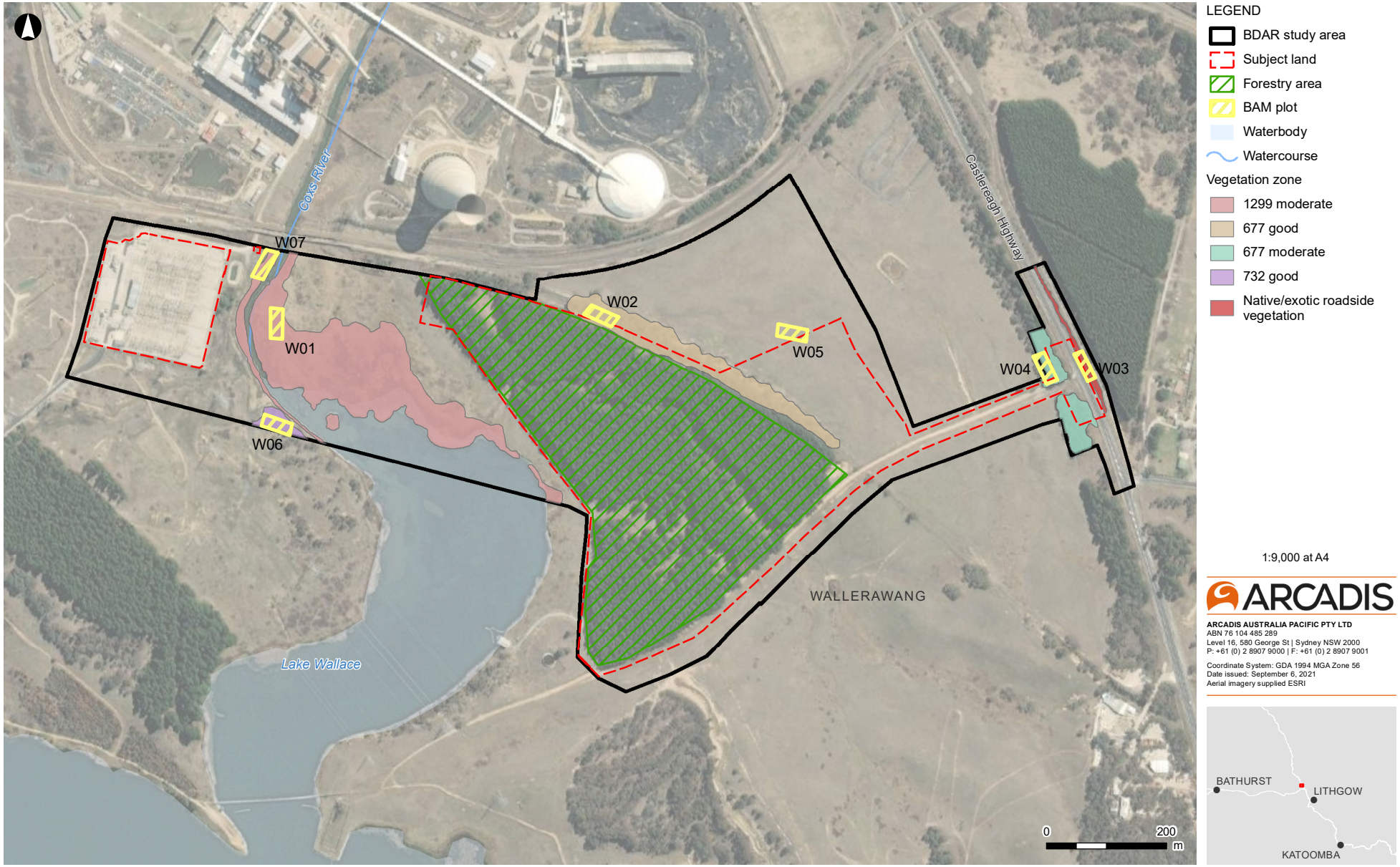

Figure 3-3 Vegetation Survey Effort

3.4 Plant Community Types present

Following the vegetation surveys, it was identified that three PCTs occur within the study area. The location of these PCTs is shown in the ground truthed vegetation mapping (**Figure 3-4**) and their extent within the study area is listed in **Table 3-4**.

Table 3-4 PCTs within the study area from ground-truthed vegetation mapping

PCT No.	PCT Name	Area within study area (ha)
677	Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands; South Eastern Highlands Bioregion	2.4
732	Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion	0.2
1299	Wetlands on alluvial valley floors of the South Eastern Highlands Bioregion	5.08

3.4.1 Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands; South Eastern Highlands Bioregion (PCT 677)

Table 3-5: Attribute information for PCT 677 in the study area

Attribute	PCT 677 in the study area
Vegetation formation	Grassy Woodlands
Vegetation class	Subalpine Woodlands
PCT Name	Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands; South Eastern Highlands Bioregion
PCT	677
BVT	CW236; HN504; LA229; MR661; SR514;
Conservation status	BC Act: not listed EPBC Act: not listed
Estimate of percent cleared	95 %
Condition	Moderate to good
Extent in the study area (ha)	2.4
Quadrats completed in vegetation zones	Two (W02, W04)
Species relied upon for PCT identification	*Eucalyptus aggregata, Eucalyptus pauciflora, Eucalyptus stellulata*

Description: Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands; South Eastern Highlands Bioregion (PCT 677) is recognised as an open woodland with a densely grassy groundlayer and a sparse to absent shrub layer. It occurs on drainage lines and associated flats within the south eastern highlands bioregion (DPIE, 2021b).

The canopy of PCT 677 typically is dominated by *Eucalyptus aggregata* (Black Gum) with *Eucalyptus pauciflora* (White Sally) and *Eucalyptus stellulata* (Black Sally) also present. While the shrub layer is

often absent, the PCT may contain a sparse shrub layer of *Acacia dealbata* (Silver Wattle), *Kunzea ericoides* (Burgan), *Kunzea parvifolia* (Violet Kunzea) and *Melaleuca parvistaminea.* The groundlayer is dominated by grasses such as *Amphibromus neesii, Imperata cylindrica* (Blady Grass) and *Themeda triandra* (Kangaroo Grass) (DPIE, 2021b).

Within the study area, PCT 677 is present along the Castlereagh Highway and bordering the eastern edge of the Forestry area in the central section of the study area (**Figure 3-4**). PCT 677 occupies a total of 2.4 hectares within the study area. The patches of PCT 677 are located on areas mapped as the Lithgow soil landscape which is associated with broad valley floors and flat to undulating rises.

The canopy of PCT 677 within the study area is characterised by the presence of *Eucalyptus aggregata* (Black Gum) with *Eucalyptus pauciflora* (Snow Gum), *Eucalyptus bridgesiana* (Apple Box) and *Eucalyptus stellulata* (Black Sally) also frequently occurring. Planted individuals of the exotic tree *Pinus radiata* (Radiata Pine) are abundant along the Castlereagh Highway however juvenile and mature Eucalypts are scattered throughout this area. While some of these Eucalypts are planted, many are also remnant or regenerating. A shrub layer is largely absent within PCT 677 in the study area, with *Acacia rubida* (Red-stemmed Wattle) sparsely occurring along Castlereagh Highway and *Hibbertia obtusifolia* (Hoary Guinea Flower) and *Cassinia quinquefaria* also present in low abundance across PCT 677. The exotic *Rubus fruticosus aggregate* (Blackberry) forms a dense thicket within the western patch of PCT 677 and is also sparsely present along the Castlereagh Highway.

The ground layer of PCT 677 within the study area is dominated by native and exotic grasses, particularly the native *Amphibromus neesii, Rytidosperma tenuius* and *Aristida ramosa* (Purple Wiregrass) and exotic grass *Phalaris aquatica* (Phalaris). Native forbs present include *Einadia nutans* (Climbing Saltbush), *Oxalis perennans* and *Euchiton involucratus* (Star Cudweed).

PCT 677 within the study area forms two vegetation zones; 677_good and 677_moderate (**Figure 3-5**). 677_good is situated within the central section of the study area bordering the Forestry area and 677_moderate occurs along the Castlereagh Highway. While the canopy of 677_good is intact with a high cover of native Eucalyptus species, 677_moderate has a disturbed canopy with a mixture of exotic and native species. Similarly, the groundcover of 677_good is high in native species, while the groundcover of 677_moderate has a higher cover of exotic species.

Justification: This vegetation has been identified as PCT 677 due to the associated characteristic species and landscape position. The dominant canopy species present are strongly associated with PCT 677, in particular *Eucalyptus aggregata.* PCT 677 is also associated with drainage lines and associated flats. The study area is situated on a flat associated with the Coxs River and the patches of PCT 677 within the study area are located on the Lithgow soil landscape which is also associated with this landscape position. This vegetation has therefore been identified as PCT 677.

Photograph 5 677_good in the study area with a high number of native species and canopy of Eucalyptus species.

Photograph 6 677_moderate within the eastern extent of the study area with a mixed canopy of exotic and native species

3.4.2 Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion (PCT 732)

Table 3-6: Attribute information for PCT 732 within the study area

Attribute	PCT 732 in the study area
Vegetation formation	Grassy Woodlands
Vegetation class	Southern Tableland Grassy Woodlands

Attribute	PCT 732 in the study area
PCT Name	Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion
PCT	732
BVT	HN515
Conservation status	BC Act: not listed EPBC Act: not listed
Estimate of percent cleared	65 %
Condition	Moderate
Extent in the study area (ha)	0.2
Quadrats completed in vegetation zones	One (W06)
Species relied upon for PCT identification	*Eucalyptus bridgesiana*

Description: Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion (PCT 732) is recognised as an open forest occurring on undulating granite tablelands of the upper Coxs and Abercrombie River valleys between elevations of 600 metres and 1100 metres (DPIE, 2021b).

The canopy of PCT 732 is typically characterised by the presence of *Eucalyptus dives* (Broad-leaved Peppermint), *Eucalyptus viminalis* (Ribbon Gum), *Eucalyptus pauciflora* and *Eucalyptus bridgesiana.* The shrub layer is often sparse and may include *Acacia dealbata, Bossiaea buxifolia* and *Bursaria spinosa subsp. spinosa.* (Native Blackthorn) while the groundcover is dominated by grasses.

Within the study area, PCT 732 is situated in a patch in the south western extent, covering a total of 0.2 hectares (**Figure 3-4**). The elevation here is approximately 880 metres, and the soil landscape is Cullen Bullen, which is associated with rolling low hills and rises on Illawarra Coal Measures and the Berry Formation.

The canopy of PCT 732 within the study area consists of both planted and remnant Eucalyptus species with *Eucalyptus bridgesiana* and *Eucalyptus mannifera subsp. Praecox* dominant. A shrub layer is largely absent, with native species *Cassinia quinquefaria* and exotic species *Rubus fruticosus aggregate* sparsely occurring (Photograph 6). The ground layer is dominated by exotic species, in particular *Plantago lanceolata* (Lamb's Tongues) and *Hypericum perforatum* (St John's Wort). Native species cover in the ground layer is fairly low however there is relatively high diversity with the presence of native grasses including *Rytidosperma tenuis, Bothriochloa macra* (Red Grass) and *Panicum effusum* (Hairy Panic) and native forbs including *Euchiton involucratus* (Star Cudweed), *Oxalis perennans* and *Geranium solanderi* (Native Geranium).

PCT 732 within the study area forms one vegetation zone, 732_moderate (**Figure 3-5**).

Justification: The patch of vegetation comprises a canopy of both planted and remnant Eucalyptus species and as a result does not neatly fit into a PCT as described in the Vegetation Classification Database. It has been assigned to PCT 732 based on the dominant canopy tree of *Eucalyptus bridgesiana* which is associated with PCT 732 as well as the landscape position of the vegetation patch. With a sparse shrub layer and grassy groundcover, the structure of the vegetation is also consistent with PCT 732. Furthermore, PCT 732 has been mapped in close proximity to this vegetation patch (DPIE, 2017).

Photograph 7 PCT 732 in the study area with a sparse shrub layer.

3.4.3 Wetlands on alluvial valley floors of the South Eastern Highlands Bioregion (PCT 1299)

Table 3-7: Attribute information for PCT 1299 within the study area

Attribute	PCT 1299 in the study area
Vegetation formation	Freshwater Wetlands
Vegetation class	Montane Lakes
PCT Name	Wetlands on alluvial valley floors of the South Eastern Highlands Bioregion
PCT	1299
BVT	LA214
Conservation status	BC Act: not listed EPBC Act: not listed
Estimate of percent cleared	90 %
Condition	Moderate
Extent in the study area (ha)	5.08
Quadrats completed in vegetation zones	Two (W01, W07)
Species relied upon for PCT identification	*Phragmites australis*

Description: Wetlands on alluvial valley floors of the South Eastern Highlands Bioregion (PCT 1299) is recognised as a wetland community lacking an upper stratum and a middle stratum dominated by *Phragmites australis* (Common Reed), *Eleocharis sphacelata* (Tall Spike Rush) and *Eleocharis acuta.* The ground layer typically contains species associated with wetlands and aquatic environments including *Myriophyllum spp., Carex spp., Lachnagrostis filiformis* and *Epilobium billardiereanum* (DPIE, 2021b).

Within the study area, PCT 1299 is situated on the fringes of Lake Wallace and the Coxs River (Figure 3-4). These areas appear to experience regular inundation and are situated within low lying areas in the landscape. PCT 1299 covers a total of 5.08 hectares within the study area.

An upper stratum in PCT 1299 within the study area is largely absent except for the exotic tree *Salix fragilis* (Crack Willow) which are scattered throughout PCT 1299. *Phragmites australis* is the dominant species within PCT 1299 in the study area, with *Typha orientalis* (Broadleaf Cumbungi) also highly abundant. Exotic shrub *Rubus fruticosus aggregate* is present throughout this PCT, and often forms dense thickets on the border of PCT 1299. Exotic species dominate the lower stratum, with *Phalaris aquatica, Rumex crispus* (Curled Dock), *Setaria pumila* (Pale Pigeon Grass) and *Plantago lanceolata* (Lamb's Tongues) frequently occurring.

Within the study area, PCT 1299 forms one vegetation zone, 1299_moderate (**Figure 3-5**).

Justification: PCT 1299 has been assigned to this area of vegetation based on the dominance of *Phragmites australis* which is strongly associated with PCT 1299 as well as the landscape position. The location of this vegetation along the fringes of Lake Wallace and Coxs River as well as the presence of species associated with wetland and aquatic environments, results in this vegetation being classified as a wetland community. This is consistent with PCT 1299 which is recognised as wetlands on alluvial valley floors. This vegetation has therefore been classified as PCT 1299.

Photograph 8 *Rubus fruticosus aggregate* abundant within PCT 1299

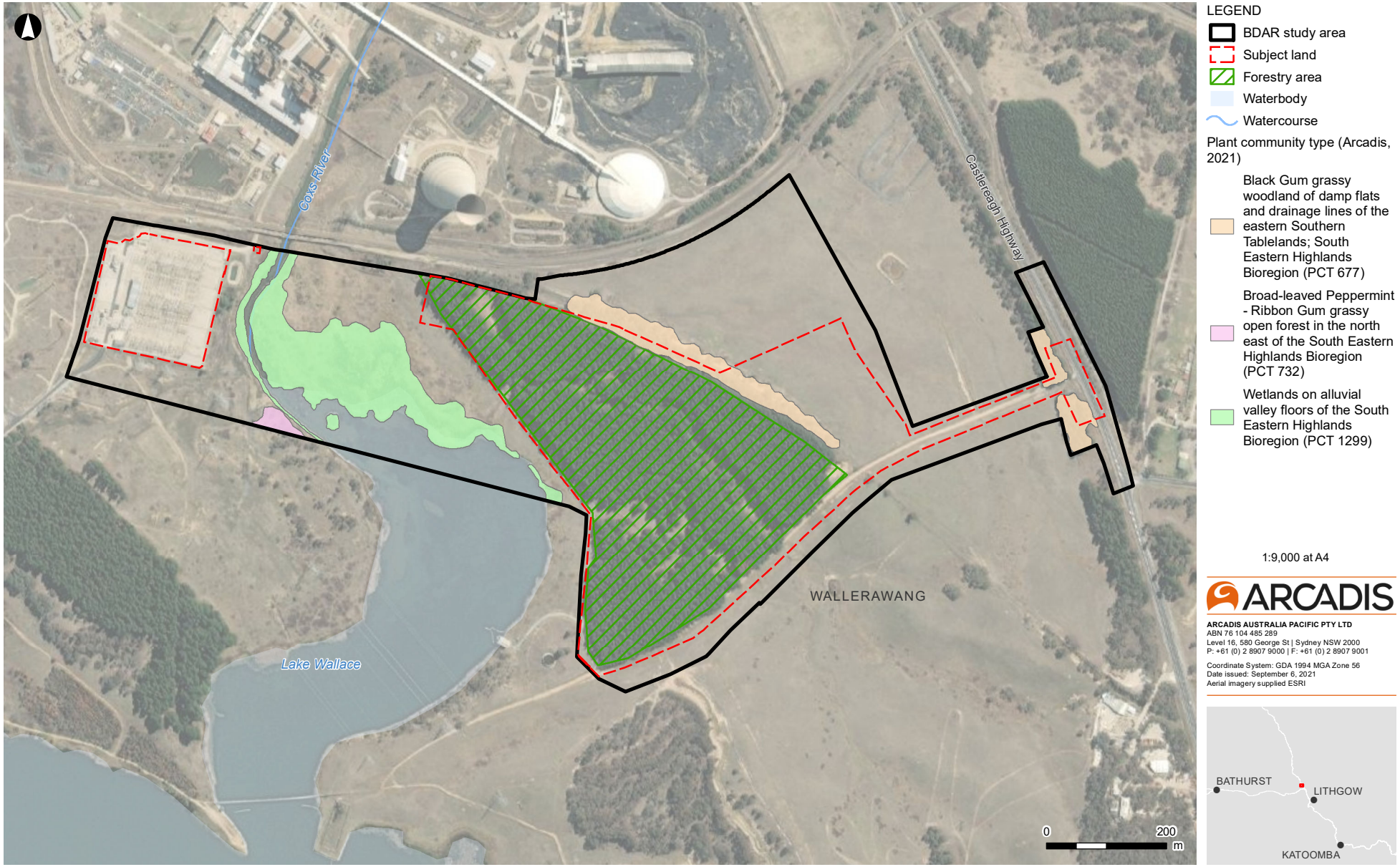

Figure 3-4 Plant Community Types (Arcadis, 2021)

3.5 Vegetation integrity assessment

The vegetation integrity score is a measure of the condition of native vegetation and is assessed for each vegetation zone by calculating the scores for the composition, structure and function attributes collected in plots within the vegetation zone against the benchmark values for the associated PCT.

The vegetation plot data was entered into the BAM credit calculator to generate vegetation integrity scores. The results of the BAM credit calculator and composition, structure, function and vegetation integrity scores for each vegetation zone is shown in **Table 3-8**.

According to section 9.2.1 of the BAM (DPIE, 2020a) the assessor must determine an offset for all impacts of proposals on PCTs that are associated with a vegetation zone that has a vegetation integrity score of:

- ≥15, where the PCT is representative of an EEC or a CEEC
- ≥17, where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community
- ≥20, where the PCT does not represent a TEC and is not associated with threatened species habitat.

All native vegetation has an integrity score above 17 and therefore requires offsets to be calculated where impacts occur.

Table 3-8 Vegetation integrity scores for vegetation zones within the study area

PCT	Vegetation zone	Composition condition score	Structure condition score	Function condition score	Vegetation integrity score
677	677_Good	33.8	35.9	80.1	46
	677_Moderate	14.1	32.6	30	23.9
732	732_Moderate	30.1	31.4	43.8	34.6
1299	1299_Moderate	17.5	54.1	n/a	30.8

3.6 Threatened Ecological Community assessment

A search of the BioNet Wildlife Atlas (DPIE, 2021a) identified six TECs that are predicted to have the potential to occur within 10 kilometres of the study area:

- *Blue Mountains Basalt Forest in the Sydney Basin Bioregion* – endangered under the BC Act and EPBC Act
- *Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion* – critically endangered under the BC Act
- *Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions* – endangered under the BC Act and EPBC Act
- *Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions* – endangered under the BC Act
- *Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions* – critically endangered under the BC Act
- *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions* – critically endangered under the BC Act and EPBC Act.

In addition, the Protected Matter Search Tool (PMST) (DAWE, 2021) identified three TECs listed under the EPBC Act that are predicted to occur within one kilometre of the site:

- *Natural Temperate Grassland of the South Eastern Highlands* – critically endangered under the EPBC Act
- *Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion* – endangered under the EPBC Act
- *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions* – critically endangered under the BC Act and EPBC Act.

Section 3.4 identifies that three PCTs (PCT 677, PCT 732 and PCT 1299) were recorded within the study area. The BioNet Vegetation Classification database (DPIE, 2021b) provides a description of each approved PCT within NSW, including its equivalence with NSW and Commonwealth listed TECs. Notwithstanding, these equivalences must be treated with caution as they are applied at a high level and do not necessarily capture the nuance of every TEC permutation. Instead, the Final Determination (BC Act) and Commonwealth Conservation Advice/Listing Advice (EPBC Act) must be relied upon when determining whether an observed PCT is consistent with the legal definition of that TEC.

PCT 677 and PCT 732 do not correspond to any TECs listed under the BC Act or EPBC Act.

PCT 1299 is listed in the VIS database as corresponding to the TEC Upland Wetlands of the Drainage Divide of the New England Tableland Bioregion, listed as endangered under the EPBC Act. The distribution of this TEC is confined to the New England Tableland Bioregion. As the study area is situated within the South East Highlands Bioregion, this TEC does not apply to PCT 1299 within the study area. There are no associated TECs for PCT 1299 listed under the BC Act.

3.7 Other vegetation types

Two vegetation types that do not conform to the definition of any PCTs were also identified within the study area. These vegetation types were cleared exotic grassland and exotic roadside vegetation.

3.7.1 Cleared exotic grassland

Extent in the study area: 27.24 hectares

Plots completed: One (Q05)

Growth form	Typical species
Trees	N/A
Shrubs	*Rubus fruticosus aggregate*, Verbascum thapsus*, Pyracantha angustifolia**
Grass and grass like	*Paspalum dilatatum*, Phalaris aquatica*, Setaria parviflora**
Forb	*Hypochaeris glabra*, Hypericum perforatum*, Cirsium vulgare*, Conyza bonariensis*, Helichrysum rutidolepis*
Fern	N/A
Other	N/A

* = exotic species

Description: A large portion of the study area contains vegetation in the form of cleared exotic grassland (**Figure 3-5**). This covers a total of 27.24 hectares across the study area. These areas have been historically cleared and are highly disturbed. A canopy is absent within this vegetation zone while a shrub layer, when present, is dominated by exotic species including *Rubus fruticosus aggregate, Verbascum thapsus* (Great Mullein) and *Pyracantha angustifolia* (Orange Firethorn). Similarly, the ground layer of this vegetation zone is dominated by exotic species including *Hypochaeris glabra* (Smooth Catsear), *Paspalum dilatatum, Phalaris aquatica* and *Setaria parviflora.*

Native groundcover species are sparsely present and include *Helichrysum rutidolepis* (Pale Everlasting), *Rytidosperma tenuis* and *Panicum effusum.*

Areas of cleared exotic grassland are not currently displaying signs of native regrowth. This is due to the already well established exotic vegetation and ongoing land use and maintenance activities, such as slashing and mowing, which prevent the regeneration of trees and shrubs in these cleared and disturbed areas.

This vegetation type is not representative of any PCT known from the Capertee Uplands subregion, nor does it conform with the definition of any TECs listed under the BC Act or EPBC Act.

3.7.2 Exotic roadside vegetation

Extent in the study area: 0.17

Plots completed: One (Q03)

Growth form	Typical species
Trees	*Eucalyptus sp.*
Shrubs	*Rubus fruticosus aggregate*, Acacia rubida, Melaleuca parvistaminea, Leptospermum polygalifolium*
Grass and grass like	*Paspalum dilatatum*, Phalaris aquatica*, Setaria parviflora**
Forb	*Scabiosa atropurpurea*, Plantago lanceolata*, Rumex crispus*, Oxalis perennans*
Fern	N/A
Other	N/A

* = exotic species

Description: The area of exotic roadside vegetation is located within the eastern extent of the study area along the Castlereagh Highway. The vegetation is in a narrow strip within the road verge and covers a total of 0.17 hectares within the study area (**Figure 3-5**). Here the vegetation is subject to ongoing disturbances, in particular from the adjacent Highway and associated edge effects.

A canopy is largely absent from this vegetation zone however there are a number of regenerating juvenile *Eucalyptus* species present. The exotic shrub *Rubus fruticosus aggregate* is dominant within the shrub layer of this vegetation zone however the native shrubs *Acacia rubida* (Red-stemmed Wattle) and *Melaleuca parvistaminea* are also present in lower abundances. The ground layer is abundant with exotic species, in particular *Paspalum dilatatum, Phalaris aquatica* and *Scabiosa atropurpurea* (Pincushion).

While this vegetation zone is showing some signs of regeneration in the form of juvenile Eucalyptus species and some native shrubs, the area is still subject to ongoing disturbances and is heavily impacted by exotic species which is likely to prevent this vegetation zone from resembling a PCT.

This vegetation type is not representative of any PCT known from the Capertee Uplands subregion, nor does it conform with the definition of any TECs listed under the BC Act or EPBC Act.

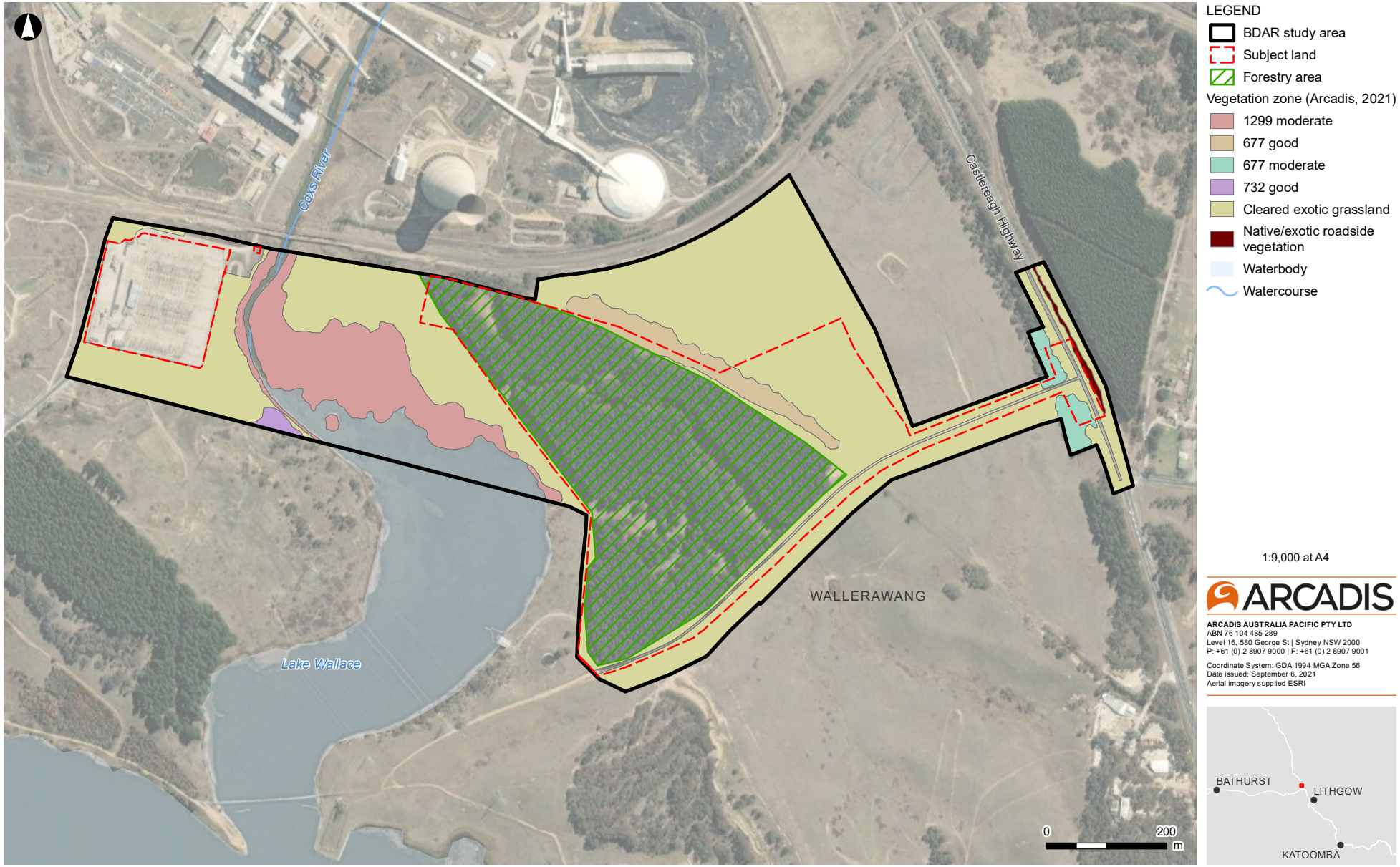

Figure 3-5 Vegetation Zones

3.8 Groundwater dependent ecosystems

Groundwater dependent ecosystems (GDEs) are ecological communities that are dependent, either entirely or in part, on the presence of groundwater for their health or survival.

As part of this assessment, The Bureau of Meteorology's GDE Atlas was reviewed to determine the occurrence of potential groundwater dependent ecosystems within and surrounding the study area. The results of that review show that there are no potential terrestrial or subterranean GDE's within the study area. There is one moderate potential aquatic GDE within the study area along Cox's River (**Figure 3-6**). No other potential GDEs are located within close proximity to the study area. The next closest potential GDEs are located approximately 100 metres south of the study area adjacent to the Castlereagh Highway. Here, both moderate and high potential terrestrial GDEs are mapped.

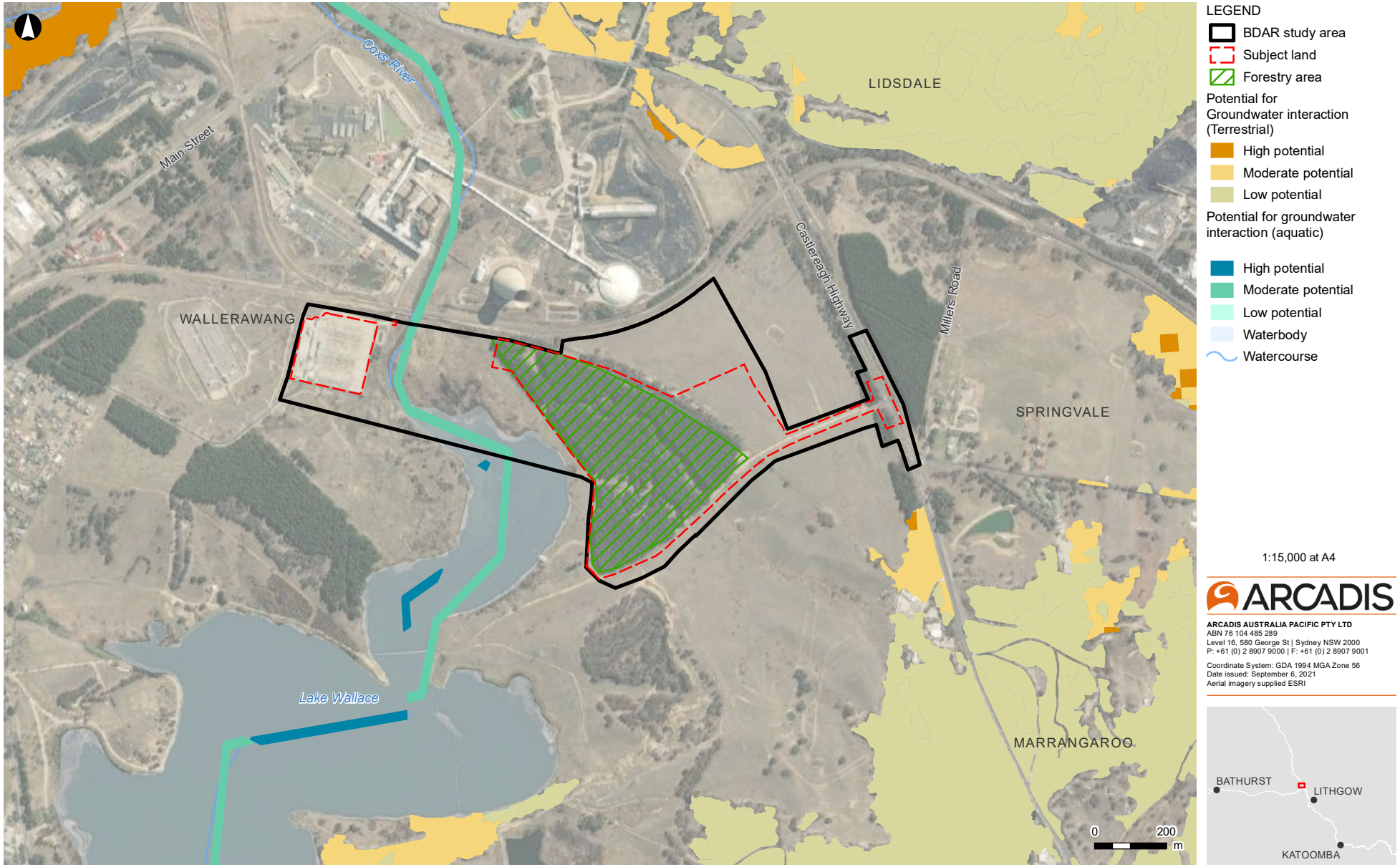

Figure 3-6 Groundwater Dependent Ecosystems

4 THREATENED SPECIES

The candidate threatened species for assessment in this BDAR were identified using the BAMC (DPIE, 2021e). A review of database searches (BioNet, PMST) was also undertaken in February 2021 to identify threatened species and habitat with potential to occur in the study area. These database searches informed the field surveys.

Threatened fauna species

Database searches (BioNet, PMST) undertaken in February 2021 identified records (or potentially suitable habitat) for 64 threatened and/or migratory fauna species listed under the BC Act and/or EPBC Act within a 10 kilometre radius of the study area (Appendix D). Records for marine species, including marine mammals, reptiles and wandering seabirds (e.g. Albatross), were not considered based on the location of the site.

The BAMC identified a total of 13 threatened fauna species with potential to occur within the study area. This includes six species or dual credit species. Assessment of candidate threatened fauna species is outlined in Section 4.1.2 below.

Threatened flora species

Database searches (BioNet, PMST) undertaken in February 2021 identified records (or potentially suitable habitat) for 30 threatened flora species listed under the BC Act and/or EPBC Act within a 10 kilometre radius of the study area (Appendix E).

The BAMC identified a total of four candidate threatened flora species credit species. Assessment of candidate threatened flora species is outlined in Section 4.1.2 below.

4.1 BAMC results and habitat suitability assessment

This section outlines the species returned by the BAMC including ecosystem credit species, species credit species, and dual credit species. An assessment of these species in accordance with Section 5.2 of the BAM has been undertaken where appropriate, to identify species for targeted surveys.

4.1.1 Ecosystem credit species

Ecosystem credit species represent species that can be readily predicted to occur by the type and condition of vegetation present at the study area (i.e. within a PCT based on the attributes of a given vegetation zone). The ecosystem credit species that are predicted to occur within the study area, their associated habitat constraints, geographic limitations, and sensitivity to potential gain class are outlined below in **Table 4-1**.

Sensitivity to gain scores consider the ability of a species to respond to management actions implemented at a biodiversity stewardship site and for ecosystem credit species, help to determine ecosystem credits for vegetation zones. The predicted ecosystem species with the highest sensitivity to gain score and the sensitivity to loss score for the relevant vegetation zone determines the biodiversity risk weighting for the vegetation zone. Ecosystem credits required for this vegetation zone are then calculated using this biodiversity risk weighting. This is outlined in Appendix I of the BAM.

All ecosystem credit species identified in the BAMC are considered to have the potential to occur within the study area and have therefore been retained as predicted species within the BAMC.

Table 4-1: Ecosystem credit species, including ecosystem component of dual credit species, predicted to occur within the study area

Common name	*Scientific name*	Ecosystem or dual credit species	BC Act Status	EPBC Act Status	Sensitivity to potential gain
Threatened fauna species					
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	Ecosystem	V	-	Moderate
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Dual Ecosystem (foraging) / Species (breeding)	V	-	Moderate (foraging) High (breeding)
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	Ecosystem	V	-	High
Varied Sittella	*Daphoenositta chrysoptera*	Ecosystem	V	-	Moderate
Spotted-tailed Quoll	*Dasyurus maculatus*	Ecosystem	V	E	High
Little Eagle	*Hieraaetus morphnoides*	Dual Ecosystem (foraging) / Species (breeding)	V	-	Moderate
White-throated Needletail	*Hirundapus caudacutus*	Ecosystem	-	V	High
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	Dual Ecosystem (foraging) / Species (breeding)	V	-	High (foraging) Very High (breeding)
Scarlet Robin	*Petroica boodang*	Ecosystem	V	-	Moderate
Flame Robin	*Petroica phoenicea*	Ecosystem	V	-	Moderate

V = vulnerable E = endangered CE = critically endangered

4.1.2 Species credit species

Species credit species represent species that cannot be readily predicted to occur within the study area based on the PCTs present (i.e. suitable habitat cannot be confidently predicted by vegetation surrogates or landscape features) and must therefore be surveyed for where potential habitat is considered to be present.

An assessment of the species credit species returned by the BAMC has been undertaken to determine whether they have the potential to occur based on the presence of necessary habitat components or habitat constraints, in accordance with BAM Section 5.2.2. Several threatened species credit species not generated by the BAMC were also considered as part of this assessment due to nearby, recent BioNet records and/or the presence of suitable habitat within the study area (see Appendix D and Appendix E).

Table 4-2 provides the full list of candidate species credit species returned by the BAMC and additional species considered likely to occur in the study area and outlines their associated habitat constraints and the presence or absence of these habitat constraints within the study area. **Table 4-2** also provides requirements to conduct threatened species surveys, and where relevant the justification for targeted surveys not being conducted, in accordance with BAM Section 5.2.

The biodiversity risk weighting for these species credit species is also listed in **Table 4-2**. For species credit species, the biodiversity risk weighting is calculated from the species sensitivity to gain score and sensitivity to loss score (as provided in the Threatened Biodiversity Data Collection (DPIE, 2021g)). This biodiversity risk weighting is then used in the calculation of the number of species credits required for any species credit species which are determined to be impacted by the Project.

Table 4-2: Species credit species (including dual credit species) predicted to occur within the study area from the BAMC or from database searches

Species	BC Act Status	EPBC Act Status	Species or dual credit species	Reason for inclusion	Biodiversity risk weighting (DPIE, 2021g)	Habitat constraint (BAMC)	Geographic constraint (BAMC)	Survey undertaken and comments/justification	Species presence
Threatened flora species									
Eucalyptus aggregata (Black Gum)	V	V	Species	BAMC	2.00	-	-	Yes – targeted surveys conducted (see Table 4-3)	Yes
Eucalyptus pulverulenta (Silver-leafed Gum)	V	V	Species	BioNet, PMST	2.00	-	-	Yes – targeted surveys conducted (see Table 4-3)	Yes
Leucochrysum albicans var. tricolor (Hoary Sunray)	-	E	Species	BAMC	2.00	-	-	Yes – targeted surveys conducted (see Table 4-3)	No
Thesium australe (Austral Toadflax)	V	V	Species	BioNet, PMST	1.5	-	-	Yes – targeted surveys conducted (see Table 4-3)	No
Veronica blakelyi	V	-	Species	BioNet	2.00	-	-	Yes – targeted surveys conducted (see Table 4-3)	No
Threatened fauna species									
Callocephalon fimbriatum (Gang-gang Cockatoo)	V	-	Dual Ecosystem (foraging) / Species (breeding)	BAMC	2.00	Eucalypt tree species with hollows greater than 9 cm diameter (breeding)	-	Foraging – Yes. Surveys confirmed foraging habitat. Breeding – No. Habitat constraint is not present	Yes – foraging habitat (assumed present) No – breeding habitat

Species	BC Act Status	EPBC Act Status	Species or dual credit species	Reason for inclusion	Biodiversity risk weighting (DPIE, 2021g)	Habitat constraint (BAMC)	Geographic constraint (BAMC)	Survey undertaken and comments/justification	Species presence
Chalinolobus dwyeri (Large-eared Pied Bat)	V	V	Species	BioNet, PMST	3.00	Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.	-	Yes – targeted surveys conducted (see Section 4.2.2)	Yes
Haliaeetus leucogaster (White-bellied Sea-Eagle)	V	-	Dual Ecosystem (foraging) / Species (breeding)	BioNet	2.00	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines AND the presence of a large stick nest within tree canopy; or an adult with nest material; or adults observed duetting within breeding period (breeding)	-	Foraging – Yes. Surveys confirmed foraging habitat. Breeding – No. Habitat constraint is not present	Yes – foraging habitat (recorded) No – breeding habitat
Hieraaetus morphnoides (Little Eagle)	V	-	Dual Ecosystem (foraging) / Species (breeding)	BAMC	1.50	Nest trees - live (occasionally dead) large old trees within vegetation (breeding).	-	Foraging – Yes. Surveys confirmed foraging habitat. Breeding – No. Habitat constraint is not present	Yes – foraging habitat (assumed present) No – breeding habitat

Species	BC Act Status	EPBC Act Status	Species or dual credit species	Reason for inclusion	Biodiversity risk weighting (DPIE, 2021g)	Habitat constraint (BAMC)	Geographic constraint (BAMC)	Survey undertaken and comments/justification	Species presence
Miniopterus orianae oceanensis (Large Bent-winged Bat)	V	-	Dual Ecosystem (foraging) / Species (breeding)	BAMC	3.00	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 (breeding)	-	A culvert is present within the study area which contains potential breeding habitat for the species. Targeted surveys to detect the presence of breeding habitat within this culvert will be undertaken in Spring 2021.	Yes – foraging habitat (recorded) Breeding habitat presence to be determined in Spring 2021.
Pteropus poliocephalus (Grey-headed Flying-fox)	V	V	Dual Ecosystem (foraging) / Species (breeding)	Recorded on site	2.00	Breeding camps (breeding)	-	Foraging – Yes. Surveys confirmed foraging habitat. Breeding – No. Habitat constraint is not present	Yes foraging habitat (recorded) No – breeding habitat

V = vulnerable E = endangered CE = critically endangered EP = endangered population

4.2 Threatened species survey methodology

Targeted threatened species surveys were conducted for all species identified in Section 4.1 as requiring survey. In total, this comprised five threatened flora species and 11 threatened fauna species.

4.2.1 Targeted threatened flora surveys

Targeted threatened flora surveys were undertaken over four days in February and March 2021. These surveys follow the methods described in *NSW Surveying threatened plants and their habitats* (DPIE, 2020b) and comprised parallel field traverses. Targeted flora surveys were completed for all threatened flora species considered likely to occur in the study area, including species returned by the BAMC and require survey in accordance with Section 5.2 of the BAM.

These threatened flora species and the survey effort undertaken are detailed below in **Table 4-3**. **Table 4-3** also outlines each species reason for inclusion, that is, generated by the BAMC and assessed in Section 4.1 as requiring survey, or determined through database searches as likely to occur in the study area. Locations of threatened flora surveys are displayed in **Figure 4-1.**

4.2.1.1 Parallel field traverses

Areas of potential habitat for threatened flora species considered likely to occur within the study area were surveyed using the parallel field traverse technique. This survey technique consists of walking in parallel traverses using both a GPS and tablet. The spacing between traverses is determined in accordance with Table 1 of the *NSW Surveying threatened plants and their habitats* (DPIE, 2020b) which describes that a 10-metre spacing is appropriate for surveying herbs and forbs in dense vegetation. This is considered to be the most appropriate for the study area, however it was reduced to five-metre spacing when surveying for species outside of their optimal flowering time. This is discussed further in Section 4.2.3.

Table 4-3: Targeted threatened flora species survey details

Scientific name	BC Act status	EPBC Act status	Minimum survey requirements	Associated PCTs within the study area	Survey method	Seasonal survey requirements	Survey timing	Adequacy against guidelines
Eucalyptus aggregata	V	V	Parallel field traverses. For a tree in open vegetation the recommended maximum distance between field traverses is 40 metres.	PCT 677	Parallel field traverses at five metres spacing	All year (DPIE, 2021g)	11 February, 05, 24, 25 March 2021	Yes
Eucalyptus pulverulenta	V	V	Parallel field traverses. For a tree in open vegetation the recommended maximum distance between field traverses is 40 metres.	PCT 732	Parallel field traverses at five metres spacing	All year (DPIE, 2021g)	11 February, 05, 24, 25 March 2021	Yes
Leucochrysum albicans var. tricolor	-	E	Parallel field traverses. For a forb in open vegetation the recommended maximum distance between field traverses is 10 metres.	PCT 677	Parallel field traverses at five metres spacing	September – April (DPIE, 2021g)	11 February, 05, 24, 25 March 2021	Yes
Thesium australe	V	V	For a herb in open vegetation the recommended maximum distance between field traverses is 10 metres.	PCT 732	Parallel field traverses at five metres spacing	November - February (DPIE, 2021g)	11 February, 05, 24, 25 March 2021	Yes. Evidence that local flowering also extends into March (see Section 4.2.3)
Veronica blakelyi	V	-	For a herb in open vegetation the recommended maximum distance between field traverses is 10 metres.	PCT 732	Parallel field traverses at five metres spacing	December - February (DPIE, 2021g)	11 February, 05, 24, 25 March 2021	Yes. Evidence that local flowering also extends into March (see Section 4.2.3)

V = vulnerable E= endangered

4.2.2 Threatened fauna surveys

4.2.2.1 Fauna habitat assessment

Prior to targeted fauna surveys being undertaken, fauna habitat assessments were conducted across the study area. Specifically, the study area and adjacent vegetation was surveyed for the following fauna habitat features:

- Vegetation type, structure and extent
- Wetlands, watercourses, natural and artificial ponds, dams, soaks and drainage channels
- Adjacent habitats and barriers (natural or artificial) between the site and adjacent lands
- Forage trees including blossom and fruit trees for birds and Grey-headed Flying-fox, feed trees for Koala, *Allocasuarina* spp. for Glossy Black-Cockatoo and *Bursaria* species (particularly *Bursaria spinosa* subsp. *lasiophylla*) for Purple Copper Butterfly
- Caves and cliffs
- Artificial microbat roosts (culverts, bridges, tunnels, buildings and mine adits)
- Terrestrial shelter habitat such as coarse woody debris, rocky outcrops and artificial shelter (i.e. corrugated iron sheets, building refuse, rubbish) for invertebrates, amphibians, reptiles and small terrestrial mammals.

During fauna habitat assessments, the following general fauna surveys were also undertaken to detect threatened species and/or important fauna habitat:

- **Hollow-bearing tree surveys:** hollow-bearing trees were recorded across the study area to detect potential sheltering, roosting and/or breeding habitat for threatened and non-threatened fauna. Hollow-bearing tree surveys involved traversing the study area and identifying tree hollows with the naked eye and binoculars. Hollow size and the position of the hollow on the tree (e.g. branch, trunk) was recorded. Signs of fauna occupation, tree species, DBH and whether it was living, or a stag were also noted. The location of hollow-bearing trees is shown below in **Figure 4-3**.
- **Canopy searches:** canopy searches were undertaken opportunistically across the study area to detect presence of threatened fauna (including individual Koalas, and in addition to targeted surveys for species; see below). Canopy searches were also undertaken to detect the presence of important fauna habitat features such as large stick nests. Canopy searches involved traversing the study area and inspecting the canopy of trees with the naked eye and binoculars. Signs of fauna occupation and presence of important fauna habitat features (e.g. nests) were documented.

4.2.2.2 Incidental fauna surveys

Field surveys also included incidental searches for indirect evidence of fauna, such as scats, nests, burrows, tracks, scratches, chewed cones and diggings. Incidental diurnal fauna surveys also involved recording all fauna species opportunistically seen or heard during surveys (Appendix B).

4.2.2.3 Targeted threatened fauna surveys

Targeted threatened fauna surveys were undertaken for all species credit/dual credit threatened fauna species likely to occur in the study area, including species returned by the BAMC and requiring survey in accordance with Section 5.2 of the BAM. This was based on the results of the assessment provided in **Section 4.1**.

Threatened fauna surveys also covered off on ecosystem credit threatened fauna species considered likely to occur within the study area. This excludes threatened wetland birds which may have potential habitat occurring along the Coxs River within the study area. As potential habitat for these species is outside the construction area no direct impacts are anticipated to occur to potential habitat or individuals of these species. This is discussed further in Section 8.2 and Section 8.5.

Targeted fauna surveys were designed to address the requirements outlined in the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft* (DEC, 2004). The following guidelines were also used to determine appropriate survey requirements for threatened fauna:

- *Threatened Biodiversity Data Collection* (DPIE, 2021g)
- *EPBC Act referral guidelines for the vulnerable koala* (CoA, 2014)
- *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (DoE, 2013)
- *Species credit' threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method* (OEH, 2018)
- *Survey guidelines for Australia's threatened bats: guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999* (CoA, 2010b)
- *Survey guidelines for Australia's threatened birds: guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999* (CoA, 2010a)
- *Survey guidelines for Australia's threatened mammals: guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999* (CoA, 2011)

The methodologies applied for each targeted threatened fauna species within the study area are described below. Specifically, survey effort and threatened fauna targeted during field surveys are summarised in **Table 4-4**. **Table 4-4**Table 4-3 also outlines each species reason for inclusion, that is, generated by the BAMC and assessed in Section 4.1 as requiring survey, or determined through database searches as likely to occur in the study area. Locations of threatened species surveys are displayed in **Figure 4-2**.

Table 4-4: Species credit threatened fauna species (including dual credit species) targeted in surveys

Scientific name	Common name	BC Act status	EPBC Act status	Minimum survey requirements	Seasonal survey requirements	Survey timing appropriate?	Adequacy against guidelines
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	Area searches (2 ha), transects or 20 min point surveys in the early morning or late afternoon in areas of suitable habitat. Detection by sightings, calls and/or indirect evidence (e.g. foraging signs, moulted feathers). Avoid wet and windy weather (CoA, 2010a) (DEC, 2004). As habitat constraints are not present (as assessed in Section 4.1) there is no requirement to survey for species credit component (breeding).	All year (October – January breeding)	Yes	Adequate. See Section 4.2.2.3 for details.
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Ultrasonic call detectors placed in suitable habitat (e.g. near rocky areas, cliffs and crevices, in woodland or in valleys with flyways) for a minimum of four nights. Minimum total effort of 16 detector nights in areas <50 ha (i.e. four detectors deployed for four nights) (DEC, 2004) (CoA, 2010b) (OEH, 2018). Note: if detected, as an SAII species breeding must be assumed (unless further surveys (i.e. harp trapping) are conducted. All breeding habitat within the study area must be mapped (i.e. PCTs associated with the species (as per the TBDC) within 100 m of rocky areas, caves, overhangs, crevices, cliffs and escarpments, or old mines or tunnels, old buildings and sheds)). All potential habitat within 2 km of caves, scarps, cliffs, rock overhangs and disused mines must also be mapped (OEH, 2018).	November – March (DPIE, 2021) (optimal November – January)	Yes	Adequate. See Section 4.2.2.3 for details.

Scientific name	Common name	BC Act status	EPBC Act status	Minimum survey requirements	Seasonal survey requirements	Survey timing appropriate?	Adequacy against guidelines
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-	Area searches (2 ha), transects or 20 min point surveys in the early morning or late afternoon in areas of suitable habitat. Detection by sightings, calls, large stick nests, and/or indirect evidence (e.g. prey remains, pellets, moulted feathers). Avoid wet and windy weather (CoA, 2010a) (DEC, 2004). As habitat constraints are not present (as assessed in Section 4.1) there is no requirement to survey for species credit component (breeding).	All year (July – December breeding)	Yes	Adequate. See Section 4.2.2.3 for details.
Hieraaetus morphnoides	Little Eagle	V	-	Area searches (2 ha), transects or 20 min point surveys in the early morning or late afternoon in areas of suitable habitat. Detection by sightings, calls, large stick nests, and/or indirect evidence (e.g. prey remains, pellets, moulted feathers). Avoid wet and windy weather (CoA, 2010a) (DEC, 2004). As habitat constraints are not present (as assessed in Section 4.1) there is no requirement to survey for species credit component (breeding).	All year (August – October breeding)	Yes	Adequate. See Section 4.2.2.3 for details.
Lophoictinia isura	Square-tailed Kite	V	-	Area searches (2 ha), transects or 20 min point surveys in the early morning or late afternoon in areas of suitable habitat. Detection by sightings, calls, large stick nests, and/or indirect evidence (e.g. prey remains, pellets, moulted feathers). Avoid wet and windy weather (CoA, 2010a) (DEC, 2004). As there is no suitable breeding habitat within the study area there is no requirement to survey for species credit component (breeding).	All year (September – January breeding)	Yes	Adequate. See Section 4.2.2.3 for details.

Scientific name	Common name	BC Act status	EPBC Act status	Minimum survey requirements	Seasonal survey requirements	Survey timing appropriate?	Adequacy against guidelines
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	Ultrasonic call detectors placed in suitable habitat (e.g. near rocky areas, cliffs and crevices, in woodland or in valleys with flyways) for a minimum of four nights (DEC, 2004) (CoA, 2010b) (OEH, 2018).	November – March (DPIE, 2021g) (optimal December – February)	Yes	Adequate. See Section 4.2.2.3 for details.
Ninox strenua	Powerful Owl	V	-	Nocturnal spotlighting transects (including call detection and observation) in areas of suitable habitat. Avoid wet and windy weather (DEC, 2004). No breeding habitat was identified within the study area during habitat assessments (i.e. hollow-bearing trees >20 cm). As such, surveys to confirm breeding are not required, and were not undertaken (e.g. stag-watching surveys).	All year (May – August breeding)	Yes	Adequate. See Section 4.2.2.3 for details.
Petauroides volans	Greater Glider	-	V	Nocturnal spotlighting transects (including call detection and observation) in areas of suitable habitat. Avoid wet and windy weather (DEC, 2004).	All year	Yes	Adequate. See Section 4.2.2.3 for details.
Petaurus norfolcensis	Squirrel Glider	V	-	Nocturnal spotlighting transects (including call detection and observation) in areas of suitable habitat. Avoid wet and windy weather (DEC, 2004).	All year (optimal March – August)	Yes	Adequate. See Section 4.2.2.3 for details.
Phascolarctos cinereus	Koala	V	V	Survey effort should be determined on a case-by-case basis and can include both direct and indirect survey methods. Targeted scat searches using the Rapid SAT (Spot Assessment Technique) (Phillips & Callaghan, 2011) and diurnal searches of trees for individuals and indirect evidence (e.g. scratch marks) in areas of suitable habitat. Nocturnal spotlighting transects (including call detection and observation) in areas of suitable habitat. Avoid wet and windy weather (DEC, 2004).	All year (optimal August – January)	Yes	Adequate. See Section 4.2.2.3 for details.

Scientific name	Common name	BC Act status	EPBC Act status	Minimum survey requirements	Seasonal survey requirements	Survey timing appropriate?	Adequacy against guidelines
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Habitat assessment and diurnal searches for Flying-fox camps in areas of suitable habitat (no suitable breeding habitat was identified within the study area during habitat assessments). Nocturnal spotlighting transects (including call detection and observation) in areas of suitable habitat. Avoid wet and windy weather (CoA, 2011) (DEC, 2004).	All year (October – December breeding)	Yes	Adequate. See Section 4.2.2.3 for details.

V = vulnerable

Diurnal bird surveys

Diurnal bird surveys were conducted across the study area in areas of suitable habitat (**Photograph 8**, **Photograph 9**; determined through habitat assessment surveys) to detect threatened and non-threatened birds. Diurnal bird surveys involved a 20-minute (min) point survey and/or two hectare area search detecting species by visual observation (e.g. through binoculars) and/or call. In addition, species opportunistically seen or heard, or signs of occupancy (e.g. nests) were recorded while traversing the study area. Diurnal bird surveys were undertaken across six days within the study area (11 February, 5 March, 24 March, 25 March, 15 April, and 16 April 2021). Diurnal bird survey effort is shown below in **Figure 4-2**.

Photograph 9: Example of woodland and cleared grassland habitats surveyed for threatened and non-threatened birds within the study area.

Photograph 10: Example of riparian habitat and habitat corridors surveyed for threatened and non-threatened birds within the study area.

Diurnal roost searches

Diurnal roost searches were conducted across the study area in initial habitat assessments to identify roosting and/or breeding habitat for the Grey-headed Flying-fox. The study area was traversed to identify individuals and/or potential habitat. Initial database searches were also undertaken to identify breeding camps. No breeding camps were located within the study area.

Rapid Spot Assessment Technique (SAT) surveys

Rapid SAT (Spot Assessment Technique; (Phillips & Callaghan, 2011)) surveys for the Koala were undertaken in areas of suitable habitat (**Photograph 10**, **Photograph 11**; determined through habitat assessment surveys). Rapid SAT surveys were performed at the base of 30 trees with a DBH >10 cm, surrounding a central survey point. The Rapid SAT involved an initial inspection of the canopy for individuals and the trunk for scratch marks, followed by raking of leaf litter and bark within a distance of 100 cm around each tree base to detect Koala scats. Each tree was surveyed for a period of 2 mins. Rapid SAT surveys were undertaken across four days (11 February, 5 March, 24 March, and 16 April 2021) and at four locations within the study area. Rapid SAT survey effort is shown below in **Figure 4-2**.

Photograph 11: Example of woodland habitat in the western extent of the study area surveyed for the threatened Koala.

Photograph 12: Example of woodland habitat in the central section of the study area surveyed for the threatened Koala.

Spotlighting surveys

Spotlighting surveys were conducted for a minimum of one hour and 20 mins, and a maximum of two hours over two nights across the study area, on the 24 March and 15 April 2021. Spotlighting surveys involved two people searching on-foot for animals using a high-powered, hand-held spotlight to detect movement and/or eye-shine (i.e. reflection of light back from the animals' eyes). Specific habitat for threatened birds and mammals were targeted, including mature trees and stags, potential foraging sites (i.e. around waterbodies, flowering eucalypts) and sheltering sites (i.e. dense vegetation). Species were identified by visual observation (e.g. through binoculars, by spotlight; **Photograph 12**, **Photograph 13**) and/or call. Wet and windy conditions were avoided. Spotlighting survey effort is shown below in **Figure 4-2**.

Photograph 13: Common Brushtail Possum (*Trichosurus vulpecula*) identified through binoculars in woodland and pine forest within the central part of the study area.

Photograph 14: Eastern Banjo Frog (*Limnodynastes dumerilii*), a non-threatened species, detected during spotlighting surveys within the study area.

Ultrasonic call detector (Anabat) surveys

Ultrasonic call detector (Anabat) surveys were conducted at two locations within the study area (**Figure 4-1**). Two 'Anabat Swift' (Titley Pty Ltd) detectors were deployed within areas of suitable habitat (**Photograph 14**, **Photograph 15**; determined through habitat assessment surveys) to target threatened microchiropteran (microbat) species, including the Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) (listed as vulnerable under the BC Act), Greater Broad-nosed Bat (*Scoteanax rueppellii*) (listed as vulnerable under the BC Act), Large Bent-winged Bat (*Miniopterus orianae oceanensis*) (listed as vulnerable under the BC Act), Large-eared Pied Bat (*Chalinolobus dwyeri*) (listed as vulnerable under the BC Act and EPBC Act) and Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) (listed as vulnerable under the BC Act). Devices were deployed on 5 March 2021 and collected on 25 March 2021 (a total of 20 nights each, or 40 detector nights). Detailed methodology and results of targeted microbat surveys are included in Appendix G.

Photograph 15: Anabat device deployed at 'Site 1' within the study area. Device placed along the edge of woodland habitat and within proximity to a small farm dam, drainage line, quarries, and sandstone plateaus.

Photograph 16: Anabat device deployed at 'Site 2' within the study area. Device placed on a raised easement in woodland habitat and within proximity to stags, cleared grassland, infrastructure, soaks, and Lake Wallace.

4.2.3 Survey limitations

Field surveys and survey effort was conducted in accordance with the Biodiversity Assessment Method and relevant guidelines where possible.

The profile for each threatened species within the Threatened Biodiversity Data Collection lists the suitable months to survey the species according to when they are most detectable. Two threatened flora species identified as having potential to occur as a result of database searches, *Veronica blakelyi* and *Thesium australe,* have survey timings of December to February and November to February, respectively. These species were surveyed over several days in February and March and therefore some days of survey were outside the recommended survey timing for these species. Records from the BioNet Atlas (DPIE, 2021a) show that the species are detectable in the months following February with the closest records of *Thesium australe* to the study area occurring in April and May. These records also describe the species in flower at the time. Nearby records of *Veronica blakelyi* have been recorded from a wide range of months throughout the year, with many occurring in May, as well as November, January and March. Therefore, due to the date of recordings of nearby *Thesium australe* and *Veronica blakelyi,* it was determined that surveys in February and March would

be adequate to detect any individuals of the species. To further increase detectability and overcome this limitation, width of parallel transects was reduced from 10 metres to five metres across all areas of suitable habitat.

As some species are only present or apparent at certain times of the year (eg migratory birds), species recorded in the study area should be treated as an indication of species presence at the time of field surveys, not a fully comprehensive list. Further, some species require specific conditions for optimum detection. For example, owls can be detected year-round however the optimal seasonal timing to detect breeding is between May and August, during nesting. In addition, peak activity periods for fauna can also be correlated with weather conditions.

The conclusions of this report are based upon available data and field surveys and are therefore indicative of the environmental condition of the study area at the time of the survey. It should be recognised that conditions, including the presence of threatened species, could change with time. To address this limitation, a precautionary approach has been used which aimed to identify the presence and suitability of the habitat for threatened species (Appendix D and Appendix E).

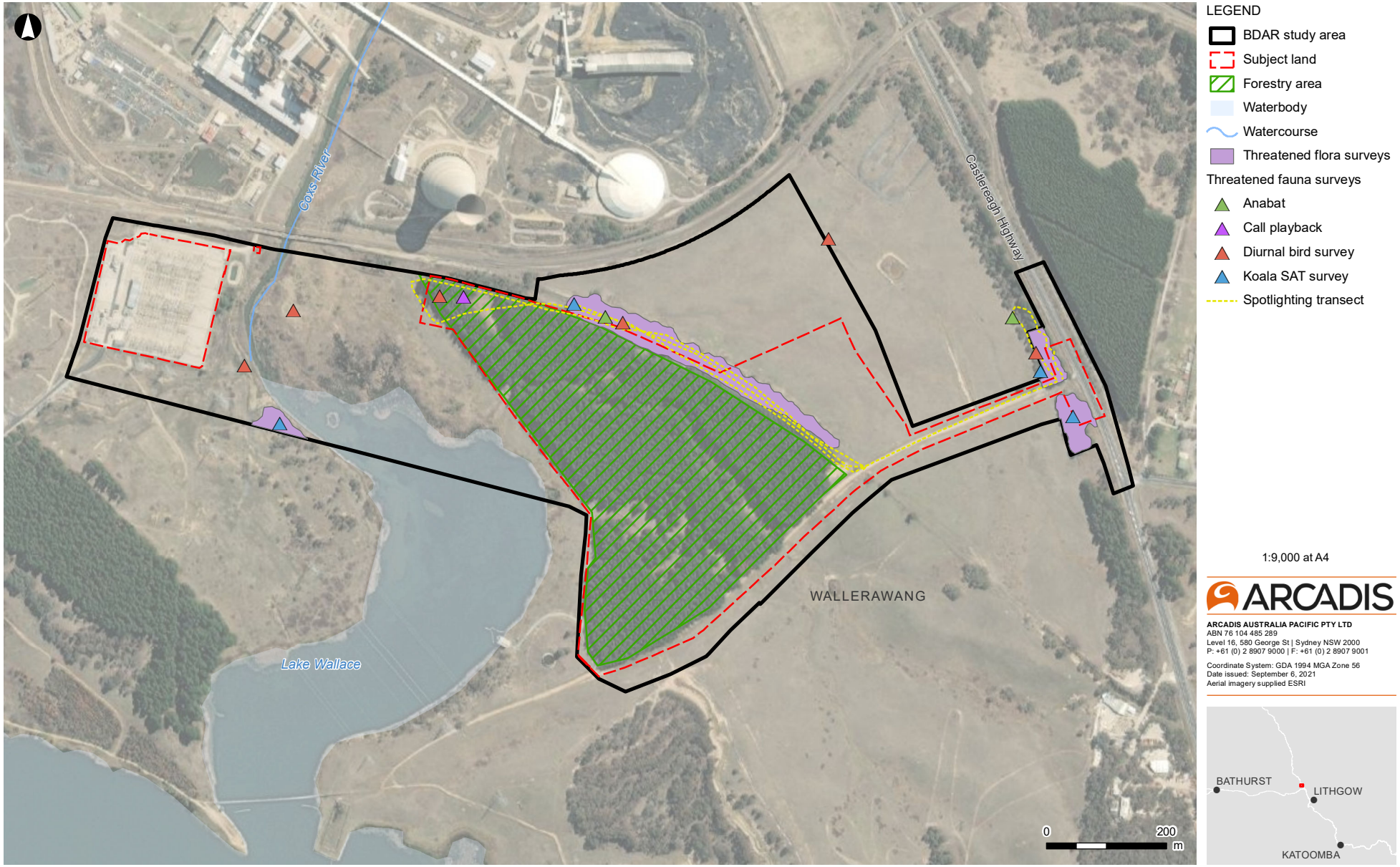

Figure 4-1 Threatened Species Survey Locations

Date: 6/09/2021 Path: \\hc-aus-ns-fs-01\jobs\30076781\L-GIS\A_Current\B_Maps\BDAR\WPS_BDAR_009_SurveyedThreatenedSpecies_A4L_v4.mxd
Created by : TK Updated by : TK QA by : EH

4.3 Threatened species survey results

Targeted surveys resulted in the detection of two threatened flora species, one species credit fauna species, three dual credit species, five ecosystem credit fauna species and one migratory fauna species. A summary of the survey results for species credit species identified as requiring survey are provided in **Table 4-5** below.

Table 4-5: Targeted threatened species credit species (including dual credit species) survey results

Scientific name	Common name	Presence (ecosystem credits)	Presence (species credits)	Number/area	Biodiversity risk weighting
Threatened flora					
Eucalyptus aggregata	Black Gum	N/A	**Present**	69	2.00
Eucalyptus pulverulenta	Silver-leafed Gum	N/A	**Present**	1	2.00
Leucochrysum albicans var. tricolor	Hoary Sunray	N/A	Not present	-	2.00
Thesium australe	Austral Toadflax	N/A	Not present	-	1.50
Veronica blakelyi	-	N/A	Not present	-	2.00
Threatened fauna					
Callocephalon fimbriatum	Gang-gang Cockatoo	**Assumed present**	Not present	-	2.00
Chalinolobus dwyeri	Large-eared Pied Bat	N/A	**Present**	N/A (acoustic recording)	3.00
Haliaeetus leucogaster	White-bellied Sea-Eagle	**Present**	Not present	One adult individual	2.00
Hieraaetus morphnoides	Little Eagle	**Assumed present**	Not present	-	1.50
Lophoictinia isura	Square-tailed Kite	**Assumed present**	Not present	-	1.50
Miniopterus orianae oceanensis	Large Bent-winged Bat	**Present**	Not present	N/A (acoustic recording)	3.00
Ninox strenua	Powerful Owl	**Assumed present**	Not present	-	2.00
Petauroides volans	Greater Glider	N/A	Not present	-	2.00
Petaurus norfolcensis	Squirrel Glider	N/A	Not present	-	2.00
Phascolarctos cinereus	Koala	Not present	Not present	-	2.00
Pteropus poliocephalus	Grey-headed Flying-fox	**Present**	Not present	One adult individual	2.00

4.3.1 Threatened flora species

4.3.1.1 Species credit species recorded within the study area

Eucalyptus aggregata

Eucalyptus aggregata (Black Gum) is listed as vulnerable under the BC Act and EPBC Act. Sixty-nine individuals of the species were recorded within PCT 677 in the study area. Fifteen mature individuals were recorded within the northern extent of the western patch of PCT 677 while 10 mature individuals were growing amongst planted *Pinus radiata* along the Castlereagh Highway. An additional 44 juvenile individuals were recorded in this area.

Samples of mature *Eucalyptus aggregata* individuals within the study area were sent to the NSW Herbarium for identification confirmation. In April 2021, the NSW Herbarium confirmed that all samples were of *Eucalyptus aggregata.*

Juvenile individuals could not be confirmed as *Eucalyptus aggregata* as they are not reproductively mature and as a result lack the identifying features of buds and fruit. Therefore, a precautionary approach has been taken and these juvenile individuals have been conservatively identified as this species based on the identifying features of juvenile leaves, suitable habitat and high number of surrounding mature *Eucalyptus aggregata* individuals.

Photograph 17 *Eucalyptus aggregata* individual in the eastern extent of the study area

Eucalyptus pulverulenta

Eucalyptus pulverulenta (Silver-leafed Gum) is listed as vulnerable under the BC Act and EPBC Act. One individual of the species was recorded within PCT 677 within the study area along the Castlereagh Highway. The individual recorded within the study area was a juvenile, approximately one metre tall with a sprawling habit. As this individual is a juvenile and lacks the identifying features of buds and fruit, it cannot be confirmed as *Eucalyptus pulverulenta*. Therefore, a precautionary approach has been taken and this juvenile individual has been conservatively identified as *Eucalyptus pulverulenta.* This is based off the identifying features of the juvenile leaves and sprawling habit, as well as the occurrence of a mature *Eucalyptus pulverulenta* in proximity to the area (approximately 150 metres to the north of the study area). Therefore, this juvenile has been conservatively identified as *Eucalyptus pulverulenta.*

Photograph 18 *Eucalyptus pulverulenta* individual in the eastern extent of the study area.

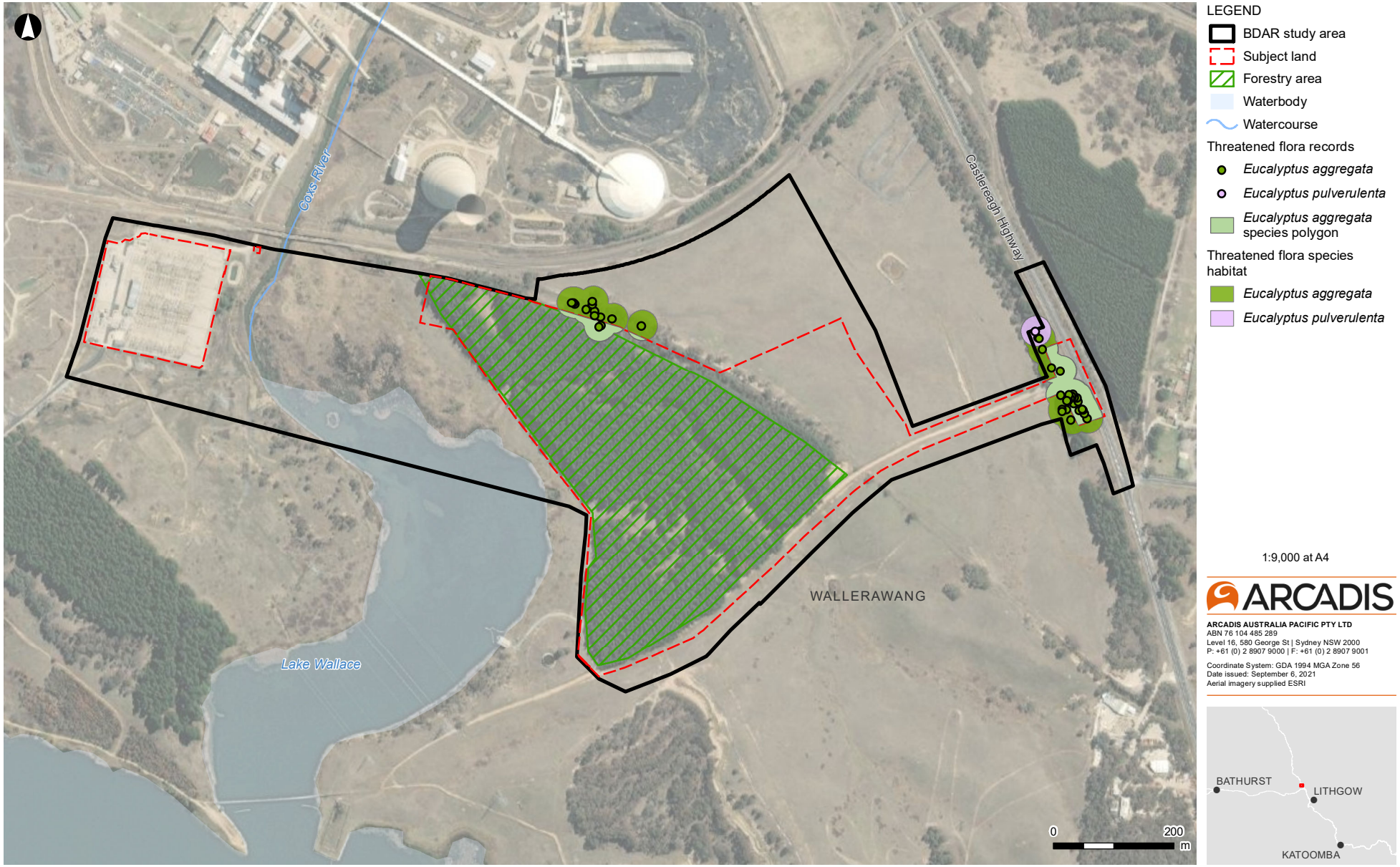

Figure 4-2 Recorded Threatened Flora and Their Habitat

4.3.2 Threatened fauna species

Ten threatened and/or migratory fauna species were recorded within the study area during the current surveys:

- Blue-billed Duck (listed as vulnerable under the BC Act)
- Dusky Woodswallow (listed as vulnerable under the BC Act)
- Eastern False Pipistrelle (listed as vulnerable under the BC Act)
- Greater Broad-nosed Bat (listed as vulnerable under the BC Act)
- Grey-headed Flying-fox (listed as vulnerable under the BC Act and EPBC Act)
- Large Bent-winged Bat (listed as vulnerable under the BC Act)
- Large-eared Pied Bat (listed as vulnerable under the BC Act and EPBC Act)
- Latham's Snipe (listed as migratory under the EPBC Act)
- White-bellied Sea-Eagle (listed as vulnerable under the BC Act)
- Yellow-bellied Sheathtail-bat (listed as vulnerable under the BC Act).

4.3.2.1 Species credit and dual credit species recorded within the study area

Large-eared Pied Bat

The Large-eared Pied Bat was recorded within the study area during targeted Anabat surveys (**Figure 4-2**). The Large-eared Pied Bat is a species credit species because it cannot be reliably predicted to occur on a site based on vegetation and other landscape features. Potential breeding habitat includes PCTs associated with the species within 100 metres of rocky areas containing caves, overhangs or crevices, cliffs or escarpments, old mines, tunnels, or culverts and/or derelict concrete buildings. There are 48 records of the species within a 10 kilometre radius of the study area, the most recent from 2020.

Vegetation within the study area provides potential foraging and/or dispersal habitat for the species. A small sandstone culvert is also present within the study area. However, following inspection of the culvert, it was determined to be unlikely to provide breeding habitat for the species. This was due to the small size of the culvert (less than 0.5 metres tall), and its placement close to the ground, making it susceptible to predators. The culvert also did not appear to have any deep crevices suitable for use by the Large-eared Pied Bat, and no signs of bats such as urine stains, droppings (guano), remains or bat fly casings were detected.

The Large-eared Pied Bat is listed as a Serious and Irreversible Impacts (SAII) species. A SAII for the species is any impact to breeding habitat as defined above.

The Threatened Biodiversity Data Collection (TBDC) (DPIE, 2021g) states that a species polygon for the Large-eared Pied Bat should align with PCTs on the subject land to which the species is associated that are within 2 kilometres of identified potential roost features. The study area is located less than two kilometres from the sandstone escarpment to the east which is highly likely to contain potential roost features. As such, any associated PCTs should be included in a species polygon. Associated PCTs, as listed in the TBDC for the species, present within the study area is limited to PCT 732, which is outside the subject land. However, Large-eared Pied Bat was recorded within the study area within PCT 677, a PCT which is not associated with the species. As a result, advice from the DPIE BAM Support Team was sought on how to determine the species polygon and credit calculations for Large-eared Pied Bat within the study area. The BAM Support Team advised that any PCTs where the species is recorded should be included within the species polygon via email received 2 September 2021. As such, the species polygon for Large-eared Pied Bat comprises PCT 677 as shown in Figure 4-3.

Potential impacts to the Large-eared Pied Bat are detailed below in Section 8.

Large Bent-winged Bat

The Large Bent-winged Bat was recorded within the study area during targeted Anabat surveys (**Figure 4-2**). The Large Bent-winged Bat is a dual credit species with the species credit component relating to breeding habitat which is highly specific. The Large Bent-winged is also a potential SAII species. A SAII for the species is any impact to breeding habitat.

There are 73 records of the species within a 10 kilometre radius of the study area, the most recent from 2020. Vegetation within the study area provides potential foraging and/or dispersal habitat for the species. Breeding habitat for the species includes caves, tunnels, mines, culverts. The small sandstone culvert identified within the study area is unlikely to provide breeding habitat for the species due to its size, location and absence of deep crevices as discussed above. Therefore, species credits are not required for Large Bent-winged Bat and foraging habitat for the species is assumed as ecosystem credits.

Grey-headed Flying-fox

The Grey-headed Flying-fox was recorded within the study area during diurnal roost searches (**Figure 4-2**). The Grey-headed Flying-fox is a dual credit species. The species credit component is based on the presence of breeding camps. There are six records of the species within a 10 kilometre radius of the study area, the most recent from 2018. Initial searches for breeding camps encompassed any recorded camps and roosting habitat likely to occur on the study area, followed by diurnal roost searches on site. Spotlighting to detect individuals within the study area was also undertaken. No breeding camps or permanent roosting habitat was identified within the study area. The nearest breeding camps are approximately 10 kilometres north-west (Portland (922)) and 40 kilometres west (Bathurst, Machattie Park (953)) of the site.

One individual Grey-headed Flying-fox was recorded temporarily roosting in vegetation adjacent to the Castlereagh Highway (**Photograph 18**). While this individual was roosting, it was not observed in subsequent surveys, and no other individuals were recorded within the study area. Although this species may opportunistically disperse, forage and/or temporarily roost within the study area, no breeding or permanent roosting habitat will be impacted and as such, species credits are not required for the Grey-headed Flying-fox. Potential foraging habitat for this species is assumed as ecosystem credits and is detailed below in Section 8.

Photograph 19: One individual Grey-headed Flying-fox recorded in the eastern extent of the study area, adjacent to the Castlereagh Highway.

White-bellied Sea-Eagle

One individual White-bellied Sea-Eagle was recorded foraging over Lake Wallace and the Cox's River in the study area during diurnal bird surveys (**Figure 4-2**). The White-bellied Sea-Eagle is a dual credit species, with the species credit component based on the presence of suitable breeding habitat

(e.g. living or dead mature trees within suitable vegetation within one kilometre of a rivers, lakes, large dams or creeks, wetlands and coastlines and the presence of a large stick nest within tree canopy; or an adult with nest material; or adults observed duetting within breeding period). There are seven records of the species within a 10-kilometre radius of the study area, the most recent from 2019. Vegetation and riparian areas within the study area provide potential foraging and/or dispersal habitat for the species (**Photograph 19**). No breeding habitat was identified within the study area (i.e. large stick nests). As such, no species credits are required for this species (detailed below in Section 8).

Photograph 20: One individual White-bellied Sea-Eagle recorded flying over the western extent of the study area and foraging over Lake Wallace and the Cox's River.

4.3.2.2 Species credit and dual credit species not recorded within the study area

Gliders

Both the Greater Glider and the Squirrel Glider are species credit species because they occur across a broad range of vegetation types and can be reliably detected from survey. While the study area contains vegetation that provides marginal habitat for both species, no suitable breeding habitat (i.e. hollow-bearing trees) was recorded within the study area, and spotlighting surveys did not detect either species (**Figure 4-2**). Further, no individuals of either species were recorded opportunistically or by indirect evidence (e.g. faeces). As such, it is considered unlikely that the Greater Glider or Squirrel Glider would occur within the study area, and consequently no species credits for either species of Glider are required.

Diurnal Raptors

The Little Eagle and Square-tailed Kite are dual credit species. The species credit components for these diurnal raptors are based on the presence of suitable breeding habitat (e.g. live (occasionally dead) large old trees within suitable vegetation). While the study area contains vegetation that provides potential foraging and/or roosting habitat for both species, no suitable breeding habitat was recorded within the study area, and diurnal bird surveys did not detect either species (**Figure 4-2**). Further, no individuals of either species were recorded opportunistically or by indirect evidence (e.g. feathers, nests). As the study area does not provide suitable breeding habitat for these species, no species credits are required. Potential foraging habitat for these species are assumed as ecosystem credits.

Koala

The Koala is a dual credit species. The species credit component is based on important habitat (defined as the density of koalas and quality of habitat determined by on-site surveys). While the

study area contains potential habitat for the Koala (e.g. five feed tree species listed within the Central and Southern Tablelands KMA), the species was not detected by Rapid SAT surveys (**Figure 4-2**), nocturnal spotlighting (**Figure 4-2**), opportunistically (i.e. during diurnal and nocturnal searches) or by indirect evidence (e.g. faeces, scratch marks). Further, there are a limited number of Koala records within the surrounding area (five records, the most recent from 2017, within 10 kilometres of the site) and while one Koala was documented within the study area in 2004, it was recorded in the pine plantation; suggesting habitat within the site was being utilised temporarily for shelter and/or dispersal. As such, the study area does not constitute 'core Koala habitat' or 'highly suitable Koala habitat' as described in the Koala SEPP 2021. As the study area does not contain these described habitats, and the Koala was not present within the study area, a Koala assessment report is not needed, and no species credits for the Koala are required. Potential foraging habitat for the Koala is assumed as ecosystem credits.

Powerful Owl

The Powerful Owl is a dual credit species. The species credit component is based on the presence of suitable breeding habitat (e.g. living or dead trees with hollows >20 cm diameter). While the study area contains vegetation that provides potential foraging (hunting medium-sized arboreal mammals) and/or dispersal habitat for the species, no suitable breeding habitat was recorded within the study area, and nocturnal spotlighting did not detect the Powerful Owl (**Figure 4-2**). Further, no individuals were recorded opportunistically or by indirect evidence (e.g. feathers, prey remains). As the study area does not provide suitable breeding habitat for this species, no species credits are required. Potential foraging habitat for the Powerful Owl is assumed as ecosystem credits.

4.3.2.3 Ecosystem credit species recorded within the study area

The following threatened ecosystem credit fauna species were recorded within the study area during the current surveys:

- Blue-billed Duck
- Dusky Woodswallow
- Eastern False Pipistrelle
- Greater Broad-nosed Bat
- Yellow-bellied Sheathtail-bat.

Potential habitat for these species is assumed as ecosystem credits. Potential impacts to these species are detailed below in Section 8.

Photograph 21: Dusky Woodswallow, listed as vulnerable under the BC Act, recorded in the western extent of the study area. A large flock, up to 30 individuals, was observed foraging and roosting in woodland adjacent to Lake Wallace and the Cox's River.

Photograph 22: Lake Wallace, located within the study area, provides suitable habitat for several threatened fauna species recorded during the current surveys.

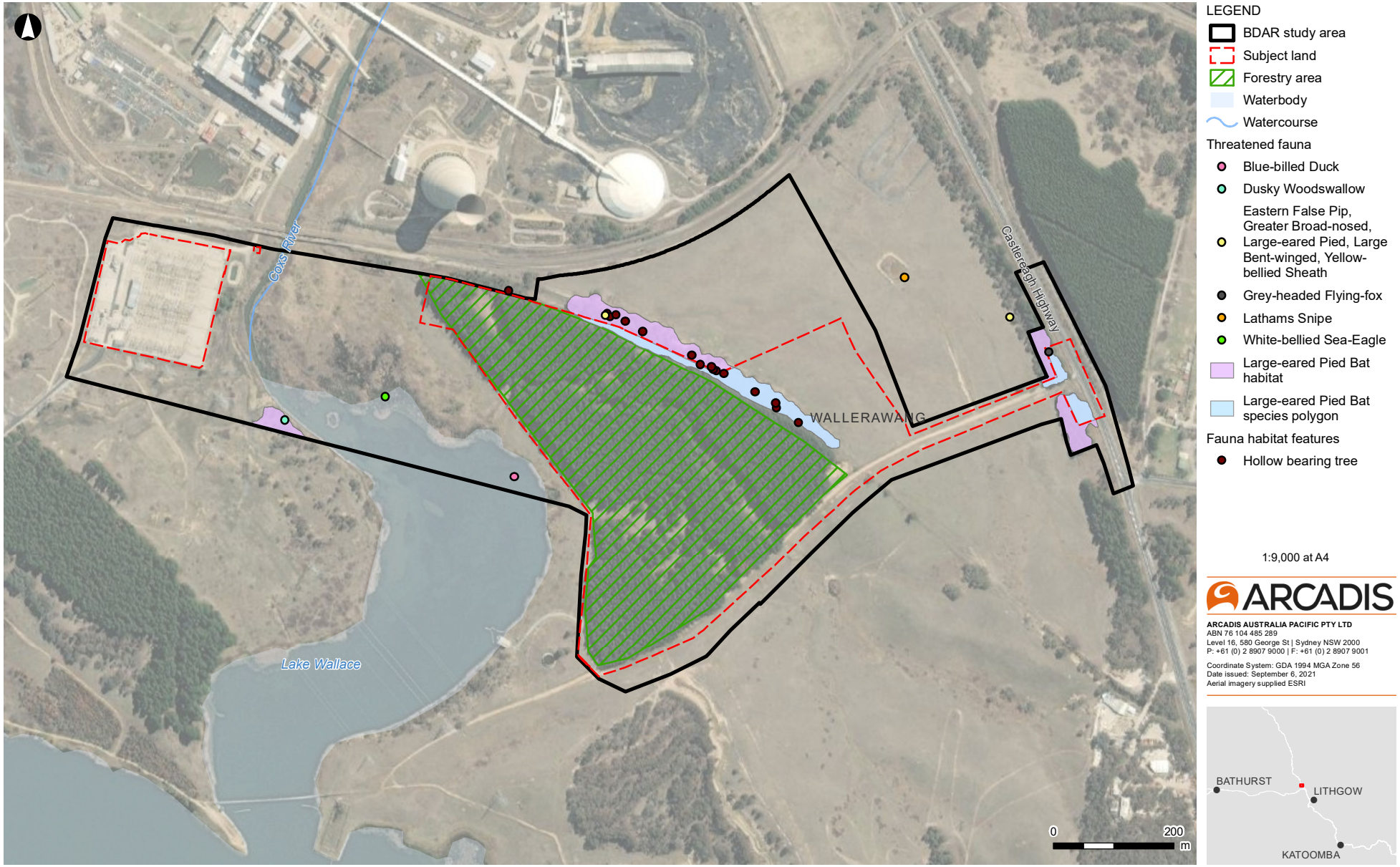

Figure 4-3 Recorded Threatened Fauna

5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Matters of National Environmental Significance (MNES) are environmental values that require approval from the Commonwealth Minister for the Environment if an action that may have a significant impact on one or more of these values is proposed. There are nine Matters of National Environmental Significance categories listed under the EPBC Act:

- World heritage properties
- National heritage places
- Wetlands of international importance (listed under the Ramsar Convention)
- Listed threatened species and ecological communities
- Migratory species protected under international agreements
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mines)
- A water resource, in relation to coal seam gas development and large coal mining development.

The relevant Matters of National Environmental Significance to the Project are:

- Listed threatened species
- Migratory species.

Other Matters of National Environmental Significance, including World heritage places, National heritages places and Wetlands of international importance (declared Ramsar wetlands) are not relevant to the Project. Furthermore, as outlined in Section 3.6, there are no TECs listed under the EPBC Act present within the study area.

5.1 Threatened species

5.1.1 Flora

Database searches of EPBC Act listed threatened flora predicted to occur within 10 kilometres of the study area identified 20 species (Appendix D). This was refined to four species considered likely to occur within the study area during desktop research based on available information on the PCTs present and other habitat information.

To threatened flora species listed under the EPBC Act were recorded within the study area during surveys:

- *Eucalyptus aggregata* (listed as vulnerable under the BC Act and EPBC Act),
- *Eucalyptus pulverulenta* (listed as vulnerable under the BC Act and EPBC Act).

Section 4.3 provides further details on the occurrence of these species within the study area. Potential impacts to these species as a result of the project are outlined in Section 8.4

5.1.2 Fauna

Database searches of EPBC Act listed threatened fauna predicted to occur within 10 kilometres of the study area identified 24 species (Appendix E). This was refined to two species considered likely to occur within the study area during desktop research based on available information on the PCTs present and other habitat information.

Two fauna species listed as threatened under the EPBC Act were recorded within the study area during surveys:

- Grey-headed Flying Fox (listed as vulnerable under the BC act and EPBC Act),
- Large-eared Pied Bat (listed as vulnerable under the BC act and EPBC Act).

Section 4.3.2 provides further details on the occurrence of these species within the study area. Potential impacts to these species as a result of the project are outlined in Section 8.4

5.2 Migratory species

The PMST and BioNet searches identified 12 migratory species listed as migratory under the EPBC Act, or under the Bonn, CAMBA, JAMBA and/or ROKAMBA conventions with the potential to occur within 10 kilometres of the study area (Appendix E).

One migratory fauna species, Latham's Snipe, was recorded within the study area during the current surveys. Further details and potential impacts to this species is detailed below in Section 8.4. Following surveys, all other migratory species identified during database searches were determined to have a low likelihood of occurrence in the study area (**Table 5-1**).

Table 5-1 Likelihood of occurrence of listed migratory species within the study area

Common name	Scientific name	Habitat requirements	Number of records and source	Potential occurrence
Black-faced Monarch	*Monarcha melanopsis*	The Black-faced Monarch is found along the coast of eastern Australia, becoming less common further south. The Black-faced Monarch is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	PMST	Low – no records within 10 km of the study area. Limited suitable habitat present in the study area.
Common Sandpiper	*Actitis hypoleucos*	Inhabits a wide range of coastal and inland wetlands, often with muddy or rocky margins. Also known to occur at estuaries, billabongs, dams, pools and lakes, often associated with mangroves.	PMST	Low – no records within10 km of the study area. Limited suitable habitat present in the study area.
Curlew Sandpiper	*Calidris ferruginea*	The Curlew Sandpiper is distributed around most of the Australian coastline, including Tasmania. In NSW, it occurs along the entire coastline, particularly in the Hunter Estuary and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are likely to be during the species migration, where they arrive in Australia for the non-breeding period between August and November, departing between March and mid-April. The Curlew Sandpiper generally occupies littoral and estuarine habitats. In NSW, it is mainly found in intertidal mudflats of sheltered coasts.	PMST	Low – no records or suitable habitat present in the study area.
Eastern Curlew	*Numenius madagascariensis*	The Eastern Curlew migrates to Australia for the non-breeding season. Within Australia, the Eastern Curlew is found across all States, and has a primarily coastal distribution, with birds rarely recorded inland. In NSW, the species occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond Ricer and Intermittently Closed and Open Lakes and Lagoons (ICOLLs) of the south coast. The species generally occupies coastal lakes, inlets, bays and estuarine habitats. In NSW, it is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts. Occasionally, the species is found on ocean beaches (often near estuaries) as well as coral reefs, rock platforms or rocky islets.	PMST	Low – no records or suitable habitat present in the study area.
Fork-tailed Swift	*Apus pacificus*	In NSW, the Fork-tailed Swift is recorded in all regions. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-	BioNet – 1 record (2013) PMST	Low – uncommon migratory species and one recent record in 10 km of the study area. Some suitable habitat present in the study area but the

Common name	Scientific name	Habitat requirements	Number of records and source	Potential occurrence
		tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. The sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines. They forage aerially, up to hundreds of metres above ground, but also less than 1 m above open areas or over water.		species was not detected during targeted surveys.
Latham's Snipe	*Gallinago hardwickii*	Latham's Snipe is a non-breeding migrant to the south east of Australia including Tasmania, passing through the north and New Guinea on passage. Latham's Snipe breed in Japan and on the east Asian mainland. Latham's Snipe are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture.	Mi	Recorded – one individual flushed from a small farm dam adjacent to the study area. Lake Wallace and the Coxs River within the study area provide suitable roosting, foraging, sheltering and/or dispersal habitat for the species.
Pectoral Sandpiper	*Calidris melanotos*	In NSW, the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands.	PMST	Low – no records or suitable habitat present in the study area.
Rufous Fantail	*Rhipidura rufifrons*	The Rufous Fantail is found in northern and eastern coastal Australia, being more common in the north. It is also found in New Guinea, the Solomon Islands, Sulawesi and Guam. The Rufous Fantail is found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground. During migration, it may be found in more open habitats or urban areas.	PMST	Low – no records within 10 km of the study area. Limited suitable habitat present in the study area.

Common name	Scientific name	Habitat requirements	Number of records and source	Potential occurrence
Satin Flycatcher	*Myiagra cyanoleuca*	The Satin Flycatcher is found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. It is also found in New Guinea. The Satin Flycatcher is not a commonly seen species, especially in the far south of its range, where it is a summer breeding migrant. The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	PMST	Low – no records within 10 km of the study area. Limited suitable habitat present in the study area.
Sharp-tailed Sandpiper	*Calidris acuminata*	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. They are widespread in most regions of New South Wales (NSW) and Victoria, especially in coastal areas, but they are sparse in the south-central Western Plain and east Lower Western Regions of NSW, and north-east and north-central Victoria. In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms.	PMST	Low – no records within 10 km of the study area. Limited suitable habitat present in the study area.
White-throated Needletail	*Hirundapus caudacutus*	White-throated Needletails are non-breeding migrants in Australia between late spring and early autumn, but most common in summer. The species often occur in large numbers over eastern and northern Australia. White-throated Needletails are aerial birds and for a time it was commonly believed that they did not land while in Australia. It has now been observed that birds will roost in trees, and radio-tracking has since confirmed that this is a regular activity.	BioNet – 15 records (2019) PMST	Low – some (15) recent records within 10 km of the study area. The species may fly over the study area while dispersing and foraging in the surrounding area. However, the species was not recorded during targeted surveys. As they are a non-breeding migrant to Australia, breeding habitat is not present in the study area.

Common name	Scientific name	Habitat requirements	Number of records and source	Potential occurrence
Yellow Wagtail	*Motacilla flava*	The Yellow Wagtail is a regular wet season visitor to northern Australia. Increasing records in NSW suggest this species is an occasional but regular summer visitor to the Hunter River region. The species is considered a vagrant to Victoria, South Australia and southern Western Australia. Habitat requirements for the Yellow Wagtail are highly variable, but typically include open grassy flats near water. Habitats include open areas with low vegetation such as grasslands, airstrips, pastures, sports fields; damp open areas such as muddy or grassy edges of wetlands, rivers, irrigated farmland, dams, waterholes; sewage farms, sometimes utilise tidal mudflats and edges of mangroves.	PMST	Low – uncommon migratory species. No records or suitable habitat present in 10 km of the study area.

6 PRESCRIBED BIODIVERSITY IMPACTS

Chapter 6 of the BAM (DPIE, 2020a) identifies the prescribed biodiversity impacts which must be assessed as part of the Biodiversity Offsets Scheme. These prescribed impacts and their relevance to the Project are described below in **Table 6-1**. An assessment of the prescribed impacts relevant to the Project is provided in Section 7.2 and Section 8.3.

Table 6-1 Prescribed impacts as identified in the BAM (DPIE, 2020a)

Prescribed impact	Relevance to the subject land
Impacts on the habitat of threatened entities including: • Karst, caves, crevices, cliffs and other geological features of significance	Not applicable. There are no karst, caves, crevices, cliffs or other geological features of significance within the subject land.
• Human-made structures	One sandstone culvert is present within the study area but outside the subject land. This culvert was determined to not contain suitable habitat for any threatened species, including Large-eared Pied Bat or Large Bent-winged Bat. This is due to the size, location and absence of deep crevices within the culvert as described in Section 4.3.2. As this culvert is not present within the subject land, it would not be removed by the Project.
• Non-native vegetation	Not applicable. No threatened species that would be associated with non-native vegetation and that have not been considered elsewhere in this report would occur within the subject land.
Impacts on areas connecting threatened species habitat, such as movement corridors	The subject land contains fragmented native vegetation with low connectivity value as outlined in Section 2.9. This prescribed impact is discussed further in Section 7.2.
Impacts that affect water quality, water bodies and hydrological processes that sustain threatened entities (including from subsidence or upsidence from underground mining)	The Cox's River is situated within the study area but outside the subject land and may sustain threatened entities. This prescribed impact is discussed further in Section 7.2.
Impacts on threatened and protected animals from turbine strikes from a wind farm	Not applicable, no turbines are proposed within the subject land.
Impacts on threatened species or fauna that are part of a TEC from vehicle strikes	Not applicable. No TECs are present within the subject land. The subject land contains potential habitat for a number of threatened fauna species as outlined in Section 4.3.2. As these species are highly mobile bird species, and the Project is unlikely to increase traffic, the Project is unlikely to increase vehicle strikes.

BAM (STAGE 2): IMPACT ASSESSMENT (BIODIVERSITY VALUES)

7 AVOID AND MINIMISE IMPACTS

7.1 Measures to avoid and minimise impacts on native vegetation and habitat

The principles in Section 7.1 of the BAM (DPIE, 2020a) have been considered to avoid and minimise impacts on native vegetation and habitat, where possible, through the development process for the Project.

7.1.1 Locating the Project

As stated in Section 7.1.1 of the BAM (DPIE, 2020a), project location decisions should be informed by knowledge of biodiversity values. An initial desktop assessment of biodiversity values, as well as an initial site survey was undertaken for early consideration in planning the Project location.

The avoidance and minimisation steps implemented during the development of the Project are outlined below in Table 7-1

Table 7-1: Avoidance and minimisation measures implemented during project location

BAM principles	How addressed
(a) Locating the project in areas where there are no biodiversity values	Approximately 29.56 hectares of the subject land has been historically cleared of native vegetation for past land uses. This includes the cleared exotic grassland as well as the Forestry area in the central section of the subject land. The Coxs River and native vegetation surrounding it has been avoided in the Project design.
(b) Locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a low vegetation integrity score)	As above, most of the subject land consists of cleared exotic grassland and the Forestry area. The Project will result in the removal of 1.15 hectares of 677_good with a vegetation integrity score of 46. As much of this vegetation zone has been avoided as far as practicable. PCT 732 and PCT 1299 within the study area which have vegetation integrity scores of 34.6 and 30.8 will be avoided. Areas of 677_moderate with a vegetation integrity score of 23.9 and a high number of individuals of *Eucalyptus aggregata,* has been avoided as far as practicable.
(c) Locating the project in areas that avoid habitat for species with a high biodiversity risk weighting or land mapped on the important habitat map, or native vegetation that is a TEC or a highly cleared PCT.	There are no TECs present within the study area or subject land and as such the development will not impact any TECs (including EECs and CEECs). With a biodiversity risk weighting of 3, Large-eared Pied Bat and Large Bent-winged Bat have the highest biodiversity risk weighting of threatened species recorded within the study area. No breeding habitat will be removed for either species. For Large-eared Pied Bat, 1.15 hectares of habitat is present within the subject land and will be removed as a result of the Project. Habitat removal for Large Bent-winged Bat is limited to 1.15 ha of foraging habitat.
(d) Locating the project outside of the buffer area around breeding habitat features such as nest trees or caves.	No nest trees or caves were recorded within the study area. Approximately 18 hollow bearing trees and stags are present within the study area. Approximately six of these are located within the subject land and will be removed as a result of the Project.

The BAM (DPIE, 2020a) also states that when selecting a proposal's location, alternatives need to be considered. The consideration of these alternatives, and justification in determining the final location is outlined below in Table 7-2.

Table 7-2 Alternatives considered in determining the Projects location

BAM principles	How addressed
(a) alternative modes or technologies that would avoid or minimise impacts on biodiversity values	As an energy source technology, the BESS has minimal impacts to biodiversity values. Impacts to biodiversity are limited to minimal clearing of vegetation and threatened species habitat. These impacts are minor compared to many alternative energy sources.
(b) alternative routes that would avoid or minimise impacts on biodiversity values	Site access roads have been designed to utilise existing roads and hence avoid impacts to biodiversity values. The route of the transmission line has been designed to avoid clearing of any high biodiversity values.
(c) alternative locations that would avoid or minimise impacts on biodiversity values	The location of the Project was determined due to its close proximity to the TransGrid substation. As a result, minimal vegetation needs to be removed for the construction of the transmission line. The location of the BESS is also situated in an area with minimal biodiversity value.
(d) alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values.	Most of the property in which the Project is located has low biodiversity value. Where possible, areas of higher biodiversity value, such as the Cox's River, have been avoided. The Project also utilises existing infrastructure such as access roads to minimise impacts to biodiversity values.

7.1.2 Designing the project

As stated in Section 7.1.2 of the BAM (DPIE, 2020a), project design (including the location of temporary and permanent ancillary construction and maintenance facilities) should be designed to avoid and minimise clearing of native vegetation and threatened species habitat.

Table 7-3: Avoidance and minimisation measures implemented during project design

BAM principles	How addressed
(a) Reducing the clearing footprint of the project by minimising the number and type of facilities	The number and type of facilities has been limited to what is required for the Project.
(b) Locating ancillary facilities in areas where there are no biodiversity values	Laydown areas, equipment and vehicle storage areas and earthworks stockpiling areas are largely located within the cleared exotic grassland areas which have very low to no biodiversity value.
(c) locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas with the lowest vegetation integrity scores)	As above. No ancillary facilities are located in areas of exotic vegetation with threatened species habitat.
(d) locating ancillary facilities in areas that avoid habitat for species and vegetation that has a high threat status (e.g. an endangered ecological community (EEC) or critically endangered ecological community (CEEC) or is an entity at risk of a serious and irreversible impact (SAII)	As above. No ancillary facilities are located in areas that are part of an EEC, CEEC, or habitat for an entity at risk of a SAII.
(e) actions and activities that provide for rehabilitation, ecological restoration and/or ongoing maintenance of retained areas of native vegetation, threatened species, threatened ecological communities and their habitat on the subject land.	Protection and management of native vegetation and threatened species will be outlined within the FFMP for the Project. Opportunities to provide rehabilitation and ecological restoration would be investigated.

7.2 Measures to avoid and minimise prescribed biodiversity impacts

Prescribed biodiversity impacts and their relevance to the Project are outlined in Section 6. Measures to avoid and minimise the prescribed biodiversity impacts relevant to the Project are outlined in **Table 7-4**.

Table 7-4: Prescribed impacts

Prescribed impact	Measures to avoid and minimise impact
Impacts on areas connecting threatened species habitat, such as movement corridors	The study area contains fragmented native vegetation with low connectivity value. This largely consists of the vegetation surrounding the Coxs River and along the Castlereagh Highway. The Project will avoid all vegetation surrounding the Coxs River. Vegetation removal along the Castlereagh Highway has been minimised to only include areas necessary to allow safe entry and exit to the access road.
Impacts that affect water quality, water bodies and hydrological processes that sustain threatened entities (including from subsidence or upsidence from underground mining)	The use of overhead transmission lines over the Coxs River is likely to avoid any risk of aquatic impacts as a result of the Project. The construction of overhead transmission lines would not result in the removal of any vegetation along the Cox's River or impact the water quality. Measures would be implemented to mitigate the risk of any aquatic impacts as a result of construction activities for the Project. These mitigation measures are listed in Section 9.

8 ASSESSMENT OF IMPACTS

The following sections assess the potential impacts of the Project.

Activities to take place during the site preparation and construction phase of the Project are outlined in Section 1.1.3. They include clearing of vegetation within the construction footprint as well as levelling the BESS area, 330 kV switchyard and ancillary areas.

Construction of the Project would take place within the subject land, except for the establishment of the new power supply connection from the BESS to the Wallerawang substation switchyard in the form of an overhead transmission line.

8.1 Direct impacts

8.1.1 Native vegetation

Clearing of native vegetation is required for the Project. The areas of PCT 677, PCT 732 and PCT 1299 and other vegetation types to be cleared are listed in **Table 8-1.**

For the purpose of this assessment, the impact area comprises the construction area. It is assumed that all vegetation within the proposal construction area would be removed. This is the same area covered by the subject land.

The total construction area covers 30.68 hectares, of which 1.15 hectares has been mapped as native vegetation and 6.48 hectares has been mapped as vegetation not conforming to any PCTs. As no TECs were identified within the study area, there are no direct impacts to TECs as a result of the Project.

The direct impacts of the Project are presented in **Table 8-1** for native vegetation.

Table 8-1: Direct impacts to native vegetation within the study area

PCT ID	PCT Name	Condition	Vegetation integrity score	Extent in the study area (ha)	Extent in the subject land (ha)
677	Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands; South Eastern Highlands Bioregion	677_Good	46	1.70	0.91
677	Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands; South Eastern Highlands Bioregion	677_Moderate	23.9	0.70	0.24
732	Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion	732_Moderate	34.6	0.20	0
1299	Wetlands on alluvial valley floors of the South Eastern Highlands Bioregion	1299_Moderate	30.8	5.08	0
Other vegetation types		Exotic roadside vegetation	15.6	0.17	0.01
		Exotic cleared grassland	0.5	27.24	6.47

PCT ID	PCT Name	Condition	Vegetation integrity score	Extent in the study area (ha)	Extent in the subject land (ha)
Total area native vegetation				**7.67**	**1.15**
Total area vegetation				**35.09**	**7.63**

8.1.2 Threatened flora and their habitat

Two threatened flora species have been identified in the study area and individuals of one species, *Eucalyptus aggregata,* are present within the subject land and would be removed as a result of the Project. Species polygons have been created for these species as an indication of their habitat within the subject land **(Figure 4-2)**. Species polygons were created using the methodology outlined in the BAM for count based species which consists of a 30 metre buffer around each recorded individual. The counts of individuals of these species and their habitat to be directly impacted by the Project are detailed in **Table 8-2**.

Table 8-2: Impacts on threatened flora

Threatened species	Status		Habitat in the study area (ha)	Habitat in the subject land (ha)	Individuals in the study area	Individuals in the subject land
	BC Act	EPBC Act				
Eucalyptus aggregata	Vulnerable	Vulnerable	2.75	0.76	69	47
Eucalyptus pulverulenta	Vulnerable	Vulnerable	0.15	0	1	0

8.1.3 Threatened fauna and their habitat

A total of 1.15 hectares of known or potential habitat for threatened fauna species would be cleared from within the construction area. Threatened species habitat to be removed is comprised of 1.15 hectares of PCT 677, which includes loss of important habitat features such as hollow-bearing trees, stags and foraging resources (eg blossoms). The 6.47 hectares of exotic grassland and 0.01 hectares of exotic roadside vegetation is not considered to provide suitable habitat for any threatened flora or fauna species. Species credits required are limited to Large-eared Pied Bat, with all other threatened species impacts restricted to ecosystem credit species only.

A total of approximately 16 hollow-bearing trees were identified within the study area, of which six are within the subject land and would be cleared as a result of the Project. These hollow-bearing trees are in the form of stags and generally comprise small hollows and fissures suitable for microbat species as well as some common frogs, arboreal mammals, reptiles and birds. The removal of hollow-bearing trees could potentially impact several threatened species as noted in Table 8-3. Hollow-bearing trees are not suitable for any species credit species.

Direct impacts to threatened fauna species and their associated habitat are presented in **Table 8-3**.

Table 8-3: Direct impacts to threatened fauna species within the subject land

Threatened species	Status		Ecosystem or species credit species	Occurrence in the Study area	Habitat or individuals in the study area	Habitat or individuals within the subject land
	BC Act	EPBC Act				
Blue-billed Duck	V	-	Ecosystem	Recorded	5.08 ha (associated PCTs),	-

Threatened species	Status		Ecosystem or species credit species	Occurrence in the Study area	Habitat or individuals in the study area	Habitat or individuals within the subject land
	BC Act	EPBC Act				
					Cox's River	
Dusky Woodswallow	V	-	Ecosystem	Recorded	7.67 ha (associated PCTs), Cox's River	1.15 ha (associated PCTs)
White-bellied Sea-Eagle	V	-	Species (breeding habitat)/ecosystem (foraging habitat)	Recorded	Cox's River (foraging habitat)	-
Eastern False Pipistrelle	V	-	Ecosystem	Recorded	2.60 ha (associated PCTs) Potential roosting habitat in tree bark and 16 hollow bearing trees.	1.15 ha (associated PCTs) Loss of potential roosting habitat in removal of tree bark and up to 6 hollow bearing trees.
Gang-gang Cockatoo	V	-	Ecosystem (foraging) / Species (breeding)	Assumed present (foraging)	2.60 ha (associated PCTs) (foraging habitat)	1.15 ha (associated PCTs) (foraging habitat only)
Greater Broad-nosed Bat	V	-	Ecosystem	Recorded	2.60 ha (associated PCTs) Potential roosting and breeding habitat in 16 hollow bearing trees.	1.15 ha (associated PCTs) Loss of potential roosting and breeding habitat in removal of up to 6 hollow bearing trees.
Grey-headed Flying-fox	V	V	Species (breeding habitat)/ecosystem (foraging habitat)	Recorded	0.20 ha (associated PCTs) (foraging habitat)	-
Large Bent-winged Bat	V	-	Species (breeding habitat)/ecosystem (foraging habitat)	Recorded	2.60 ha (associated PCTs) (foraging habitat)	1.15 ha (associated PCTs) (foraging habitat only)
Large-eared Pied Bat	V	V	Species	Recorded	2.60 ha (PCTs where species is recorded within 2km of potential roost habitat features)	1.15 ha (PCTs where species is recorded within 2km of potential roost habitat features)

Threatened species	Status		Ecosystem or species credit species	Occurrence in the Study area	Habitat or individuals in the study area	Habitat or individuals within the subject land
	BC Act	EPBC Act				
Yellow-bellied Sheathtail-bat	V	-	Ecosystem	Recorded	0.20 ha (associated PCTs) Potential breeding and roosting habitat in 16 hollow bearing trees	Loss of potential breeding and roosting habitat with the removal of up to 6 hollow bearing trees

8.1.4 Serious and irreversible impacts

The DPIE (2019) *Guidance to assist a decision-maker to determine a serious and irreversible impact* identifies threatened species and ecological communities most at risk of serious and irreversible impacts. To assist the consent authority to evaluate the nature of an impact on a potential entity at risk of a serious and irreversible impact, the BDAR must contain details of the assessment of serious and irreversible impact, in accordance with the assessment criteria set out in Section 9.1 of the BAM.

Two species recorded during surveys are listed as potential SAII species; Large-eared Pied Bat and Large Bent-winged Bat. As discussed in Section 4.3.2, an SAII for these species is any impact to breeding habitat. As there is no breeding habitat for either species within the study area, no SAII assessments are required.

The three PCTs identified within the study area do not correspond to any TECs and therefore no ecological communities are considered at risk of serious and irreversible impacts.

8.2 Indirect Impacts

The BAM (Section 8.2.2) identifies 16 potential indirect impacts that, as a minimum, must be considered as a part of a BDAR. The majority of these indirect impacts are not relevant to the Project and are therefore not considered further. **Table 8-4** provides consideration of the indirect impacts of the Project on native vegetation, TECs, threatened species and their habitat.

Table 8-4: Potential indirect impacts of the Project

Indirect impact type	Nature	Extent	Frequency	Duration	Timing
Impacts of the proposal on TECs/PCTs and/or threatened species and their habitat beyond the Construction area, including but not limited to: (a) Inadvertent impacts on adjacent habitat or vegetation	As with any construction project, there is always a risk of inadvertent impacts to adjacent habitat and vegetation through overstepping vegetation clearing boundaries. Areas of native vegetation which interface with the construction area are a small area along the Castlereagh Highway, and the retained area of 677_good. Within these areas, individuals of the threatened flora species *Eucalyptus aggregata* are also present and at risk of indirect impacts. This risk can be mitigated through good environmental management and strict controls for identifying and adhering to clearing boundaries. It is expected that through preparation and implementation of a Construction Environmental Management Plan (CEMP), the risk of inadvertent impacts can be reduced to an acceptable level.	Adjacent vegetation	Ongoing during construction activities	Throughout the construction period	Potentially permanent
(b) Reduced viability of adjacent habitat due to edge effects	Habitat adjacent to the construction area is limited to a small area along the Castlereagh Highway and the retained areas of 677_good. Both these areas of vegetation are already subject to high levels of edge effects and highly fragmented from other areas of native vegetation. Construction and operational activities as a result of the Project are not likely to exacerbate these edge effects and reduce the viability of these adjacent areas of habitat.	Adjacent vegetation	Ongoing during construction and operation	Throughout the construction period and during operation	Potentially permanent
(c) Reduced viability of adjacent habitat due to noise, dust or light spill	The Project would result in minor increases to noise, dust and light spill as a result of construction and operational activities. The surrounding habitat is already subject to high levels of noise, dust and light spill as a result of surrounding developments and the Castlereagh Highway. Therefore, any increases to noise, dust and light spill are expected to be negligible and would not reduce the viability of adjacent habitat.	Adjacent vegetation	Ongoing during construction and to a lesser extent, during operation	Throughout the construction period and potentially during operation	Potentially permanent

Indirect impact type	Nature	Extent	Frequency	Duration	Timing
(d) Transport of weeds and pathogens from the site to adjacent vegetation	All areas of adjacent vegetation are currently abundant in weeds. However, an increase in the movement of people, vehicles, machinery, vegetation waste and soil during and following construction may facilitate the introduction or spread of weeds and pathogens that currently occur within the study area into adjacent vegetation. It is anticipated that the spread of weeds to adjacent vegetation can be managed as a part of a CEMP.	Adjacent vegetation	Ongoing during construction	Throughout the construction period	Potentially permanent
(e) Increased risk of starvation, exposure and loss of shade or shelter	The Project is not expected to result in any indirect impacts resulting in an increased risk of starvation, exposure and loss of shade or shelter.	N/A	N/A	N/A	N/A
(f) Loss of breeding habitat	The Project is not expected to result in any indirect impacts resulting in the loss of breeding habitats.	N/A	N/A	N/A	N/A
(g) Trampling of threatened flora species	Threatened flora species recorded in areas adjacent to the subject land include mature *Eucalyptus aggregata.* Due to the large size of these individuals, trampling is not considered a risk. However, trampling of the root zone of some of these individuals during construction activities is possible. It is expected that through preparation and implementation of a Construction Environmental Management Plan (CEMP), the risk of trampling of threatened flora species can be reduced to an acceptable level.	Adjacent vegetation	Ongoing during construction and operation	Throughout the construction period and during operation	Potentially permanent
(h) Inhibition of nitrogen fixation and increased soil salinity	The Project is not expected to result in any inhibition of nitrogen fixation.	N/A	N/A	N/A	N/A
(i) Fertiliser drift	The Project is not expected to result in any fertiliser drift.	N/A	N/A	N/A	N/A
(j) Rubbish dumping	The Project is not expected to result in any additional rubbish dumping.	N/A	N/A	N/A	N/A
(k) Wood collection	The Project is not expected to result in any wood collection.	N/A	N/A	N/A	N/A

Indirect impact type	Nature	Extent	Frequency	Duration	Timing
(l) Removal and disturbance of rocks, including bush rock	The Project is not expected to result in any disturbance of rocks.	N/A	N/A	N/A	N/A
(m) Increase in predators	The Project is not expected to result in any increase in predatory species populations	N/A	N/A	N/A	N/A
(n) Increase in pest animal populations	The Project is not expected to result in any increase in pest animal populations.	N/A	N/A	N/A	N/A
(o) Changed fire regimes	The Project is not expected to result in any changed fire regimes.	N/A	N/A	N/A	N/A
(p) Disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	The Project is not expected to result in any disturbance to specialist breeding and foraging habitat.	N/A	N/A	N/A	N/A
Other indirect impacts identified for the Project: Impacts to aquatic habitats.	The Project has the potential to result in minor indirect impacts to the Coxs River through sedimentation and run off from construction activities. This indirect impact is anticipated to be minor and of low risk as a result of its management as part of a CEMP.	Coxs river and adjacent vegetation	Ongoing during construction	Throughout the construction period	Potentially permanent

8.3 Prescribed biodiversity impacts

With the measures described in Section 7.2 and Section 9 to avoid and minimise and reduce the risk of the Project resulting in prescribed biodiversity impacts, there is not expected to be any residual prescribed biodiversity impacts.

8.4 Matters of National Environmental Significance

MNES relevant to the Project are discussed in Section 5.

Two EPBC Act listed threatened flora species, two EPBC Act listed threatened fauna species, and one EPBC Act listed migratory species were recorded within the study area. No additional threatened species or other MNES were considered likely to occur within the study area.

Significant Impact Assessments using the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Significant Impact Guidelines (DoE 2013) were undertaken for these listed species. The impact assessments are provided in Appendix H. A summary of the impact assessments is provided in Table 8-5.

The results of the significant impact criteria assessments determined that the Project would not significantly impact on any of the listed species assessed. As such the Project is not considered likely to require referral to the Australian Government Minister for the Environment for impacts to MNES.

Table 8-5 Summary of Significant Impact Criteria (EPBC Act)

EPBC Act significant impact criteria assessments										
EPBC Act listed species	**Significant impact criteria[1]**									**Likely significant impact?**
	i	**ii**	**iii**	**iv**	**v**	**vi**	**vii**	**viii**	**ix**	
Eucalyptus aggregata [a]	N	Y	N	N	Y	N	N	N	N	No
Eucalyptus pulverulenta [a]	N	N	N	N	N	N	N	N	N	No
Large-eared Pied Bat [a]	N	N	N	N	N	N	N	N	N	No
Grey-headed Flying-fox [a]	N	N	N	N	N	N	N	N	N	No
Latham's Snipe[b]	N	N	N	n/a	n/a	n/a	n/a	n/a	n/a	No

1. Significant impact criteria as set out in the EPBC Act:
   a. An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
      i. Lead to a long-term decrease in the size of an important population of a species
      ii. Reduce the area of occupancy of an important population
      iii. Fragment an existing important population into two or more populations
      iv. Adversely affect habitat critical to the survival of a species
      v. Disrupt the breeding cycle of an important population
      vi. Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
      vii. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
      viii. Introduce disease that may cause the species to decline, or
      ix. Interfere with the recovery of the species
   b. An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:
      i. substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species

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

8.5 Aquatic impacts

During the construction phase of the Project, there is the potential for water quality impacts including spills and sedimentation. Impacts are likely to be localised and minor as no works are occurring directly in these watercourses. No impacts to threatened fish or any other entities as listed under the FM Act are anticipated. No obstruction of fish passage would occur at these waterways. Impacts would be mitigated by the implementation of erosion and sediment controls and spill management, discussed further in Section 9.

8.6 Groundwater dependent ecosystems

No mapped potential GDEs would be removed as a result of the Project. One mapped moderate potential aquatic GDE is situated within the Cox's River (**Figure 3-6**). This GDE is not expected to be impacted as a result of the Project. This is because there would be no direct impacts to the vegetation or aquatic environment the potential GDE is situated within. Excavation required for the Project is unlikely to encounter the water table. In the event there are any impacts to the water table this is anticipated to be minor, and would not impact upon the nearby GDEs.

The next closest potential GDEs are located approximately 100 metres south of the study area adjacent to the Castlereagh Highway (**Figure 3-6**). As no works are occurring within, or within proximity to these areas, these potential GDEs are not anticipated to be impacted by the Project.

9 MITIGATION OF IMPACTS

Biodiversity impacts cannot be avoided for several aspects of the Project. As such, the measures in **Table 9-1** have been developed to mitigate these impacts during construction and operation.

Table 9-1: Measures to be implemented to minimise impacts on biodiversity

Mitigation measure	Outcome	Timing	Responsibility
A Construction Flora and Fauna Management Plan (CFFMP) would be prepared. Clearing of native vegetation and threatened species habitat within the study area would not occur until the CFFMP is approved. This CFFMP would include the following: • Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas • Pre-clearing survey requirements • Procedures for unexpected threatened species finds and fauna handling • Protocols to manage weeds and pathogens.	Flora and fauna would be managed in accordance with the requirements of the CFFMP; prevention of over clearing of vegetation; prevention of weed establishment and invasion	Pre-construction and construction	Construction contractor
Pre-clearing surveys would be undertaken to identify any breeding or nesting activities by native fauna in hollow-bearing trees and native vegetation. No breeding sites or active nests should be disrupted, as far as practical.	Minimise fauna mortality and injury	Pre-construction	Construction contractor Project ecologist
Site inductions for construction staff will include a briefing on the potential presence of threatened species and their habitat adjacent to the development site, their significance and locations and extents of no-go zones.	Protect threatened species	Construction	Construction contractor
Clearance of native vegetation would be minimised as far as is practicable.	Minimise biodiversity loss	Pre-construction/ construction	Construction contractor
The limits of vegetation clearing would be marked on plans and on site with signed fencing so that clearing activities are constrained to approved areas only.	Prevent accidental vegetation clearing	Pre-construction/ construction	Construction contractor
Where fauna species are identified in vegetation to be cleared, animals would be removed and relocated to adjacent bushland prior to felling. If this is not possible, the tree would be sectionally dismantled or soft felled under the supervision of an ecologist or wildlife carer, before relocating the animal.	Minimise fauna mortality and injury	Pre-construction	Construction contractor Project ecologist
Undertake a two-stage approach to clearing: • Remove non hollow-bearing trees at least 48 hours before habitat trees are removed • Hollow-bearing trees are to be knocked with an excavator bucket or other machinery to encourage fauna to evacuate the tree immediately prior to felling • Felled trees must be left for a short period of time on the ground to give any fauna trapped in the trees an opportunity to escape before further processing of the trees	Prevention of fauna injury/mortality	Construction	Construction contractor

Mitigation measure	Outcome	Timing	Responsibility
• Felled hollow-bearing trees must be inspected by an ecologist as soon as possible (no longer than two hours after felling).			
A pre-start up check for sheltering native fauna of all infrastructure, plant and equipment and/or during relocation of stored construction materials would be undertaken.	Minimise fauna mortality and injury	Pre-construction	Construction contractor Project ecologist
If any pits/trenches are to remain open overnight adjacent to native vegetation, they would be securely covered, if possible. Alternatively, fauna ramps (logs or wooden planks) would be installed to provide an escape for trapped fauna.	Prevent fauna injury/starvation/mortality	Construction	Construction contractor Project ecologist
Appropriate sediment and erosion controls would be installed prior to the commencement of earthworks and construction, around the impact area, to reduce run-off into adjoining vegetation and downstream to the Coxs River and Lake Wallace.	Protect waterways including Coxs River and Irrawang Swamp	Pre-construction/ construction	Construction contractor
Where possible, earthworks would be undertaken during dry weather conditions. Clearing of vegetation should be avoided during overland flow events.	Prevent erosion and downstream water quality impacts	Construction	Construction contractor

10 IMPACT SUMMARY AND OFFSETS

The following section summarises the impacts of the Project and outlines the offsets required in accordance with the BAM.

10.1 Impacts requiring offset

10.1.1 Impacts on native vegetation

The impacts of the Project on native vegetation that require offset (in accordance with Section 9.2 of the BAM and as determined using the BAMC) are outlined below in **Table 10-1** and **Figure 10-1**. The full biodiversity offset credit reports are provided in Appendix F of this report.

Table 10-1: Impact summary for PCTs requiring offsets and the associated ecosystem credit requirements

Vegetation Zone	PCT Name	Area to be impacted (ha)	Change in vegetation integrity score	Ecosystem credits required
677_Good	Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands; South Eastern Highlands Bioregion (PCT 677)	0.91	-46	26
677_Moderate	Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands; South Eastern Highlands Bioregion (PCT 677)	0.24	-23.9	4
Total		**1.15**		**30**

10.1.2 Impacts on threatened species

Impacts to species credit species as a result of the Project require offsetting in accordance with Section 10.1.1 of the BAM. The TBDC identifies the assessment method for threatened species to be used when determining credit requirements. *Eucalyptus aggregata* is identified in the TBDC as being assessed by count of individuals while Large-eared Pied Bat is assessed by area.

The credit requirements for each species as a result of the Project are listed in **Table 10-2** and impacts are shown in **Figure 10-1**. The full biodiversity offset credit reports are provided in Appendix F of this report.

Table 10-2: Impact summary for threatened species credit species requiring offsets and the associated species credit requirements

Species Name	BC Act status	EPBC Act status	Vegetation Zone	Direct impact (ha/individuals)	Species credits required
FLORA					
Eucalyptus aggregata	V	V	677_Good	3	6
			677_Moderate	44	88
Large-eared Pied Bat	V	V	677_Good	0.91	31
			677_Moderate	0.24	4
Total					129

V = vulnerable

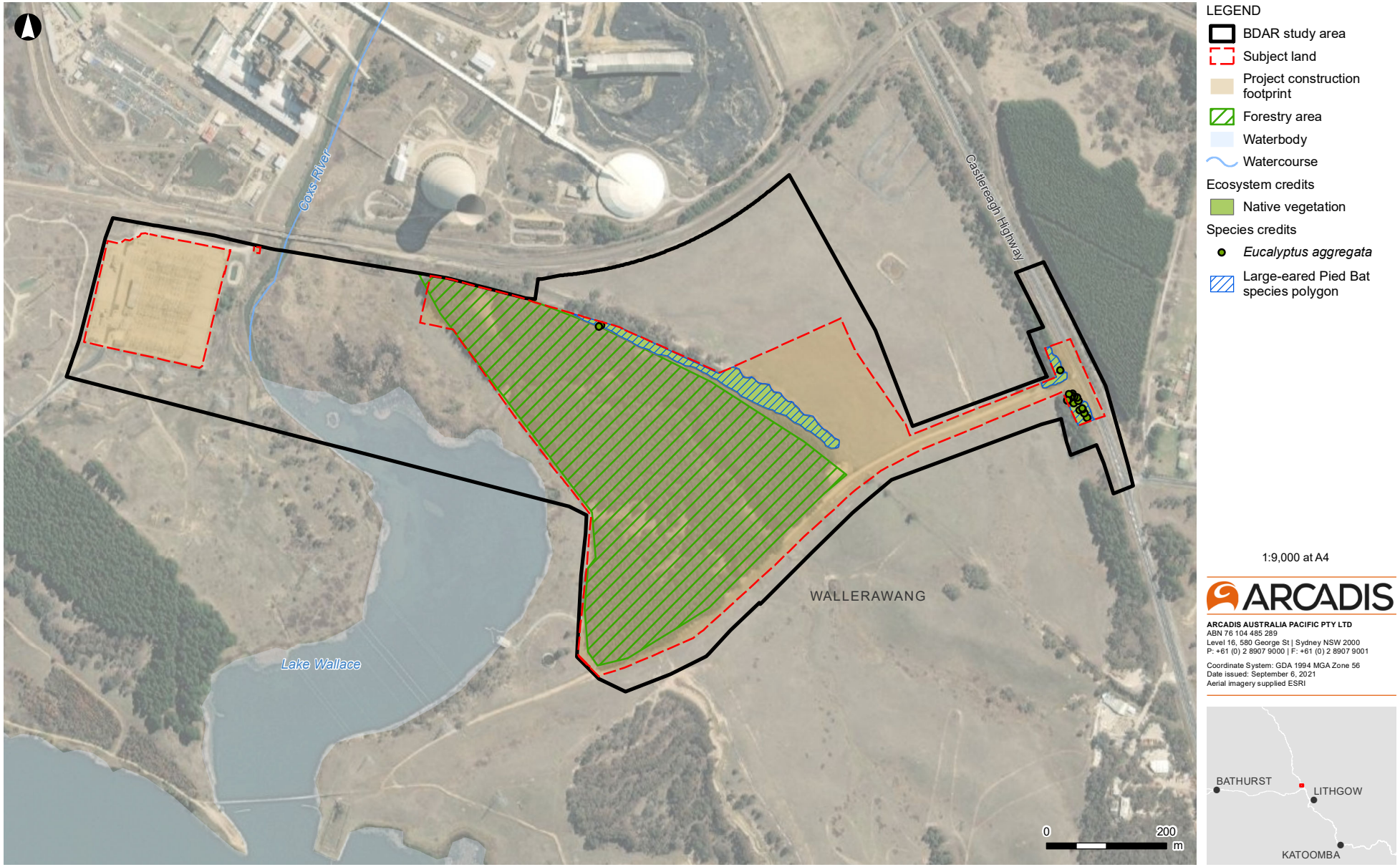

Figure 10-1 Impacts Requiring Offset

10.2 Impacts not requiring offset

All impacts on native vegetation as a result of the Project require offsetting in accordance with Section 9.2.1 of the BAM.

10.3 Areas not requiring assessment

Two vegetation zones recorded within the subject land are dominated by exotic species and do not conform to the definition of any PCT listed in the VIS database. These areas comprise of cleared exotic grassland and roadside vegetation as listed in **Table 10-3** and do not require further assessment or offsetting in accordance with section 9.3 of the BAM.

Table 10-3: Areas not requiring assessment

Vegetation Zone	Area to be impacted (ha)
Cleared exotic grassland	6.47
Exotic roadside vegetation	0.01

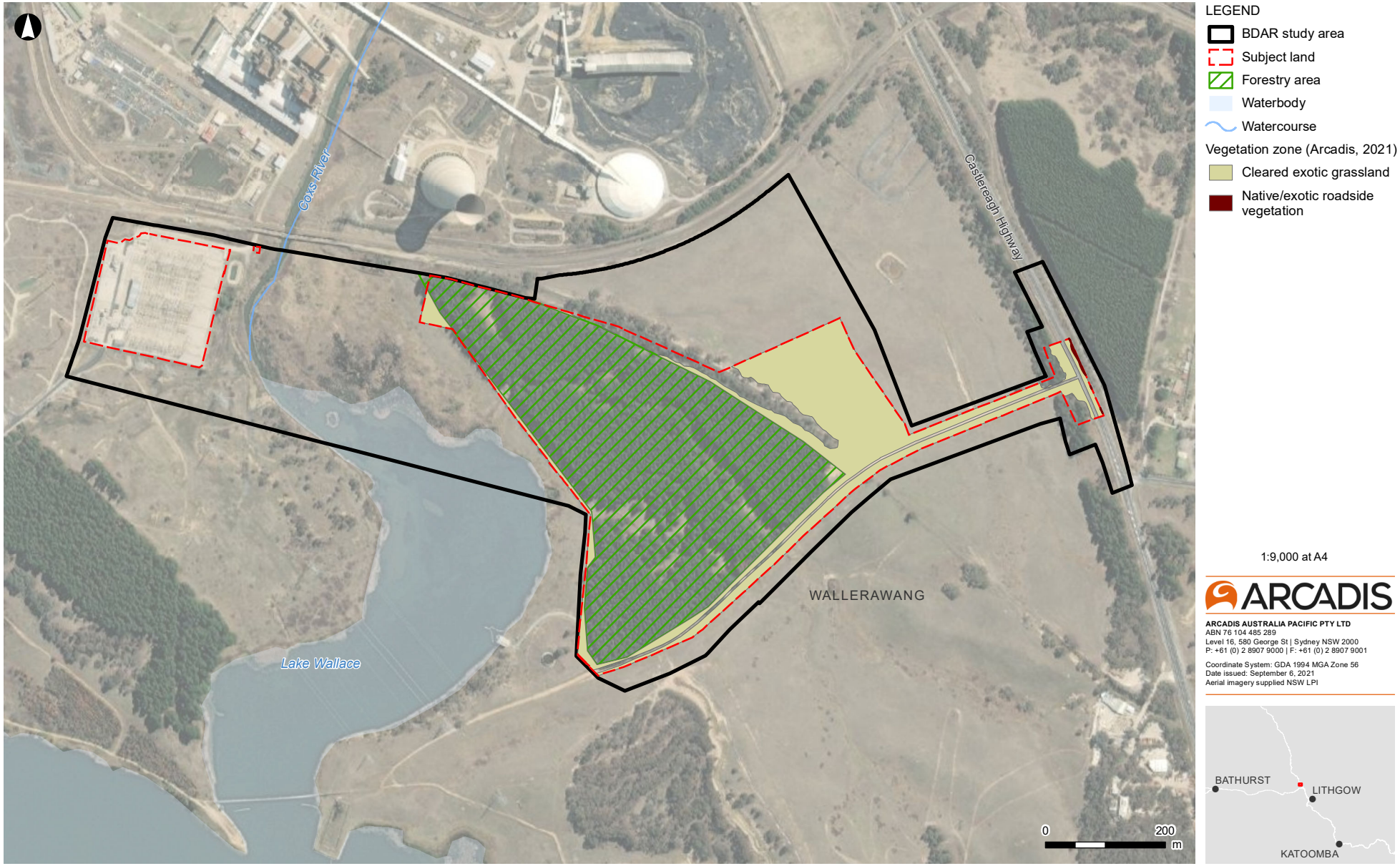

Figure 10-2 Impacts Not Requiring Assessment

11 OFFSET STRATEGY

The impacts of the proposed development have been assessed in accordance with the BC Act and the BAM. As such, the offset requirement presented in Section 9 of this BDAR are in the form of BAM credits.

11.1 Biodiversity Conservation Fund

The available options for delivery of offsets under the Biodiversity Offsets Scheme are as follows:

- An appropriate number and class of like-for-like biodiversity credits may be retired.
- If all the required like-for-like biodiversity credits cannot be sourced, an appropriate number and class of variation biodiversity credits may be retired. The use of variation offset rules must be approved by the consent authority. The use of variation offset rules cannot be approved unless an applicant can demonstrate that they have taken reasonable steps to secure like-for-like biodiversity credits.
- Alternatively, the Offsets Payment Calculator may be used to determine the cost of all or part of the credit obligations, and a payment may be made to the Biodiversity Conservation Fund (BCF).

For the purpose of this BDAR, it has been assumed that a future offset requirement would be met through a contribution to the BCF. The BCF is administered by the Biodiversity Conservation Trust (BCT) who take on responsibility for sourcing the requisite land offsets from a proponent once the payment to the BCF has been made.

Table 11-1 and **Table 11-2** below outline the necessary financial contribution for offsets required by the Project based on the impacts requiring offset (identified in **Table 10-1** and **Table 10-2**).

Table 11-1: BCF contribution for ecosystem credits required by the proposed development (see Appendix I)

PCT	Impact (ha)	Price per credit	Credits required	Total price (excl. GST)
Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion (PCT 677)	1.15	$5,861.69	30	$175,850.83

Table 11-2: BCF contribution for species credits required by the Project (see Appendix I)

Species Name	Impact (ha/individuals)	Price per credit	Credits required	Total price (excl. GST)
Eucalyptus aggregata	47 individuals	$173.02	94	$27,148.88
Large-eared Pied Bat	1.15 hectares	$741.31	35	$34,114.05
Total				$61,262.93

12 CONCLUSION

This BDAR has been prepared on behalf of Greenspot Wallerawang Pty Ltd to inform the construction, operation, and maintenance of a Battery Energy Storage System (BESS), that will be up to 500 Megawatts (MW) and would provide up to 1,000 Megawatt hours (MWh) of battery storage capacity or up to 2 hours of storage duration (the Project). This BDAR has been prepared by Kate Carroll, an Accredited Person (BAAS17070) under the New South Wales (NSW) *Biodiversity Conservation Act 2016* (BC Act). It is based on desktop research and field surveys, carried out by Arcadis in 2021.

Three PCTS, PCT 677, PCT 732 and PCT 1299, occur within the study area, occupying a total of 7.67 hectares, of which 1.15 hectares lies within the construction area. None of these PCTs are associated with any TECs under the BC Act or EPBC Act.

Two threatened flora species, *Eucalyptus aggregata* (listed as vulnerable under the BC act and EPBC Act) and *Eucalyptus pulverulenta* (listed as vulnerable under the BC act and EPBC Act) were recorded within the study area during targeted surveys. Forty-seven individuals of *Eucalyptus aggregata* are present within the subject land and would be removed as a result of the Project. No individuals of *Eucalyptus pulverulenta* would be removed. No additional threatened flora species are considered moderately or highly likely to occur in the study area.

Nine threatened fauna species were recorded during surveys; Large-eared Pied Bat, Grey-headed Flying-fox, White-bellied Sea-Eagle, Large Bent-winged Bat, Blue-billed Duck, Dusky Woodswallow, Eastern False Pipistrelle, Greater Broad-nosed Bat and Yellow-bellied Sheathtail-bat. All nine species are listed as vulnerable under the BC Act and Large-eared Pied Bat and Grey-headed Flying-fox are also listed as vulnerable under the EPBC Act. Targeted surveys did not detect any breeding sites for dual credit species and consequently, no species credit habitat is present for dual credit species. Large-eared Pied Bat is a species credit species and a species polygon has been created for species credit habitat within the subject land. No additional threatened fauna species are considered likely to occur in the study area. One listed migratory species under the EPBC Act, Latham's Snipe, was recorded within the study area.

Significant impact criteria assessments under the EPBC Act concluded that the Project is unlikely to have a significant impact on any MNES including listed threatened species.

Where impacts cannot be avoided, mitigation measures are proposed that would reduce adverse impacts on ecological values. These include preparation of a Flora and Fauna Management Plan, appropriate sediment and erosion controls, avoiding and minimising removal of vegetation where practicable, site inductions, exclusion fencing, pre-clearance surveys and appropriate weed and hygiene protocols.

The offsets required for the Project were calculated using the BAMC; 30 ecosystem credits and 129 species credits are required to offset the impacts of the Project.

13 REFERENCES

BOM. (2021). *Climate Data Online*. Retrieved from Bureae of Meterology: http://www.bom.gov.au/climate/data/?ref=ftr

Bowmer, K., Eberach, P., Murphy, T., & Harris, E. (2007). Science to support water sharing planning in New South Wales. *5th Australian Stream Management Conference*, 21-25.

CoA. (2010a). *Survey guidelines for Australia's threatened birds: guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999.* Canberra: Commonwealth of Australia.

CoA. (2010b). *Survey guidelines for Australia's threatened bats: guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999.* Canberra: Commonwealth of Australia.

CoA. (2011). *Survey guidelines for Australia's threatened mammals: guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999.* Sydney: Commonwealth of Australia.

CoA. (2014). *EPBC Act referral guidelines for the vulnerable Koala.*

DAWE. (2021). *National Recovery Plan for the Grey-headed Flying-fox 'Pteropus poliocephalus'.* Canberra: Department of Agriculture, Water and the Environment.

DAWE. (2021). *Protected Matters Search Tool*. Retrieved from http://www.environment.gov.au/epbc/protected-matters-search-tool

DEC. (2004). *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities working draft.* Department of Environment and Conservation.

Department of Environment and Resource Management. (2011). *National recovery plan for the large-eared pied bat Chalinolobus dwyeri.* Canberra: Report to the Department of Sustainability, Environment, Water, Population and Communities.

DoE. (2013). *Matters of National Environmental Significance: Significant impact guidelines 1.1.* Sydney: Department of Environment.

DPI. (2021a). *Fisheries NSW Spatial Data Portal.* Department of Primary Industries.

DPI. (2021b). *Register of Critical Habitat.* Department of Primary Industries.

DPI. (n.d.). *Key Fish Habitat maps*. Retrieved from Department of Primary Industries Key Fish Habitat maps: https://www.dpi.nsw.gov.au/fishing/habitat/publications/pubs/key-fish-habitat-maps

DPI. (n.d.). *Fisheries NSW Spatial Data Portal*.

DPIE. (2016). *NSW (Mitchell) Landscapes - version 3.1*. Retrieved from SEED Sharing and Enabling Environmental Data: https://datasets.seed.nsw.gov.au/dataset/nsw-mitchell-landscapes-version-3-1

DPIE. (2017). *Large-eared Pied Bat - profile*. Retrieved from https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10157

DPIE. (2017). State Vegetation Type Map: Central Tablelands Region Version 1.0. VIS_ID 4778.

DPIE. (2019). *Black Gum - profile*. Retrieved from https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20128

DPIE. (2020a). *Biodiversity Assessment Method.* Sydney: NSW Department of Planning, Industry and Environment.

DPIE. (2020b). *Surveying threatened plants and their habitats.* Parramatta: Department of Planning, Industry and Environment: Environment, Energy and Science.

DPIE. (2021a). *BioNet Atlas*. Retrieved from http://www.bionet.nsw.gov.au/

DPIE. (2021b). *BioNet NSW Vegetation Information System (VIS) Classification database*. Retrieved July 16, 2018, from https://www.environment.nsw.gov.au/research/Vegetationinformationsystem.htm

DPIE. (2021b). *BioNet NSW Vegetation Information System (VIS) Classification database*. Retrieved July 16, 2018, from https://www.environment.nsw.gov.au/research/Vegetationinformationsystem.htm

DPIE. (2021c). *eSPADE*. Retrieved 04 12, 2019, from https://www.environment.nsw.gov.au/eSpade2WebApp#

DPIE. (2021e). Biobanking Assessment Method Calculator. Office of Environment and Heritage.

DPIE. (2021f). *NSW WeedWise*. Retrieved from https://weeds.dpi.nsw.gov.au/

DPIE. (2021g). *Threatened Biodiversity Data Collection.*

DPIE EES. (2020c). *Threatened biodiversity profile search*. Retrieved from https://www.environment.nsw.gov.au/threatenedSpeciesApp/

Judge, S. M. (2013). *Fauna of the Upper Coxs River catchment: An assessment of common freshwater species in a high-demand landscape.* University of Western Sydney.

OEH. (2012). *Eucalyptus pulverulenta- profile*. Retrieved from https://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10308

OEH. (2013). Compilation map: Biometric vegetation types of the Shoalhaven, Eurobodalla and Bega Valley local government areas. Version 2.1. VIS_ID 3900. NSW Office of Environment and Heritage.

OEH. (2016). *NSW Guide to Surveying Threatened Plants.* Sydney: Office of Environment and Heritage.

OEH. (2016). *The Native Vegetation of the Sydney Metropolitan Area Version 3.0.* Office of Environment and Heritage.

OEH. (2018). *Species credit' threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method .* Office of Environment and Heritage.

Phillips, S., & Callaghan, J. (2011). The Spot Assessment Technique: a tool for determining localised levels of habitat use by Koala Phascolarctos cinereus. *Australian Zoologist*, 774-780.

Slade, D. A. (2000). Case Study: Environmental considerations of horizontal directional drills. *2000 International Pipeline Conference*, 353-361.

The Ecology Lab. (2007). *Aquatic Ecology Studies for the Kerosene Vale Stage 2 Ash Repository Area.*

TSSC. (2015). Conservation advice Eucalyptus aggregata.

WaterNSW. (n.d.). *Fish River Water Supply Scheme.* Retrieved from https://www.waternsw.com.au/supply/regional-nsw/fish-river

Young, W., Brock, M., Chessman, B., Gehrke, P., Maher, W., Marr, A., . . . Warner, R. (2000). *Assessments of river condition under the current flow regime and proposed flow regimes in the lower Coxs River'.* New South Wales.

APPENDIX A: FLORA RECORDED IN THE STUDY AREA (ARCADIS, 2021)

Family	Scientific name	Common name	BC Act status	EPBC Act status	Cover in each plot						
					W01	W02	W03	W04	W05	W06	W07
Asteraceae	*Brachyscome spp.*		-	-			0.1			0.1	
Asteraceae	*Cassinia quinquefaria*		-	-		0.5				1.0	
Asteraceae	*Cirsium vulgare*	Spear Thistle	-	-		0.1		0.1		0.2	
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane	-	-					1.0	0.1	0.1
Asteraceae	*Euchiton involucratus*	Star Cudweed	-	-		0.1				0.1	
Asteraceae	*Helichrysum rutidolepis*	Pale Everlasting	-	-					2.0		
Asteraceae	*Hypochaeris glabra*	Smooth Catsear	-	-		0.2		3.0	15.0	1.0	
Asteraceae	*Hypochoeris radicata*	Catsear	-	-			0.1				
Boraginaceae	*Echium plantagineum*	Patterson's Curse	-	-							
Chenopodiaceae	*Einadia nutans*	Climbing Saltbush	-	-		0.5					
Clusiaceae	*Hypericum perforatum*	St. Johns Wort	-	-		0.5	0.1			3.0	
Cyperaceae	*Carex echinata*	Star Sedge	-	-				0.1		0.1	

Family	Scientific name	Common name	BC Act status	EPBC Act status	Cover in each plot						
					W01	W02	W03	W04	W05	W06	W07
Cyperaceae	*Carex inversa*	Knob Sedge	-	-		0.1			0.1		
Cyperaceae	*Cyperus eragrostis*	Umbrella Sedge	-	-		0.1					
Dilleniaceae	*Hibbertia obtusifolia*	Hoary Guinea Flower	-	-		0.1					
Dipsacaceae	*Scabiosa atropurpurea*	Pincushion	-	-			20.0				
Fabaceae (Faboideae)	*Lotus uliginosus*	Birds-foot Trefoil	-	-	0.1						
Fabaceae (Faboideae)	*Trifolium subterraneum*	Subterranean Clover	-	-						0.1	
Fabaceae (Mimosoideae)	*Acacia rubida*	Red-stemmed Wattle	-	-			4.0	4.0			
Gentianaceae	*Centaurium erythraea*	Common Centaury	-	-					0.1		
Geraniaceae	*Geranium solanderi*	Native Geranium	-	-						0.1	
Juncaceae	*Juncus australis*	Rush	-	-	0.1				0.1		
Lomandraceae	*Lomandra filiformis subsp. coriacea*	Wattle Matt-rush	-	-							
Lomandraceae	*Lomandra multiflora*	Many-flowered Mat-rush	-	-							
Lythraceae	*Lythrum salicaria*	Purple Loosestrife	-	-	0.1						

Family	Scientific name	Common name	BC Act status	EPBC Act status	Cover in each plot						
					W01	W02	W03	W04	W05	W06	W07
Malaceae	*Pyracantha angustifolia*	Orange Firethorn	-	-							
Myrtaceae	*Eucalyptus aggregata*	Black Gum	V	V		12.0					
Myrtaceae	*Eucalyptus bridgesiana*	Apple Box	-	-						5.0	
Myrtaceae	*Eucalyptus dives*	Broad-leaved Peppermint	-	-				5.0			
Myrtaceae	*Eucalyptus mannifera subsp. praecox*	Brittle Gum	-	-						20.0	
Myrtaceae	*Eucalyptus pauciflora*	White Sally	-	-		10.0		8.0			
Myrtaceae	*Eucalyptus pulverulenta*	Silver-leafed Gum	V	V							
Myrtaceae	*Eucalyptus stellulata*	Black Sally	-	-							
Myrtaceae	*Eucalyptus viminalis*	Ribbon Gum	-	-			0.5	12.0			
Myrtaceae	*Leptospermum myrtifolium*		-	-		0.1					
Myrtaceae	*Leptospermum polygalifolium*	Tantoon	-	-			0.2	0.2			
Myrtaceae	*Melaleuca parvistaminea*		-	-			3.0				
Oxalidaceae	*Oxalis perennans*		-	-		0.5	0.1	0.2		0.1	

Family	Scientific name	Common name	BC Act status	EPBC Act status	Cover in each plot						
					W01	W02	W03	W04	W05	W06	W07
Pinaceae	*Pinus radiata*	Radiata Pine	-	-		0.2	0.1	30.0			
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues	-	-	0.1		10.0			15.0	
Poaceae	*Agrostis stolonifera*	Creeping Bent	-	-					8.0	0.1	
Poaceae	*Amphibromus neesii*		-	-		7.0					
Poaceae	*Aristida calycina var. calycina*		-	-							
Poaceae	*Aristida ramosa*	Purple Wiregrass	-	-		2.0					
Poaceae	*Bothriochloa macra*	Red Grass	-	-						0.1	
Poaceae	*Cynodon dactylon*	Common Couch	-	-						0.1	
Poaceae	*Eragrostis curvula*	African Lovegrass	-	-		0.1	0.3				
Poaceae	*Microlaena stipoides*	Weeping Grass	-	-				0.2		0.1	
Poaceae	*Panicum effusum*	Hairy Panic	-	-		0.1			0.1	0.1	
Poaceae	*Paspalum dilatatum*	Paspalum	-	-			25.0	0.1	10.0	0.2	0.1
Poaceae	*Pennisetum clandestinum*	Kikuyu Grass	-	-						0.1	

Family	Scientific name	Common name	BC Act status	EPBC Act status	Cover in each plot						
					W01	W02	W03	W04	W05	W06	W07
Poaceae	*Phalaris aquatica*	Phalaris	-	-	5.0	5.0	35.0	8.0	10.0	0.1	0.2
Poaceae	*Phragmites australis*	Common Reed	-	-	45.0						70.0
Poaceae	*Rytidosperma tenuius*		-	-		3.0	0.1		0.1	0.3	
Poaceae	*Setaria parviflora*		-	-		0.1	0.3		50.0		
Poaceae	*Setaria pumila*	Pale Pigeon Grass	-	-							0.1
Poaceae	*Themeda triandra*		-	-			0.1		0.1		
Polygonaceae	*Rumex acetosella*	Sheep Sorrel	-	-		0.3		0.1	0.1	0.1	
Polygonaceae	*Rumex crispus*	Curled Dock	-	-	0.1		0.1				0.1
Pteridaceae	*Cheilanthes sieberi*	Rock Fern	-	-		0.1					
Rosaceae	*Rubus fruticosus sp. agg.*	Blackberry complex	-	-	10.0	5.0	15.0			0.5	10.0
Salicaceae	*Salix fragilis*	Crack Willow	-	-							1.0
Scrophulariaceae	*Verbascum thapsus*	Great Mullein	-	-		0.1					
Solanaceae	*Solanum spp.*		-	-		0.2					

Family	Scientific name	Common name	BC Act status	EPBC Act status	Cover in each plot						
					W01	W02	W03	W04	W05	W06	W07
Typhaceae	*Typha orientalis*	Broad-leaved Cumbungi	-	-	55.0						20.0

APPENDIX B: FAUNA RECORDED IN THE STUDY AREA (ARCADIS, 2021)

Common name	Scientific name	Status (BC Act)	Status (EPBC Act)	Observation type	Introduced (Yes/No)
BIRDS					
Australasian Grebe*	*Tachybaptus novaehollandiae*	-	-	O	N
Australasian Shoveler*	*Anus rhynchotis*	-	-	O	N
Australian Magpie	*Cracticus tibicen*	-	-	OW	N
Australian Pipit	*Anthus novaeseelandiae*	-	-	OW	N
Australian Raven	*Corvus coronoides*	-	-	OW	N
Australian Reed-Warbler*	*Acrocephalus australis*	-	-	OW	N
Australian Wood Duck*	*Chenonetta jubata*	-	-	OW	N
Black Swan*	*Cygnus atratus*	-	-	O	N
Blue-billed Duck*	*Oxyura australis*	V	-	O	N
Brown Cuckoo-Dove	*Macropygia phasianella*	-	-	O	N
Brown Falcon	*Falco berigora*	-	-	O	N
Brown Quail	*Coturnix ypsilophora*	-	-	O	N
Brown-headed Honeyeater	*Melithreptus brevirostris*	-	-	OW	N
Buff-rumped Thornbill	*Acanthiza reguloides*	-	-	OW	N
Common Blackbird	*Turdus merula*	-	-	O	Y
Common Starling	*Sturnus vulgaris*	-	-	OW	Y
Crimson Rosella	*Platycercus elegans*	-	-	OW	N
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	-	OW	N
Eurasian Coot*	*Fulica atra*	-	-	OW	N
Fairy Martin	*Petrochelidon ariel*	-	-	O	N
Great Crested Grebe*	*Podiceps cristatus*	-	-	O	N
Grey Butcherbird	*Cracticus torquatus*	-	-	OW	N
Grey Fantail	*Rhipidura albiscapa*	-	-	OW, E	N
Grey Shrike-thrush	*Colluricincla harmonica*	-	-	O	N

Common name	Scientific name	Status (BC Act)	Status (EPBC Act)	Observation type	Introduced (Yes/No)
House Sparrow	*Passer domesticus*	-	-	OW	Y
Latham's Snipe	*Gallinago hardwickii*	-	**Mi**	O	N
Laughing Kookaburra	*Dacelo novaeguineae*	-	-	OW	N
Little Grassbird*	*Megalurus gramineus*	-	-	OW	N
Little Pied Cormorant*	*Microcarbo melanoleucos*	-	-	O	N
Magpie-lark	*Grallina cyanoleuca*	-	-	OW	N
Masked Lapwing	*Vanellus miles*	-	-	OW	N
Musk Duck*	*Biziura lobata*	-	-	O	N
Nankeen Kestrel	*Falco cenchroides*	-	-	O	N
Noisy Miner	*Manorina melanocephala*	-	-	OW	N
Pacific Black Duck*	*Anas superciliosa*	-	-	OW	N
Pied Currawong	*Strepera graculina*	-	-	OW	N
Purple Swamphen*	*Porphyrio porphyrio*	-	-	OW	N
Red Wattlebird	*Anthochaera carunculata*	-	-	OW	N
Red-browed Finch	*Neochmia temporalis*	-	-	OW	N
Red-whiskered Bulbul*	*Pycnonotus jocosus*	-	-	W	Y
Rufous Whistler	*Pachycephala rufiventris*	-	-	OW	N
Silvereye	*Zosterops lateralis*	-	-	OW	N
Spotted Pardalote	*Pardalotus punctatus*	-	-	W	N
Striated Thornbill	*Acanthiza lineata*	-	-	OW	N
Superb Fairy-wren	*Malurus cyaneus*	-	-	OW	N
Welcome Swallow	*Hirundo neoxena*	-	-	O	N
Whistling Kite*	*Haliastur sphenurus*	-	-	O	N
White-bellied Sea-Eagle*	*Haliaeetus leucogaster*	**V**	-	O	N
White-browed Scrubwren	*Sericornis frontalis*	-	-	OW	N
White-plumed Honeyeater	*Lichenostomus penicillatus*	-	-	OW	N
White-throated Treecreeper	*Cormobates leucophaea*	-	-	OW	N
White-winged Chough	*Corcorax melanorhamphos*	-	-	W	N

Common name	Scientific name	Status (BC Act)	Status (EPBC Act)	Observation type	Introduced (Yes/No)
Willie Wagtail	*Rhipidura albiscapa*	-	-	OW	N
Yellow-faced Honeyeater	*Lichenostomus chrysops*	-	-	OW	N
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	-	-	OW	N
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	-	-	OW	N
Zebra Finch	*Taeniopygia guttata*	-	-	OW	N
MAMMALS					
Chocolate Wattled Bat	*Chalinolobus morio*	-	-	AR (Prob)	N
Common Ringtail Possum	*Pseudocheirus peregrinus*	-	-	O	N
Common Wombat	*Vombatus ursinus*	-	-	P, FB	N
Eastern Broad-nosed Bat	*Scotorepens orion*	-	-	AR (Prob)	N
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	-	AR (Prob)	N
Eastern Grey Kangaroo	*Macropus giganteus*	-	-	O, F	N
Eastern Horseshoe-bat	*Rhinolophus megaphyllus*	-	-	AR (Def)	N
European Rabbit	*Oryctolagus cuniculus*	-	-	O, P, F, FB	Y
European Red Fox	*Vulpes vulpes*	-	-	O, P	Y
Gould's Wattled Bat	*Chalinolobus gouldii*	-	-	AR (Def)	N
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V	-	AR (Prob)	N
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	O	N
House Mouse	*Mus musculus*	-	-	O	Y
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	V	-	AR (Prob)	N
Large Forest Bat	*Vespadelus darlingtoni*	-	-	AR (Prob)	N
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	AR (Def)	N
Little Forest Bat	*Vespadelus vulturnus*	-	-	AR (Prob)	N
Ride's Free-tailed Bat	*Ozimops (Mormopterus) ridei*	-	-	AR (Prob)	N
Southern Forest Bat	*Vespadelus regulus*	-	-	AR (Prob)	N

Common name	Scientific name	Status (BC Act)	Status (EPBC Act)	Observation type	Introduced (Yes/No)
Unidentified *Nyctophilus* species	*Nyctophilus sp.*	-	-	AR (Def)	N
White-striped Freetail-bat	*Austronomus (Tadarida) australis*	-	-	OW, AR (Def)	N
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	**V**	-	AR (Prob)	N
AMPHIBIANS					
Common Eastern Froglet	*Crinia signifera*	-	-	OW	N
Eastern Banjo Frog	*Limnodynastes dumerilii*	-	-	OW	N
Smooth Toadlet	*Uperoleia laevigata*	-	-	OW	N
Spotted Marsh Frog	*Limnodynastes tasmaniensis*	-	-	OW	N
Striped Marsh Frog	*Limnodynastes peronii*	-	-	OW	N
Whistling Tree Frog	*Litoria verreauxii*	-	-	W	N
REPTILES					
Common Garden Skink	*Lampropholis guichenoti*	-	-	O	N
Eastern Long-necked Turtle*	*Chelodina longicollis*	-	-	O	N
Jacky Dragon	*Amphibolurus muricatus*	-	-	O	N
Red-bellied Black Snake	*Pseudechis porphyriacus*	-	-	O	N
OTHER					
Common Yabby	*Cherax destructor*	-	-	O	N

APPENDIX C: PMST REPORT

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.

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

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

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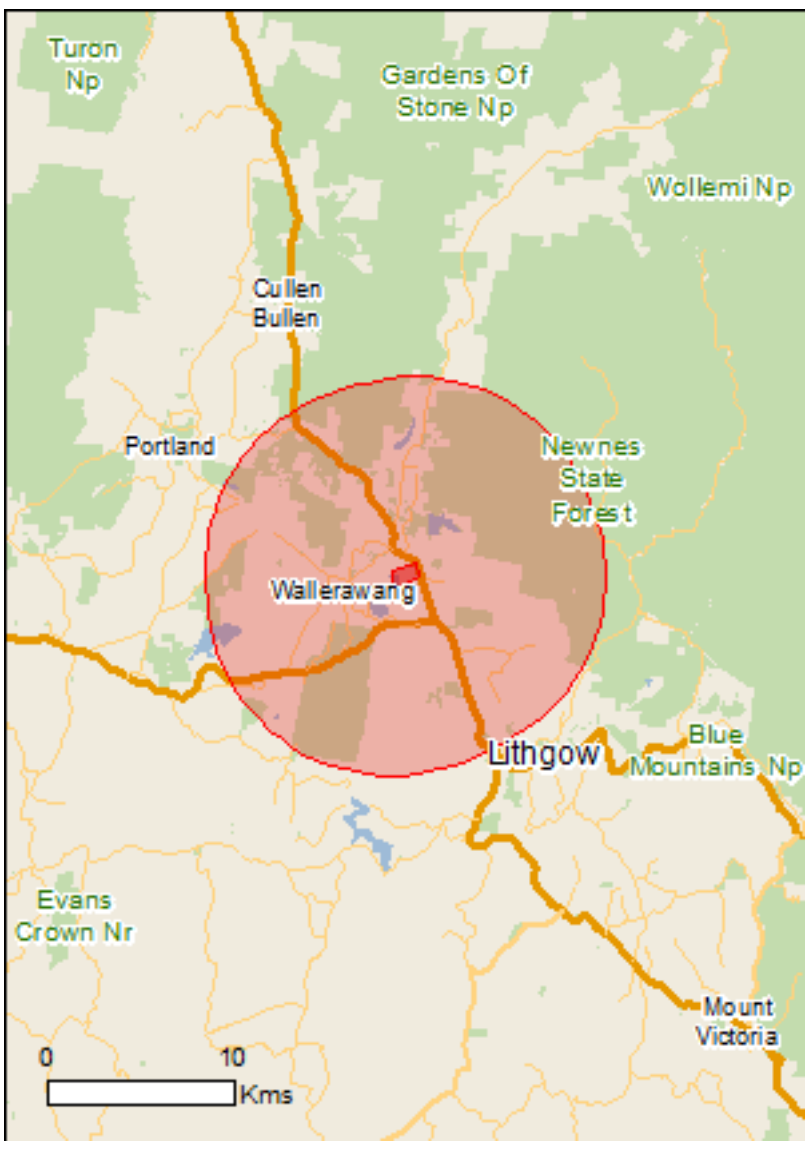

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates

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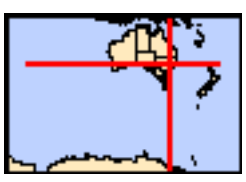

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	47
Listed Migratory Species:	13

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	5
Commonwealth Heritage Places:	None
Listed Marine Species:	20
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	3
Regional Forest Agreements:	None
Invasive Species:	39
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Banrock station wetland complex	800 - 900km upstream
Riverland	800 - 900km upstream
The coorong, and lakes alexandrina and albert wetland	900 - 1000km upstream
The macquarie marshes	300 - 400km upstream

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Natural Temperate Grassland of the South Eastern Highlands	Critically Endangered	Community may occur within area
Temperate Highland Peat Swamps on Sandstone	Endangered	Community may occur within area
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
Maccullochella peelii		
Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica		
Macquarie Perch [66632]	Endangered	Species or species habitat known to occur within area
Prototroctes maraena		
Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area
Frogs		
Heleioporus australiacus		
Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat may occur within area
Litoria booroolongensis		
Booroolong Frog [1844]	Endangered	Species or species habitat likely to occur within area
Litoria littlejohni		
Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat known to occur within area
Mixophyes balbus		
Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat known to occur within area
Insects		
Paralucia spinifera		
Bathurst Copper Butterfly, Purple Copper Butterfly, Bathurst Copper, Bathurst Copper Wing, Bathurst-Lithgow Copper, Purple Copper [26335]	Vulnerable	Species or species habitat known to occur within area
Mammals		
Chalinolobus dwyeri		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
Dasyurus maculatus maculatus (SE mainland population)		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
Nyctophilus corbeni		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Petauroides volans		
Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petrogale penicillata		
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pseudomys novaehollandiae		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area

Name	Status	Type of Presence
Plants		
Acacia bynoeana Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat may occur within area
Boronia deanei Deane's Boronia [8397]	Vulnerable	Species or species habitat likely to occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
Eucalyptus aggregata Black Gum [20890]	Vulnerable	Species or species habitat known to occur within area
Eucalyptus pulverulenta Silver-leaved Mountain Gum, Silver-leaved Gum [21537]	Vulnerable	Species or species habitat known to occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area
Haloragodendron lucasii Hal [6480]	Endangered	Species or species habitat may occur within area
Kunzea cambagei [11420]	Vulnerable	Species or species habitat known to occur within area
Leucochrysum albicans subsp. tricolor Hoary Sunray, Grassland Paper-daisy [89104]	Endangered	Species or species habitat may occur within area
Persoonia marginata Clandulla Geebung [10852]	Vulnerable	Species or species habitat may occur within area
Pomaderris cotoneaster Cotoneaster Pomaderris [2043]	Endangered	Species or species habitat may occur within area
Prasophyllum petilum Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Pultenaea glabra Smooth Bush-pea, Swamp Bush-pea [11887]	Vulnerable	Species or species habitat known to occur within area
Pultenaea parrisiae [56699]	Vulnerable	Species or species habitat may occur within area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat known to occur within area
Velleia perfoliata [17190]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
[Xerochrysum palustre](#) Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
[Aprasia parapulchella](#) Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area
[Eulamprus leuraensis](#) Blue Mountains Water Skink [59199]	Endangered	Species or species habitat known to occur within area
[Hoplocephalus bungaroides](#) Broad-headed Snake [1182]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
[Hirundapus caudacutus](#) White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
[Monarcha melanopsis](#) Black-faced Monarch [609]		Species or species habitat known to occur within area
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat may occur within area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat known to occur within area
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat may occur within area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Pandion haliaetus		
Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Bank of Australia
Commonwealth Land - Telstra Corporation Limited
Defence - MARRANGAROO

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans		
Black-eared Cuckoo [705]		Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Forestry Management Areas in Bathurst (FMZ2)	NSW
Marrangaroo	NSW
Snow Gum	NSW

Invasive Species

[Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Feral deer		
Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis		
Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus		
House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus		
Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus		
Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus		
Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa		
Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes		
Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides		
Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera		
Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera		
Boneseed [16905]		Species or species habitat likely to occur within area
Cytisus scoparius		
Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Genista monspessulana		
Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana		
Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum		
African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana		
Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma		
Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp.		
Prickly Pears [82753]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-33.40559 150.08325,-33.4025 150.09481,-33.40835 150.09721,-33.41378 150.08397,-33.40559 150.08325

Acknowledgements

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

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

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

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

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APPENDIX D: DATABASE SEARCH RESULTS - FLORA

Scientific name	Common name	BC Act status	EPBC Act status	Database records	Habitat requirements
Acacia bynoeana	Bynoe's Wattle	E	V	PMST only	The species is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. Found in heath or dry sclerophyll forest on sandy soils, often in slightly disturbed areas, in association with Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple.
Boronia deanei	Deane's Boronia	V	V	BioNet - 20 records (2019) PMST	Occurs in Hawkesbury/Nepean and Southern Rivers Catchments. There are scattered populations of Deane's Boronia between the far south-east of NSW and the Blue Mountains. The species grows on the margins of high altitude swamps, in wet heath and in drier open forest on low nutrient, poorly drained peaty soils on sandstone or granite.
Caesia parviflora var. minor	Small Pale Grass-lily	E		BioNet – 2 records (2017)	Distributed through the Hawkesbury-Nepean, Murrumbidgee and Northern Rivers as well as Sydney Metro. region. An outlying population occurs in NSW, in Barcoongere State Forest, between Grafton and Coffs Harbour. Found in damp places in open forest on sandstone. Vegetation types include: Dry Sclerophyll Forests, Freshwater wetlands, Grassy woodlands and Heathlands.
Carex klaphakei	Klaphake's Sedge	E		BioNet – 2 records (2019)	Found in swamps on sandstone at altitudes greater than 600 m where it is usually growing in association with native sedges and rushes. Carex klaphakei is found in only three locations, from the Blue Mountains (at Blackheath and Mt Werong) to the Southern Highlands (at Penrose).
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V	PMST only	Can occur along almost the entire NSW eastern coast with recent records between Batemans Bay and Nowra. It is found in a range of communities, including swamp-heath and woodland. Larger populations often occur in woodlands dominated by Eucalyptus sclerophylla, E. sieberi, Corymbia gummifera and Allocasuarina littoralis with populations preferring open areas in the understorey of this type of community.

Scientific name	Common name	BC Act status	EPBC Act status	Database records	Habitat requirements
Dillwynia tenuifolia		V		BioNet – 1 record (2012)	Distributed from the Cumberland Plain to Windsor and Penrith, east to Dean Park near Colebee and the Liverpool and Penrith LGA's. Some localities in the Bulga Mountains, Kurrajong, Woodford and Lower Blue Mountains. In Western Sydney, the species is abundant within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest. Red Iron Bark is often the dominant cover species.
Eucalyptus aggregata	Black Gum	V	V	BioNet – 296 records (2019), PMST, BAMC	The species is found in the NSW Central and Southern Tablelands, with small isolated populations in Victoria and the ACT. In NSW it occurs in the South Eastern Highlands Bioregion and on the western fringe of the Sydney Basin Bioregion. It has a moderately narrow distribution, ccurring mainly in the wetter, cooler and higher parts of the tablelands, for example in the Blayney, Crookwell, Goulburn, Braidwood and Bungendore districts. Typically grows in the lowest parts of the landscape on alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers. Often grows with other cold-adapted eucalypts, such as Snow Gum or White Sallee.
Eucalyptus cannonii	Capertee Stringybark	V		BioNet – 203 records (2020)	This species is restricted to the western side of the Blue Mountains from Mount Piper in the south to the Mudgee area in the north. There are also populations to the west in Winburndale Nature Reserve and adjacent State Forests. Capertee Stringybark has a broad altitudinal range, from around 450m to 1,050m. Within this range, the species appears to tolerate most situations except the valley floors.
Eucalyptus pulverulenta	Silver-leafed Gum	V	V	BioNet – 2 records (1995), PMST, BAMC	Populations found in Lithgow and Bathurst area and the Monaro. Grows in shallow soils as an understorey plant in open forest dominated by Brittle Gum, Red Stringybark, Broad-leafed Peppermint, Silvertop Ash and Apple Box.
Euphrasia arguta		CE	CE	PMST only	Present in the Nundle area of NSW north western slopes and tablelands, Hastings River and Barrington Tops. Grows in eucalypt forest with a mixed grass and shrub understorey. Dies off over Winter months and actively grows from January to April.
Genoplesium superbum	Superb Midge Orchid	E		BioNet – 3 records (2020)	Genoplesium superbum is restricted to the southern tablelands of NSW where it has been recorded from 2 locations near Nerriga, c. 20 km apart. Some plants fall within the boundary of Morton National Park. Occurs predominantly in wet heathland on shallow soils above a sandstone cap but has also been found in open woodland interspersed with heath and dry open shrubby woodland.

Scientific name	Common name	BC Act status	EPBC Act status	Database records	Habitat requirements
Haloragodendron lucasii		E	E	PMST only	Known locations confined to very narrow distribution on the north shore of Sydey. Prefers dry sclerophyll forest but can grow in moist sandy loam soils in sheltered aspects and on gentle slopes below cliff-lines near creeks in low open woodland. Associated with high soil moisture and high soil-phosphorus levels. Flowers August to November.
Isotoma fluviatilis subsp. fluviatilis			X	BioNet – 1 record (1995)	Hypsela sessiliflora was previously listed as Endangered under the TSC Act. An assessment of the taxonomic status of Hypsela sessiliflora by Albrecht (2015) using morphological and molecular data determined that it is a synonym of Isotoma fluviatilis subsp. fluviatilis, a widespread taxon not listed under the Act. The species has subsequently been removed from the schedules of the TSC Act but remains listed as Extinct under the EPBC Act. A proposal to delete Hypsela sessiliflora from the EPBC Act is currently under consideration by the Threatened Species Scientific Committee.
Kunzea cambagei	Cambage Kunzea	V	V	PMST only	Cambagei Kunzea occurs mainly in the Yerranderie / Mt Werong area in the Blue Mountains but has also been collected on the Wanganderry Plateau, and at Medway and along the Wingecarribee River (near Berrima). Cambage Kunzea is restricted to damp, sandy soils in wet heath or mallee open scrub at higher altitudes on sandstone outcrops or Silurian group sediments. Flowering occurs between September and November.
Leucochrysum albicans subsp. tricolor	Hoary Sunray		E	PMST only	Endemic to south-eastern Australia, where it is currently known from three geographically separate areas in Tasmania, Victoria and south-eastern NSW and ACT. In NSW it currently occurs on the Southern Tablelands adjacent areas in an area roughly bounded by Albury, Bega and Goulburn, with a few scattered locatlities know from beyond this region. Occurs in a wide variety of grassland, woodland and forest habitats, generally on relatively heavy soils.
Persoonia hindii		E		BioNet – 845 records (2020)	Restricted to the Newnes Plateau in the Blue Mountains, north of Lithgow. Occurs in dry sclerophyll forests and woodlands on sandy soils. Flowers January to March, possibly with sporadic flowering in other months.
Persoonia marginata	Clandulla Geebung	V	V	PMST only	Known from only four disjunct locations in the Central West, Hawkesbury/Nepean and Hunter Central Rivers catchment. Core of the species distribution is within Clandulla State Forest, west of Kandons. Disjunct populations occur; to the north at Dingo Creek and Mount Dangar; to the south within Ben Bullen State Forest; and north of Colo

Scientific name	Common name	BC Act status	EPBC Act status	Database records	Habitat requirements
					Heights within Parr State Recreation Area. P. marginata is found in dry woodland communities associated with Shoalhaven Group sediments. Soils are shallow hardsetting sandy loams, generally with gravel or rocks, and the topography is flat. The vegetation is part of the Tablelands Grassy Woodland Complex vegetation described by Benson and Keith (1990). The dominant tree species include Eucalyptus punctata, E. sparsifolia, E. rossii , E. fibrosa and E. crebra. The understorey generally comprises a shrub layer of medium density and a grassy ground layer of low to medium density. Common shrub species include Acacia buxifolia, Exocarpos strictus, Acacia terminalis, Pultenaea microphylla, Acacia verniciflua, Dillwynia phylicoides, Platysace ericoides, Persoonia linearis and Grevillea ramosissima. Ground layer species include Chionochloa pallida, Lomandra filiformis var. coriacea, Dianella revoluta and Chrysocephalum apiculatum. Potential habitat beyond known locations would include flat land with sandy soils on Shoalhaven Group sediments. Recorded flowering period varies and includes December and Winter. Appears to respond well to disturbance, with greater densities found along the edges of tracks and in areas disturbed by forestry activities.
Pomaderris cotoneaster	Cotoneaster Pomaderris	E	E	PMST only	Cotoneaster Pomaderris has a very disjunct distribution, being known from the Nungatta area, northern Kosciuszko National Park (near Tumut), the Tantawangalo area in South-East Forests National Park and adjoining freehold land, Badgery's Lookout near Tallong, the Yerranderie area, the Canyonleigh area and Ettrema Gorge in Morton National Park. The species has also been recorded along the Genoa River in Victoria. Cotoneaster Pomaderris has been recorded in a range of habitats in predominantly forested country. The habitats include forest with deep, friable soil, amongst rock beside a creek, on rocky forested slopes and in steep gullies between sandstone cliffs.
Prasophyllum pallens	Musty Leek Orchid	V		BioNet – 65 records (2018)	P. pallens is endemic to New South Wales where it is known only from the Blue Mountains, west of Sydney. The species is presently known from four distinct populations: Mt Banks and Mt Hay in Blue Mountains National Park, and near the townships of Blackheath and Wentworth Falls. P. pallens grows in dense low heath, often along seepage lines, in moist to wet shallow sandy soils over sandstone, mostly at altitudes greater than 900 m above sea level.

Scientific name	Common name	BC Act status	EPBC Act status	Database records	Habitat requirements
Prasophyllum petilum	Tarengo Leek Orchid	E	E	PMST only	Known from two sites in the NSW Southern Tablelands; at Boorowa and Captains Flat; and at Hall in the Australian Capital Territory.Plants can be very cryptic when growing in small numbers and within tall grasses Grows in open sites within Natural Temperate Grassland at the Boorowa site. Also grows in grassy woodland in association with River Tussock *Poa labillardieri* Black Gum *Eucalyptus aggregata* and tea-trees *Leptospermum spp*. at Captains Flat and within the grassy groundlayer of Box-Gum Woodland at Hall. Flowers in October at Boorowa and December at Captains Flat.
Prasophyllum sp. Wybong			CE	PMST only	Leek orchids are generally found in shrubby and grassy habitats in dry to wet soil. Prasophyllum sp. Wybong is known to occur in open eucalypt woodland and grassland. Prasophyllum sp. Wybong is endemic to NSW. It is known from seven populations in eastern NSW near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell and Tenterfield. Prasophyllum sp. Wybong occurs within the Border Rivers (Gwydir, Namoi, Hunter), Central Rivers and Central West Natural Resource Management Regions. The species occurs within the Sydney Basin, New England Tablelands, Brigalow Belt South and NSW South Western Slopes Interim Biogeographic Regionalisation for Australia Bioregions.
Prostanthera cryptandroides subsp. cryptandroides	Wollemi Mint-bush	V	V	BioNet – 1 record (2014)	At Glen Davis, occurs in open forest dominated by Eucalyptus fibrosa. Other eucalypt species may be present as sub-dominants. In the Denman-Gungal and Widden-Baerami Valley areas, occurs on rocky ridgelines on Narrabeen Group Sandstones in association with a range of communities.
Pultenaea glabra	Smooth Bush-pea	V	V	PMST only	Restricted to the upper altitudes of the Blue Mountains LGA. Recorded from the Katoomba-Hazelbrook and Mount Victoria areas. The species is associated with riparian or swamp habitat on sandstone derived soils. Grows in swamp margins, hillslopes, gullies and creekbanks and occurs within dry sclerophyll forest and tall damp heath.
Pultenaea parrisiae	Parris' Bush-pea	V	V	PMST only	This subspecies is known only from far north-east Gippsland (in Victoria) and three sites in NSW (Wadbilliga Trig area and two sites south of Nalbaugh). Parris' Bush-pea grows in moist heathlands in loam soils, sometimes at the margins of woodlands. Also in riparian vegetation.

Scientific name	Common name	BC Act status	EPBC Act status	Database records	Habitat requirements
Rhodamnia rubescens	Scrub Turpentine	CE		BioNet – 1 record (1914)	Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of *R. rubescens* typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.
Rhizanthella slateri	Eastern Underground Orchid	V	E	PMST only	Occurs from south-east QLD to south-east NSW. In NSW it occurs in Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry, Agnes Banks and Nowra. Habitat requirements are poorly understood with no particular vegetation type associated although it can occur in sclerophyll forest.
Thesium australe	Austral Toadflax	V	V	BioNet – 4 records (2013), PMST, BAMC	Found in small populations scattered across eastern NSW, the coast, and the Northern and Southern Tablelands. Populations occur in grassland on coastal headlands or grassland and grassy woodland away from the coast. The species is often found in association with Kangaroo Grass (*Themeda australis*).
Velleia perfoliata		V	V	BioNet – 1 record (2019), PMST	Only known in the Hawkesbury district and upper Hunter Valley. Found in shallow depression on Hawkesbury sandstone shelves on rocky hillsides, under cliffs or on rocky/sandy soils along tracks and trails. Can grow on fairly shallow soils of sandy loam texture. Flowering occurs Spring and Summer.
Veronica blakelyi		V		BioNet – 181 records (2019), BAMC	Restricted to the western Blue Mountains, near Clarence, near Mt Horrible, on Nullo Mountain and in the Coricudgy Range. Over this range, occurrences are patchy and generally small in in size. Occurs in eucalypt forest, often in moist and sheltered areas. Associated canopy species include Eucalyptus dives, E. dalrympleana, E. rossii and E. pauciflora.
Xerochrysum palustre	Swamp Everlasting		V	PMST only	Found in Kosciuszko National Park and the eastern escarpment south of Badja. Also found in eastern Victoria. Grows in swamps and bogs which are often dominated by heaths. Also grows at the edges of bog margins on peaty soils with a cover of shrubs or grasses.

E – Endangered V – Vulnerable CE – Critically endangered EP – Endangered population X - Extinct

APPENDIX E: DATABASE SEARCH RESULTS - FAUNA

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
BIRDS					
Australasian Bittern	*Botaurus poiciloptilus*	E	E	PMST only	The Australasian Bittern is widespread but uncommon across south-eastern Australia. In NSW, they can be found over most of the state except for the far north-west. The species favours permanent freshwater wetlands with tall, dense vegetation, particularly bulrushes (*Typha spp.*) and spikerushes (*Eleocharis spp.*).
Australian Painted Snipe	*Rostratula australis*	E	E	PMST only	The Australian Painted Snipe is restricted to Australia. Most records are from the south-east, particularly surrounding the Murray Darling Basin. Scattered records exist across northern Australia and historical records exist around Perth in Western Australia. In NSW, many records are from the Murray-Darling Basin, including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and swamps surrounding Balldale and Wanganella. Other important locations include wetlands on the Hawkesbury River, and the Clarence and Lower Hunter Valleys. The species prefers fringes of swamps, dams and nearby marshes where there is a cover of grasses, lignum, low scrub or open timber.
Barking Owl	*Ninox connivens*	V	-	BioNet – 6 records (2010) BAMC	The Barking Owl is found throughout Australia except for the central arid regions. The species has greatly declined in southern Australia and now occurs in a wide but sparse distribution in NSW. Core populations exist on the western slopes and plains and some north-east coastal and escarpment forests. The species inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use and hunting can extend in to closed forest as well as more open areas. Occasionally, the species can breed successfully along timbered watercourses in heavily cleared habitats, such as in western NSW, due to the higher density of prey on these fertile riparian soils. Roost in tree canopies including tall midstorey trees (e.g. *Acacia* and *Casuarina* species).
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	V	-	BioNet – 2 records (2004)	The Black-chinned Honeyeater has two subspecies, with only the nominate (*gularis*) occurring in NSW. The eastern subspecies extends south from central Queensland, through NSW, Victoria into south eastern South Australia, though it is very rare in the last state. In NSW it is widespread, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. It is

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
					rarely recorded east of the Great Dividing Range, although regularly observed from the Richmond and Clarence River areas. It has also been recorded at a few scattered sites in the Hunter, Central Coast and Illawarra regions, though it is very rare in the latter. Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Inland Grey Box (*E. microcarpa*), Yellow Box (*E. melliodora*), Blakely's Red Gum (*E. blakelyi*) and Forest Red Gum (*E. tereticornis*). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees.
Black-faced Monarch	*Monarcha melanopsis*	-	Mi	PMST only	The Black-faced Monarch is found along the coast of eastern Australia, becoming less common further south. The Black-faced Monarch is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.
Blue-billed Duck	*Oxyura australis*	V	-	BioNet – 3 records (2005)	The Blue-billed Duck is endemic to south-eastern and south-western Australia. It is widespread in NSW, but most common in the southern Murray-Darling Basin area. Birds disperse during the breeding season to deep swamps up to 300 km away. It is generally only during summer or in drier years that they are seen in coastal areas. The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover. Blue-billed Ducks are partly migratory, with short-distance movements between breeding swamps and overwintering lakes with some long-distance dispersal to breed during spring and early summer. Young birds disperse in April-May from their breeding swamps in inland NSW to non-breeding areas on the Murray River system and coastal lakes.
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V	-	BioNet – 42 records (2016)	The Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. The eastern subspecies lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands such as the Snowy River Valley, Cumberland Plains, Hunter Valley and parts of the Richmond and Clarence Valleys. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
					shrub species; also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.
Common Sandpiper	*Actitis hypoleucos*	-	Mi	PMST only	Inhabits a wide range of coastal and inland wetlands, often with muddy or rocky margins. Also known to occur at estuaries, billabongs, dams, pools and lakes, often associated with mangroves.
Curlew Sandpiper	*Calidris ferruginea*	E	CE, Mi	PMST only	The Curlew Sandpiper is distributed around most of the Australian coastline, including Tasmania. In NSW, it occurs along the entire coastline, particularly in the Hunter Estuary and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are likely to be during the species migration, where they arrive in Australia for the non-breeding period between August and November, departing between March and mid-April. The Curlew Sandpiper generally occupies littoral and estuarine habitats. In NSW, it is mainly found in intertidal mudflats of sheltered coasts.
Diamond Firetail	*Stagonopleura guttata*	V	-	BioNet – 1 record (1999)	The Diamond Firetail is endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley and the Bega Valley. This species has a scattered distribution over the rest of NSW, though is very rare west of the Darling River. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum *Eucalyptus pauciflora* Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas and sometimes in lightly wooded farmland. Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Nests are globular structures built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests. Birds roost in dense shrubs or in smaller nests built especially for roosting.

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	V	-	BioNet – 22 records (2019)	The Dusky Woodswallow is widespread in eastern, southern and south-western Australia. The species occurs throughout most of NSW, but is sparsely scattered in, or largely absent from, much of the upper western region. The species primarily inhabits dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and groundcover of grasses, sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. It has also been recorded in farmland, usually at the edges of forest or woodland.
Eastern Curlew	*Numenius madagascariensis*	-	CE, Mi	PMST only	The Eastern Curlew migrates to Australia for the non-breeding season. Within Australia, the Eastern Curlew is found across all States, and has a primarily coastal distribution, with birds rarely recorded inland. In NSW, the species occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond Ricer and Intermittently Closed and Open Lakes and Lagoons (ICOLLs) of the south coast. The species generally occupies coastal lakes, inlets, bays and estuarine habitats. In NSW, it is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts. Occasionally, the species is found on ocean beaches (often near estuaries) as well as coral reefs, rock platforms or rocky islets.
Flame Robin	*Petroica phoenicea*	V	-	BioNet – 406 records (2020)	The Flame Robin is endemic to south-eastern Australia, ranging from the Queensland border to south-east South Australia and Tasmania. In NSW, it breeds in upland areas and in winter, many birds move to the inland slopes and plains. It is likely that there are two separate populations in NSW: one in the Northern Tablelands, and one ranging from the Central to Southern Tablelands. The species breeds in upland tall moist eucalypt forests and woodlands, often of ridges and slopes. The Flame Robin prefers clearings or areas with open understoreys and are often found in recently burnt areas. The species occasionally occurs in temperate rainforest, as well as herbfields, heathlands, shrublands and sedgelands at high altitudes. Breeding habitat is typically dominated by native grasses and the shrub layer may either be sparse or dense.
Fork-tailed Swift	*Apus pacificus*	-	Mi	BioNet – 1 record (2013) PMST	In NSW, the Fork-tailed Swift is recorded in all regions. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
					spinifex, open farmland and inland and coastal sand-dunes. The sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines. They forage aerially, up to hundreds of metres above ground, but also less than 1 m above open areas or over water.
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V	-	BioNet – 184 records (2020) BAMC	The Gang-gang Cockatoo is distributed from southern Victoria through south and central-eastern NSW. In NSW, the species is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. The Gang-gang Cockatoo occurs regularly in the ACT and is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee. During spring and summer, the species is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species typically moves to lower altitudes to inhabit drier, open eucalypt forests and woodlands (particularly Box-Gum and Box-Ironbark assemblages) or in dry forest in coastal and urban areas. It may also occur in sub-alpine Snow Gum (*Eucalyptus pauciflora*) woodland, and occasionally in temperate rainforests. The species favours old growth forest and woodland for nesting and roosting.
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V	-	BioNet – 8 records (2018)	The Glossy Black-Cockatoo is widespread but uncommon throughout suitable forest and woodland habitats from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population also exists on Kangaroo Island in South Australia. The species inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of Sheoak occur. The species feeds almost exclusively on *Casuarina* and *Allocasuarina* species, with Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) being important foraging resources for the species. Inland populations feed on a wider range of Sheoaks, and Belah may also be a critical food source for some populations. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak and Belah.
Grey Falcon	*Falco hypoleucos*	E	-	PMST only	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The breeding range has contracted since the 1950s with most breeding now confined to arid parts of the range. There are possibly less than 5000 individuals left. Population trends are unclear, though it is believed to be extinct in areas with more than 500 mm rainfall in NSW.

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
					Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	V	-	BioNet – 1 record (2010)	The Grey-crowned Babbler has two distinctive subspecies that intergrade to the south of the Gulf of Carpentaria. West of here the subspecies rubeculus, formerly considered a separate species (Red-breasted Babbler) is still widespread and common. The eastern subspecies (*temporalis* occurs from Cape York south through Queensland, NSW and Victoria and formerly to the south east of South Australia. This subspecies also occurs in the Trans-Fly Region in southern New Guinea. In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. It may be extinct in the southern, central and New England tablelands. Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions. Territories range from one to fifty hectares (usually around 10 ha) and are defended all year.
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	V	-	BioNet – 6 record (2008)	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places, and rarely found on the coast. It is considered a sedentary species, but local seasonal movements are possible. The south-eastern form (subspecies cucullata) is found from Brisbane to Adelaide and throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies picata. Two other subspecies occur outside NSW. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.
Latham's Snipe	*Gallinago hardwickii*	-	Mi	PMST only	Latham's Snipe is a non-breeding migrant to the south east of Australia including Tasmania, passing through the north and New Guinea on passage. Latham's Snipe breed in Japan and on the east Asian mainland. Latham's Snipe are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture.

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
Little Eagle	*Hieraaetus morphnoides*	V	-	BioNet – 10 records (2018) BAMC	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. It occupies open eucalypt forest, woodland or open woodland. Sheoak or *Acacia* woodlands and riparian woodlands of interior NSW are also used. The species nest in tall living trees within a remnant patch, where pairs build a large stick nest in winter.
Little Lorikeet	*Glossopsitta pusilla*	V	-	BioNet – 5 records (2017)	The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. In NSW, lorikeets are found westward as far as Dubbo and Albury, and the State provides a large portion of the species core habitat. The Little Lorikeet forages primarily in the canopy of open *Eucalyptus* forest and woodland, yet also finds food in *Angophora*, *Melaleuca* and other tree species. Riparian habitats are highly used, due to higher soil fertility and greater productivity. The species targets isolated flowering trees in open country, such as in paddocks or in roadside remnants and street trees, which help sustain viable populations.
Masked Owl	*Tyto novaehollandiae*	V	-	BioNet – 2 records (2012)	The Masked Owl is most abundant on the coast but extends to the western plains. About 90 % of overall records occur within NSW, excluding the most arid north-western corner. The species occupies dry, eucalypt forests and woodlands up to 1,100 m altitude. The Masked Owl typically prefers open forest with low shrub density and requires old trees for roosting and nesting.
Painted Honeyeater	*Grantiella picta*	V	V	BioNet – 1 record (2005) PMST	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of Painted Honeyeater, as well as all breeding events, occur on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter, it is more likely to be found in the north of its range. The species inhabits Boree/Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*), Box-Gum Woodlands and Box-Ironbark Forests. The Painted Honeyeater is also a specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias; preferring mistletoes of the genus *Amyema*.

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
Pectoral Sandpiper	*Calidris melanotos*	-	Mi	PMST only	In NSW, the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands.
Powerful Owl	*Ninox strenua*	V	-	BioNet – 41 records (2020)	The Powerful Owl is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing. Throughout its eastern range is occurs at low densities and are rare along the Murray River. Former inland populations may never recover. The species inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl typically requires large tracts of forest or woodland habitat with dense wet gullies and creek areas but can also occur in fragmented landscapes. The species breeds and hunts in open or closed sclerophyll forest of woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine (*Syncarpia glomulifera*), Black She-oak (*Allocasuarina littoralis*), Blackwood (*Acacia melanoxylon*), Rough-barked Apple (*Angophora floribunda*), Cherry Ballart (*Exocarpos cupressiformis*) and a number of eucalypt species. The Powerful Owl requires large, mature trees with hollows for breeding, and dense areas of vegetation for foraging and roosting.
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	PMST BAMC	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. The species is also found in drier coastal woodlands and forests. The species range has contracted to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: North-east Victoria (Chiltern – Albury) and the Capertee Valley and Bundarra-Barraba region in NSW. In NSW, the distribution is very patchy and mainly

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
					confined to the two listed breeding areas and surrounding fragmented woodlands. In some years, flocks converge on flowering coastal woodlands and forests. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species; these woodlands generally have a large number of mature trees, high canopy cover, and an abundance of mistletoes. Non-breeding flocks are observed foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the Central Coast and occasionally on the upper North Coast. Individuals are occasionally seen on the South Coast. In the last decade, the species has been recorded in urban areas around Albury where Mugga Ironbark and Yellow Box were planted 20 years ago. Key eucalypt species include Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany. Other tree species may be regionally important.
Rufous Fantail	*Rhipidura rufifrons*	-	Mi	PMST only	The Rufous Fantail is found in northern and eastern coastal Australia, being more common in the north. It is also found in New Guinea, the Solomon Islands, Sulawesi and Guam. The Rufous Fantail is found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground. During migration, it may be found in more open habitats or urban areas.
Satin Flycatcher	*Myiagra cyanoleuca*	-	Mi	PMST only	The Satin Flycatcher is found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. It is also found in New Guinea. The Satin Flycatcher is not a commonly seen species, especially in the far south of its range, where it is a summer breeding migrant. The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.
Scarlet Robin	*Petroica boodang*	V	-	BioNet – 364 records (2020)	The Scarlet Robin is found from south-east Queensland to south-east South Australia and in Tasmania, and south-west Western Australia. In NSW, it occurs from the coast to the inland slopes. After breeding, some Scarlet Robins disperse to the lower valleys and plains of the tablelands and slopes. Some birds may appear as far west as the eastern edges of the inland plains in autumn and winter. The species inhabits dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. The species lives in both mature and regrowth vegetation, occasionally occurring in mallee or wet forest communities, or in wetlands and tea-tree swamps. Abundant logs and fallen timber are key components of the species habitat. In autumn and winter, the

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
					Scarlet Robin may occupy open grassy woodlands and grasslands or grazed paddocks with scattered trees.
Sharp-tailed Sandpiper	*Calidris acuminata*	-	Mi	PMST only	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. They are widespread in most regions of New South Wales (NSW) and Victoria, especially in coastal areas, but they are sparse in the south-central Western Plain and east Lower Western Regions of NSW, and north-east and north-central Victoria. In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms.
Sooty Owl	*Tyto tenebricosa*	V	-	BioNet – 1 record (2011)	Occupies the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands. Territories are occupied permanently. Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests.
Speckled Warbler	*Chthonicola sagittata*	V	-	BioNet – 5 records (2016)	The Speckled Warbler has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. The species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast. There has been a decline in population density throughout its range, with the decline exceeding 40% where no vegetation remnants larger than 100ha survive. The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy.
Spotted Harrier	*Circus assimilis*	V	-	BAMC	The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. The species inhabits grassy open woodland including Acacia and Mallee remnants, inland

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
					riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.
Square-tailed Kite	*Lophoictinia isura*	V	-	BioNet – 1 record (2013)	The Square-tailed Kite ranges along coastal and subcoastal areas from south-western to northern Australia, Queensland, NSW and Victoria. In NSW, scattered records of the species throughout the state indicate that the Square-tailed Kite is a regular resident in the north, north-east and along the major west-flowing river systems. It is a summer breeding migrant to the south-east, including the NSW south coast, arriving in September and leaving by March. The species is found in a variety of timbered habitats including dry woodlands and open forests and shows a preference for timbered watercourses. In arid north-western NSW, the species has been observed in stony country with a ground cover of chenopods and grasses, open *Acacia* scrub and patches of low open eucalypt woodland.
Swift Parrot	*Lathamus discolor*	E	CE	PMST BAMC	The Swift Parrot breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW, it mostly occurs on the coast and south west slopes. On the mainland they occur in areas where eucalypts are flowering profusely or where there is abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*). Commonly used lerp infested trees include Inland Grey Box (*E. microcarpa*), Grey Box (*E. moluccana*) and Blackbutt (*E. pilularis*).
Turquoise Parrot	*Neophema pulchella*	V		BAMC	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. The species lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.
Varied Sittella	*Daphoenositta chrysoptera*	V	-	BioNet – 29 records (2020)	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades. The

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
					species inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, *Mallee* and *Acacia* woodland.
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V	-	BioNet – 7 record (2019)	The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. In NSW, it is widespread along the east coast, and along all major inland rivers and waterways. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps and lakes, as well as the ocean. The species occurs at study areas near the sea or seashore, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarshes. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland and forests (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have dead emergent branches or large dead trees nearby which are used as guard roosts.
White-fronted Chat	*Epthianura albifrons*	V	-	BAMC	In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Along the coastline, it is found predominantly in saltmarsh vegetation but also in open grasslands and sometimes in low shrubs bordering wetland areas.
White-throated Needletail	*Hirundapus caudacutus*	-	V, Mi	BioNet – 15 records (2019) PMST	White-throated Needletails are non-breeding migrants in Australia between late spring and early autumn, but most common in summer. The species often occur in large numbers over eastern and northern Australia. White-throated Needletails are aerial birds and for a time it was commonly believed that they did not land while in Australia. It has now been observed that birds will roost in trees, and radio-tracking has since confirmed that this is a regular activity.
Yellow Wagtail	*Motacilla flava*	-	Mi	PMST only	The Yellow Wagtail is a regular wet season visitor to northern Australia. Increasing records in NSW suggest this species is an occasional but regular summer visitor to the Hunter River region. The species is considered a vagrant to Victoria, South Australia and southern Western Australia. Habitat requirements for the Yellow Wagtail are highly variable, but typically include open grassy flats near water. Habitats include open areas with low vegetation such as grasslands, airstrips, pastures, sports fields; damp open

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
					areas such as muddy or grassy edges of wetlands, rivers, irrigated farmland, dams, waterholes; sewage farms, sometimes utilise tidal mudflats and edges of mangroves.
AMPHIBIANS					
Booroolong Frog	*Litoria booroolongensis*	E	E	PMST BAMC	The Booroolong Frog is restricted to NSW and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range. It has disappeared from much of the Northern Tablelands, however several populations have recently been recorded in the Namoi catchment. The species is rare throughout most of the remainder of its range. The Booroolong Frog lives along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock structures within stream margins.
Giant Burrowing Frog	*Heleioporus australiacus*	V	V	PMST only	The Giant Burrowing Frog is distributed in south eastern NSW and Victoria and appears to exist as two distinct populations: Northern (largely confined to the sandstone geology of the Sydney Basin, extending as far south as Ulladulla) and Southern (occurring from north of Narooma through to Walhalla, Victoria). The species is found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. The Giant Burrowing Frog requires ephemeral and permanent freshwater wetlands, ponds and dams with an open aspect and fringed by *Typha*, as well as free from predatory fish. The species spends more than 95% of its time in non-breeding habitat, burrowing below the soil surface or in the leaf litter. Individuals occupy a series of burrow study areas, some of which are used repeatedly. Non-breeding study areas are usually located up to 300 m from breeding study areas, and home ranges are approximately 0.04 ha in size.
Littlejohn's Tree Frog	*Litoria littlejohni*	V	V	BioNet – 1 record (2013)	The Littlejohn's Tree Frog is distributed on plateaus and eastern slopes of the Great Diving Range, from Watagan State Forest in NSW, to Buchan in Victoria. Most records are from within the Sydney Basin Bioregion, with only scattered records south to the Victorian border. This species has not been recorded in southern NSW within the last decade. Records are isolated and tend to be at higher altitudes. The species breeds in the upper reaches of permanent streams and in perched swamps. Non-breeding habitat is heath-based forests and woodlands where it shelters under leaf litter and low vegetation.

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
Stuttering Frog	*Mixophyes balbus*	V	-	BioNet – 1 record (2004)	Stuttering Frogs occur along the east coast of Australia from southern Queensland to north-eastern Victoria. Considered to have disappeared from Victoria and to have undergone considerable range contraction in NSW, particularly in south-east NSW. It is the only *Mixophyes* species that occurs in south-east NSW and in recent surveys it has only been recorded at three locations south of Sydney. The Dorrigo region, in north-east NSW, appears to be a stronghold for this species. Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.
MAMMALS					
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	PMST BAMC	The Brush-tailed Rock-wallaby is distributed from south-east Queensland to the Grampians in western Victoria, roughly following the lines of the Great Diving Range. In NSW, the species occurs from the Queensland border in the north, to Shoalhaven in the south. The population in the Warrumbungle Ranges is the western limit of the species range. Brush-tailed Rock-wallaby occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges often facing north.
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	-	BioNet – 71 records (2020)	The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. The species prefers moist habitats, with trees over 20 m tall. The Eastern False Pipistrelle generally roosts in eucalypt hollows but has also been found under loose bark on trees, or in buildings.
Eastern Pygmy-possum	*Cercartetus nanus*	V	-	BioNet – 30 records (2020) BAMC	The Eastern Pygmy Possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW, the species is found from the coast to inland on the western slopes, around the Pilliga, Dubbo, Parkes and Wagga Wagga. The Eastern Pygmy Possum is found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath. Woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently found in rainforests. The species feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (*Pseudocheirus peregrinus*) dreys or thickets of vegetation, (e.g. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
					favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks.
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V	-	BioNet – 8 records (2014)	The Greater Broad-nosed Bat is found mainly in the gullies and river systems that drain the Great Diving Range, from north-eastern Victoria to the Atherton Tableland. The species extends to the coast over much of its range. In NSW, the Greater Broad-nosed Bat is widespread over the New England Tablelands, however it does not occur at altitudes above 500 m. The species utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although the species predominantly roosts in tree hollows, it has also been recorded roosting in buildings.
Greater Glider	*Petauroides volans*	-	V	BioNet – 681 records (2020) PMST	The Greater Glider is endemic to eastern Australia, ranging from Windsor Tableland in far northern Queensland to the Wombat Forest in central Victoria, except in altitudes above 1,200 m. The species is largely restricted to eucalypt forests and woodlands, with higher abundances occurring in taller, denser, montane, moist eucalypt forests with old trees and abundant hollows.
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	BioNet – 6 records (2018) PMST BAMC	The Grey-headed Flying-fox is generally found within 200 km of the coast in eastern Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, the species can occur in unusual locations. The Grey-headed Flying-fox occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of regular food sources, and are commonly found in gullies, close to water, in vegetation with a dense canopy. Study area fidelity to camps are high, and the species travels up to 50 km from these camps to forage, typically commuting distances up to 20 km from the camp study area.
Koala	*Phascolarctos cinereus*	V	V	BioNet – 5 records (2017) PMST BAMC	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW, it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. It also has sparse and possibly disjunct populations in the Southern Tablelands. The Koala is also known from several study areas on the Southern Tablelands. The species inhabits eucalypt woodlands and forests, and feeds on select species; about 70 eucalypt

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
					species and 30 non-eucalypt species but will select preferred browse species in any one area.
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	V	-	BioNet – 73 records (2020) BAMC	The Large Bent-winged Bat (formerly the Eastern Bentwing-bat) occurs along the east and north-west coasts of Australia. Their primary roosting habitat are caves, but the species is also known to use derelict mines, stormwater tunnels, buildings and other man-made structures.
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	BioNet – 48 records (2020) PMST BAMC	The Large-eared Pied Bat is found mainly in areas with extensive cliffs and caves, and in well-timbered areas containing gullies, from Rockhampton in Queensland to Bungonia in the NSW Southern Highlands. In NSW, the species is generally rare with a very patchy distribution. Scattered records exist from the New England Tablelands and North West Slopes. The species roosts in cave entrances, crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of Fairy Martins (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features.
New Holland Mouse	*Pseudomys novaehollandiae*	-	V	PMST only	The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, NSW and Queensland. The species is known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes.
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	BioNet – 3 records (2017) PMST	The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Only in Tasmania is it still considered relatively common. The species has been recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den study areas, and have communal latrine study areas; often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks.
Squirrel Glider	*Petaurus norfolcensis*	V	-	BioNet – 5 records (2018)	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
					Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or *Acacia* midstorey.
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	-	BioNet – 21 records (2020)	The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes. The species roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows.
REPTILES					
Blue Mountains Water Skink	*Eulamprus leuraensis*	E	E	BioNet – 59 records (2020)	Restricted to the middle and upper Blue Mountains west of Sydney, the Blue Mountains Water Skink is known from approximately 70 threatened highland peat swamps extending from the Newnes Plateau in the north-west to just south of Hazelbrook in the south-east. It is possible that additional locations will be identified, and these may lie outside the currently known distribution. Dispersal between populations appears to be very rare and appears to involve mostly males. It is restricted to an isolated and naturally fragmented habitat of sedge and shrub swamps that have boggy soils and appear to be permanently wet. The vegetation in these swamps typically takes the form of a sedgeland interspersed with shrubs but may occur as a dense shrub thicket.
Broad-headed Snake	*Hoplocephalus bungaroides*	E	V	BioNet – 1 record (2010) PMST	The Broad-headed Snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250 km of Sydney. The species is nocturnal and shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in cervices or hollows in large trees within 500m of escarpments in summer. Feeds mostly on geckos and small skinks; will also eat frogs and small mammals occasionally.
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	V	PMST only	The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands and South Western Slopes, with concentrated populations in the Canberra and Queanbeyan Region, Cooma, Yass, Bathurst, Albury and West Wyalong. The species inhabits sloping, open woodland areas dominated by Kangaroo Grass and containing well-drained soils and rocky outcrops.

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
Rosenberg's Goanna	*Varanus rosenbergi*	V	-	BioNet – 1 record (2015)	Rosenberg's Goanna occurs on the Sydney Sandstone in Wollemi National Park to the north-west of Sydney, in the Goulburn and ACT regions and near Cooma in the south. There are records from the South West Slopes near Khancoban and Tooma River. Also occurs in South Australia and Western Australia. Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens.
FISH					
Australian Grayling	*Prototroctes maraena*	E	V	PMST only	The Australian Grayling occurs in streams and rivers on the eastern and southern flanks of the Great Dividing Range, from Sydney, southwards to the Otway Ranges of Victoria and in Tasmania. The species is found in fresh and brackish waters of coastal lagoons, from Shoalhaven River in NSW to Ewan Ponds in South Australia. It is absent from the inland Murray-Darling system. Adults (including pre-spawning and spawning adults) inhabit cool, clear, freshwater streams with gravel substrate and areas alternating between pools and riffle zones.
Macquarie Perch	*Macquaria australasica*	E	E	PMST only	The Macquarie Perch is a riverine, schooling species. It prefers clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks. Macquarie Perch have declined considerably from their historical distribution within NSW and they are now considered isolated to the upper reaches of the Lachlan and Murrumbidgee Rivers in southern NSW. It is also found in low numbers in the Mongarlowe River, where the population is considered likely to be the result of a translocation from the Murray-Darling Basin. Other populations exist in Cataract Dam in the Nepean River catchment, as well as a 2008 record from Georges River near Campbelltown, the first record from the river since 1894. It persists in the Burrinjuck, Cotter (Murrumbidgee) and Wyangala impoundments. A breeding population in the Queanbeyan River upstream of the Googong Reservoir exists solely due to a translocation of individuals from the reservoir past a natural barrier. The Googong reservoir population is believed to be effectively extinct. Macquarie perch may occasionally become displaced downstream from the Queanbeyan River into Googong, but they do not form a population in the reservoir.

Common name	*Scientific name*	BC Act status	EPBC Act status	Database records	Habitat requirements
INSECTS					
Giant Dragonfly	*Petalura gigantea*	E	-	BioNet – 6 records (2017)	The Giant Dragonfly is found along the east coast of NSW from the Victorian border to northern NSW. It is not found west of the Great Dividing Range. There are known occurrences in the Blue Mountains and Southern Highlands, in the Clarence River catchment, and on a few coastal swamps from north of Coffs Harbour to Nadgee in the south. The Giant Dragonfly lives in permanent swamps and bogs with some free water and open vegetation.
Purple Copper Butterfly	*Paralucia spinifera*	E	V	BioNet – 91 records (2019) PMST BAMC	The Purple Copper Butterfly occurs on the Central Tablelands of NSW in an area approximately bounded by Oberon, Hartley, and Bathurst. The butterfly is found at 35 locations, all within the Greater Lithgow, Bathurst Regional and LGAs. It is possible that additional locations will be identified, and these may lie outside the currently known distribution. The species occurs above 850 m elevation in open woodland or open forest with a sparse understorey that is dominated by *Bursaria spinosa* subsp. *lasiophylla*. Its lifecycle relies on a mutualistic relationship with the ant, *Anonychomyra itinerans*, and on the presence of *Bursaria spinosa* subsp. *lasiophylla* which the larvae form of the butterfly feed exclusively on.

E – Endangered V – Vulnerable CE – Critically endangered EP – Endangered population Mi = Migratory

APPENDIX F: BAMC REPORT

BAM Credit Summary Report

Proposal Details

Assessment Id
00024962/BAAS17070/21/00024963

Proposal Name
Wallerawang SSD

BAM data last updated *
10/06/2021

Assessor Name
Kate Carroll

Report Created
15/10/2021

BAM Data version *
45

Assessor Number
BAAS17070

BAM Case Status
Finalised

Date Finalised
15/10/2021

Assessment Revision
0

Assessment Type
Major Projects

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

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion											
1	677_good	Not a TEC	46	46.0	0.91			High Sensitivity to Potential Gain	2.50		26
2	677_moderate	Not a TEC	23.9	23.9	0.24			High Sensitivity to Potential Gain	2.50		4
										Subtotal	**30**
										Total	**30**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Species credits
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)								
677_good	46.0	46.0	0.91	Vulnerable	Vulnerable	3	True	31
677_moderate	23.9	23.9	0.24	Vulnerable	Vulnerable	3	True	4
							Subtotal	**35**
Eucalyptus aggregata / Black Gum (Flora)								
677_moderate	N/A	N/A	44	Vulnerable	Vulnerable	2	False	88
677_good	N/A	N/A	3	Vulnerable	Vulnerable	2	False	6
							Subtotal	**94**

APPENDIX G: MICROBAT ECHOLOCATION CALL ANALYSIS (ARCADIS, 2021)

APPENDIX H SIGNIFICANT IMPACT ASSESSMENT (EPBC ACT)

Eucalyptus aggregata

Eucalyptus aggregata is listed as a vulnerable species under the EPBC Act. It is a woodland tree growing to 18 metres tall and is found on in the NSW Central and Southern Tablelands, with small, isolated populations in Victoria and the ACT. It generally occurs in the wetter, cooler and higher parts of the tablelands, but in the lowest parts of the landscape on alluvial soils. *Eucalyptus aggregata* usually occurs in an open woodland with a grassy groundlayer and sparse shrub layer (DPIE, 2019).

Within the study area, 69 individuals of *Eucalyptus aggregata* were recorded. Of these, 47 are located within the subject land and would be removed as a result of the Project. Approximately 41 of these individuals are juvenile. Juvenile individuals could not be confirmed as *Eucalyptus aggregata* as they are not reproductively mature and as a result lack the identifying features of buds and fruit. They have therefore been conservatively identified as *Eucalyptus aggregata.*

A species polygon has been created for recorded *Eucalyptus aggregata,* calculated using a 30 metre buffer of each individual. This species polygon represents the habitat for the species and within the subject land. The species polygon covers 0.76 hectares and would be removed as a result of the Project.

All areas of PCT 677 within the subject land are considered potential habitat for the species. This covers a total of 1.15 hectares.

Will the proposal lead to a long-term decrease in the size of an important population of a species?

Within the significant impact guidelines, an important population is defined as the following (DoE, 2013):

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.*

Within the locality of Wallerawang, there are 546 records of *Eucalyptus aggregata* individuals. The Conservation Advice for *Eucalyptus aggregata* (TSSC, 2015) states that the stand of *Eucalyptus aggregata* within Wallerawang is defined as an important population due to its large size and viability. The 69 individuals of *Eucalyptus aggregata* recorded within the study area were not previously recorded and therefore the population size of *Eucalyptus aggregata* at Wallerawang is at least 615, and likely to be larger.

The removal of 47 individuals of *Eucalyptus aggregata* as a result of the Project is not expected to lead to a long-term decrease in the size of the important population at Wallerawang. A majority (41) of the individuals within the subject land are juvenile and all juveniles have been recorded within close proximity to each other in a patch adjacent to the Castlereagh Highway and south of the access road. Here, most individuals are growing within one to two metres of each other and among mature Eucalyptus species and *Pinus radiata.* As a result, not all of the juveniles of *Eucalyptus aggregata* within the subject land are expected to reach maturity. Furthermore, an additional 22 individuals of the species have been recorded within the study area outside of the subject land and will be retained by the Project. Additional individuals of the species are also expected to occur within close proximity to the study area. For example, sightings of potential *Eucalyptus aggregata* individuals were made adjacent to the Forestry area to the north of the study area. This was based on the bark type, leaf size and colour, and habit of the individuals. However, identification of these individuals could not be confirmed due to access restrictions.

While the removal of these individuals will lead to a short term decrease in the size of the *Eucalyptus aggregata* population at Wallerawang, it is not expected to result in a long term decrease. This is due to the high number of individuals of the species in the surrounding area and small area of habitat (0.76 hectares) to be removed.

Will the proposal reduce the area of occupancy of an important population?

The stand of *Eucalyptus aggregata* within Wallerawang is defined as an important population due to its large size and viability.

Eucalyptus aggregata has been recorded across Wallerawang, particularly to the east, north and west of the study area. A large stand of the species is located approximately 700 metres to the east of the site (DPIE, 2021a). The area of occupancy for this species within Wallerawang is therefore large and made up of a high number of individuals. The Project will result in the removal of 0.76 hectares of habitat for this species. While this is a slight reduction in the area of occupancy for the species, this small area of habitat to be removed does not represent a significant area of habitat in comparison to the surrounding areas. Therefore, due to the high number of *Eucalyptus aggregata* recorded surrounding the study area to be retained, and the small area of habitat to be removed, any reduction in the area of occupancy for the species as a result of the Project is expected to be negligible.

Will the proposal fragment an existing important population into two or more populations?

Eucalyptus aggregata has been recorded across Wallerawang, particularly to the east, north and west of the study area. While the Project will result in the removal of 0.76 hectares of habitat for the species and 47 individuals, this is a small area compared to the large area of occupancy of the Wallerawang population. The habitat to be removed is also highly fragmented and present in small, isolated patches with little connectivity to other areas of habitat.

The Conservation Advice for *Eucalyptus aggregata* (TSSC, 2015) states that pollen movement for *Eucalyptus aggregata* is less than one kilometre and seed dispersal can be up to 300 metres. Individuals of *Eucalyptus aggregata* within the study area are located in two patches of vegetation. In each patch, some individuals of *Eucalyptus aggregata* will be retained and therefore distances between individuals will not be significantly increased. Retained individuals of the species will remain less than one kilometre from other known individuals of *Eucalyptus aggregata,* and therefore the Project is unlikely to significantly disrupt the reproductive cycle of the population. However, the removal of the *Eucalyptus aggregata* individuals within the construction area will decrease the gene flow within the population. This is not anticipated to be significant enough to fragment the population into two or more populations.

Therefore, due to the current level of fragmentation in the area, and large area of occupancy surrounding the study area, the Project is unlikely to fragment an existing population into two or more populations.

Will the proposal adversely affect habitat critical to the survival of a species

No critical habitat has been declared for *Eucalyptus aggregata* within the Register of Critical Habitat or within a recovery plan for the species.

Habitat critical to the survival of a species can also refer to areas that are necessary for foraging, breeding, roosting or dispersal, the long term maintenance of the species, to maintain genetic diversity and long term evolutionary development, or for the recovery of the species. While the habitat to be removed by the Project contributes to the dispersal, long term maintenance, and genetic diversity of the species, the habitat is not considered necessary for these functions. This is due to the large size of the local population and areas of suitable habitat, as well as other individuals of *Eucalyptus aggregata* in proximity.

Will the proposal disrupt the breeding cycle of an important population?

The Project will result on the removal of up to 47 *Eucalyptus aggregata* individuals, including 6 adult individuals. As a result, these individuals will no longer be able to produce reproductive material and contribute to the breeding cycle of the important population at Wallerawang. Therefore, the Project will disrupt the breeding cycle of an important population.

As outlined above, pollen movement for *Eucalyptus aggregata* is less than one kilometre and seed dispersal can be up to 300 metres. Individuals of *Eucalyptus aggregata* within the study area are located in two patches of vegetation. In each patch, some individuals of *Eucalyptus aggregata* will be retained and therefore distances between individuals will not be significantly increased. Retained individuals of the species will remain less than one kilometre from other known individuals of *Eucalyptus aggregata,* allowing gene flow between small patches of individuals to continue. There are also a large number of individuals in the locality which contribute to the gene flow and genetic diversity of the population.

The Project is therefore anticipated to have a negligible impact on the breeding cycle of the Wallerawang population.

Will the proposal 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 will result in the removal of 0.76 hectares of habitat for *Eucalyptus aggregata.* This habitat is currently in fairly degraded condition and is subject to a number of ongoing disturbances including edge effects and weed incursion. The Project is not expected to impact on any other habitat for the species.

Larger areas of habitat for the species in the form of PCT 677 are present in the surrounding area, particularly to the north and west of the study area. *Eucalyptus aggregata* also appears to have some capacity to grow in disturbed habitat, as seen within the study area. As such, most areas of PCT 677 within the locality are expected to be potential habitat for the species.

Given the small area of habitat to be removed, and its degraded condition and situation in a fragmented landscape, the removal of this habitat is not anticipated to result in the species decline.

Will the proposal result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The project is unlikely to result in the establishment of an invasive species that is harmful to *Eucalyptus aggregata.* The individuals of *Eucalyptus aggregata* recorded within the study area are currently growing in vegetation abundant with exotic species. With the appropriate mitigation measures, the Project is unlikely to increase the prevalence of exotic species, or result in the establishment of invasive species, in the *Eucalyptus aggregata* habitat.

Will the proposal introduce disease that may cause the species to decline?

Eucalyptus species, including *Eucalyptus aggregata* are susceptible to Myrtle Rust and *Phytophthora cinnamomi.* No signs of either disease were identified within the study area. With the appropriate pathogen management controls, the Project is unlikely to introduce disease that may cause the species to decline.

Will the proposal interfere substantially with the recovery of the species?

There is no Recovery Plan for this species. The Approved Conservation Advice for *Eucalyptus aggregata* lists the primary conservation objectives for the species. These are:

1. Maintain and increase the number and size of wild populations.
2. Maintain and enhance quality existing and potential habitat.
3. Abate identified threats where possible.
4. Investigate options for linking, enhancing or establishing additional populations.
5. Raise awareness of black gum within the local community.
6. Effectively administer the recovery effort.

The Project interferes with the first conservation objective of maintaining and increasing the number and size of wild populations. The Project would result in the removal of up to 47 individuals and 0.76 hectares of habitat for the species. Therefore, while the Project would interfere with one of the conservation objectives for the species, it is not anticipated that this would substantially interfere with the recovery of the species.

Conclusion

The Project would result in the removal of up to 47 individuals of *Eucalyptus aggregata,* 41 of which are juvenile and have been identified as *Eucalyptus aggregata* on a precautionary basis. These individuals form part of an important population for the species as identified within the Conservation Advice for the species. The Project is unlikely to:

- Lead to the long term decrease in the size of an important population,
- Fragment an existing population into two or more populations,
- Introduce disease or invasive species that may cause the species to decline,
- Negatively impact its habitat to the point the species is likely to decline or
- Interfere substantially with the recovery of the species.

However, the Project will reduce the area of occupancy and disrupt the breeding cycle of an important population. These impacts are anticipated to be negligible. This is due to the high number of juvenile individuals to be removed by the Project which are unlikely to reach maturity, the high level of habitat fragmentation in the areas to be impacted, and the large number of individuals and habitat in the surrounding area. Therefore, based on this assessment, the Project is unlikely to have a significant impact on the species and referral to the Minister is not required.

Eucalyptus pulverulenta

Eucalyptus pulverulenta is listed as a vulnerable species under the EPBC Act. The species is a straggly mallee or small tree growing to 10 metres tall with juvenile leaves retained on mature plants. *Eucalyptus pulverulenta* is found between Lithgow and Bathurst areas as well as the Monaro. It grows in shallow soils in open forest, typically dominated by *Eucalyptus mannifera, Eucalyptus macrorhyncha, Eucalyptus dives, Eucalyptus sieberi* and *Eucalyptus bridgesiana.*

One juvenile individual of *Eucalyptus pulverulenta* was recorded within the study area. No individuals will be removed or impacted as a result of the Project.

Will the proposal lead to a long-term decrease in the size of an important population of a species?

One individual of *Eucalyptus pulverulenta* was recorded within the study area within the vegetation zone 677_moderate. The individual is outside of the construction footprint and will not be impacted as a result of the Project. Therefore, the Project will not lead to a long term decrease in the size of an important population of a species.

Will the proposal reduce the area of occupancy of an important population?

A species polygon was created by applying a 30 metre buffer to the individual recorded within the study area. This species polygon does not intersect with the construction footprint and therefore will not be impacted as a result of the Project.

As no areas of occupancy or individuals of *Eucalyptus pulverulenta* will be impacted as a result of the Project, the Project will not reduce the area of occupancy of an important population.

Will the proposal fragment an existing important population into two or more populations?

Native vegetation surrounding the study area is currently highly fragmented. The removal of 1.92 hectares of native vegetation as a result of the Project will have a negligible impact on fragmentation within the locality. Furthermore, none of the vegetation to be removed is currently occupied by *Eucalyptus pulverulenta.* Therefore, the Project will not fragment an existing population into two or more populations.

Will the proposal adversely affect habitat critical to the survival of a species?

No critical habitat has been declared for *Eucalyptus pulverulenta.*

Habitat critical to the survival of a species can also refer to areas that are necessary for foraging, breeding, roosting or dispersal, the long term maintenance of the species, to maintain genetic diversity and long term evolutionary development, or for the recovery of the species.

As no vegetation occupied by *Eucalyptus pulverulenta* would be removed by the Project, the Project is not expected to adversely affect habitat critical to the survival of the species.

Will the proposal disrupt the breeding cycle of an important population?

As no individuals of *Eucalyptus pulverulenta* are within the construction footprint, the Project will not impact any individuals. The Project will therefore not disrupt the breeding cycle of an important population.

Will the proposal 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 will not impact on any vegetation within the species polygon for *Eucalyptus pulverulenta.* While the vegetation within the construction footprint may become potential habitat for the species in the future, it is not considered significant habitat within the locality. Therefore the Project will not modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Will the proposal result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The project is unlikely to result in the establishment of an invasive species that is harmful to *Eucalyptus pulverulenta.* The individual of *Eucalyptus pulverulenta* recorded within the study area is currently growing in degraded habitat abundant with exotic species. With the appropriate mitigation measures, the Project is unlikely to increase the prevalence of exotic species, or result in the establishment of invasive species, in the *Eucalyptus pulverulenta* habitat.

Will the proposal introduce disease that may cause the species to decline?

The Project is highly unlikely to introduce disease that may cause the species to decline.

Will the proposal interfere substantially with the recovery of the species?

There is no Recovery Plan in place for *Eucalyptus pulverulenta.* The following actions may assist in recovery of the Silver-leaved Mountain Gum (OEH, 2012):

- Encourage regeneration by fencing remnants, controlling stock grazing and undertaking supplementary planting or direct sowing of this species, if necessary.
- Conduct further survey in potential habitat to look for additional populations.

The Project will not interfere with the recovery of the species.

Conclusion

Based on the above assessment, the Project will not have a significant impact on the species as it will not result in the removal of any individuals or habitat which forms part of a species polygon for the species. It is also unlikely to introduce diseases or invasive species that would impact this species. As such a referral is not required.

Grey-headed Flying Fox

Grey-Headed Flying-Fox (Pteropus poliocephalus) is listed as Vulnerable under the EPBC Act. In NSW, the Grey-Headed Flying-Fox occurs along the east coast, eastern slopes of the Great Dividing Range and the tablelands. The species may be found in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps, while additional foraging is provided by urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 kilometres of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young.

One individual Grey-headed Flying-fox was recorded temporarily roosting in vegetation adjacent to the Castlereagh Highway. While this individual was roosting, it was not observed in subsequent surveys, and no other individuals were recorded within the study area. Although this species may

opportunistically disperse, forage and/or temporarily roost within the subject land, no breeding or permanent roosting habitat was identified within the study area and will therefore not be impacted.

Will the proposal lead to a long-term decrease in the size of an important population of a species?

Important populations are those that may be 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 Grey-headed Flying-fox has no separate or distinct populations. The species constantly exchanges genetic information between camps throughout its geographic range. The subject land does not contain a maternity roost or roosting camp. One individual was recorded on a single occasion within the subject land. It is therefore unlikely that the subject land contains a population that is a key source of breeding or dispersal or important for maintaining genetic diversity. The subject land is not near the limit of the species range. As such, it is not considered to contain an important population. Therefore, the Project would not lead to a long-term decrease in the size of an important population.

Will the proposal reduce the area of occupancy of an important population?

The subject land does not support an important population of Grey-headed Flying-fox. No associated PCTs defined as foraging habitat for the species would be removed by the Project. Therefore, the Project would not reduce the area of occupancy of the species.

Will the proposal fragment an existing important population into two or more populations?

The subject land does not support an important population of Grey-headed Flying-fox. No foraging or breeding habitat would be removed by the Project. Therefore, the Project would not fragment a population of Grey-Headed Flying-fox into two or more populations.

Will the proposal adversely affect habitat critical to the survival of a species?

No critical habitat has been declared for Grey-headed Flying-fox.

Will the proposal disrupt the breeding cycle of an important population?

The subject land does not support an important population of Grey-headed Flying-fox. There is no known maternity roosting camp of Grey-headed Flying-foxes within the subject land and no foraging habitat as defined in the TBDC would be removed by the Project. As such, the Project is unlikely to disrupt the breeding cycle of an important population.

Will the proposal modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

No foraging or breeding habitat for Grey-headed Flying-fox, as defined in the TBDC, would be removed as a result of the Project. Therefore, the Project would not negatively impact on habitat to the extent the species is likely to decline.

Will the proposal result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The Project is unlikely to result in the establishment of an invasive species that is harmful to the Grey-Headed Flying-fox. Known predators of the species include native reptiles and birds; no invasive exotic fauna species are known to predate upon Grey-Headed Flying-foxes. As such, the Project is unlikely to result in the establishment of invasive species that are harmful to the Grey-Headed Flying-fox.

Will the proposal introduce disease that may cause the species to decline?

The Project is highly unlikely to introduce disease that may cause the Grey-Headed Flying-fox to decline.

Will the proposal interfere substantially with the recovery of the species?

The National Recovery Plan for the Grey-Headed Flying-fox (DAWE, 2021) lists nine specific objectives to be achieved over 10 years. The overall objectives of this Grey-headed Flying-fox recovery plan are:

- to improve the Grey-headed Flying-foxes national population trend by reducing the impact of the threats outlined in this plan on Grey-headed Flying-foxes through habitat identification, protection, restoration and monitoring, and
- to assist communities and Grey-headed Flying-foxes to coexist through better education, stakeholder engagement, research, policy and continued support to fruit growers.

As no breeding or foraging habitat for the species would be impacted as a result of the Project, the Project is unlikely to interfere with any of these objectives. Therefore, the Project would not interfere substantially with the recovery of the species.

Conclusion

Based on the above assessment, it is concluded that the Project would not have a significant impact on Grey-Headed Flying-fox as it would not result in the removal of any breeding or foraging habitat for the species. It is also unlikely to introduce diseases or invasive species that would impact this species. Therefore, the Project does not require referral to the Minister.

Large eared Pied Bat

The Large-eared Pied Bat is listed as a vulnerable species under the EPBC Act.

The Large-eared Pied bat is found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes. The species is found in well-timbered areas containing gullies, where it forages for small, flying insects below the forest canopy (DPIE, 2017).

The species roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (between 20-40 females) from November through to January in roof domes in sandstone caves and overhangs and may use the same cave over many years (DPIE, 2017).

The Large-eared Pied Bat was recorded within the study area during targeted Anabat surveys. Vegetation within the subject land provides potential foraging and/or dispersal habitat for the species. A small sandstone culvert is also present within the study area. However, following inspection of the culvert, it was determined to be unlikely to provide breeding habitat for the species. This was due to the small size of the culvert (less than 0.5 metres tall), and its placement close to the ground, making it susceptible to predators. The culvert also did not appear to have any deep crevices suitable for use by the Large-eared Pied Bat, and no signs of bats such as urine stains, droppings, remains or bat fly casings were detected. Furthermore, the culvert is not present within an associated PCT for the species. Therefore, there is no breeding or roosting habitat for Large-eared Pied Bat within the study area or subject land.

Large-eared Pied Bat was recorded within PCT 677 within the study area, and while this PCT is not associated with the species as listed in the TBDC (DPIE, 2021g) it may provide some foraging habitat. This PCT also forms the species polygon for Large-eared Pied Bat within the subject land as described within Section 4.3.2 of the BDAR. There is 1.15 hectares of the species polygon within the subject land and would be removed as a result of the Project.

Will the proposal lead to a long-term decrease in the size of an important population of a species?

There is no breeding or roosting habitat for Large-eared Pied Bat present within the subject land. While the species was recorded within PCT 677 and may use this habitat for foraging, it is not considered an important foraging resource for the species. This is due to the large area of more intact vegetation in the locality which are also listed as associated PCTs for the species. The loss of this

foraging habitat would not lead to a long-term decrease in the size of an important population of the species.

Will the proposal reduce the area of occupancy of an important population?

Foraging habitat for the species which would be removed by the Project is limited to 1.15 hectares of PCT 677. No breeding or roosting habitat would be removed by the Project. This foraging habitat does not represent a significant or important area of habitat for the species. Therefore, the Project would not reduce the area of occupancy of the species.

Will the proposal fragment an existing important population into two or more populations?

The Project would not result in the removal of any breeding or roosting habitat for the species. While there would be removal of some potential foraging habitat used by the Large-eared Pied Bat, this vegetation is not considered to be significant to maintaining connectivity for the local population of the species. Its removal would not fragment an existing important population.

Will the proposal adversely affect habitat critical to the survival of a species?

The National Recovery Plan for the Large-eared Pied Bat (Department of Environment and Resource Management, 2011) lists maternity roosts as critical habitat as well as sandstone cliffs and fertile wooded valley habitat within close proximity of each other. Habitat critical to the survival of a species can also refer to areas that are necessary for foraging, breeding, roosting or dispersal, the long term maintenance of the species, to maintain genetic diversity and long term evolutionary development, or for the recovery of the species.

No breeding or roosting habitat for the Large-eared Pied Bat would be removed as a result of the Project. The potential foraging habitat within the subject land is fragmented narrow patches of vegetation and is not considered fertile wooded valley habitat. Therefore, there is no critical habitat as defined within the National Recovery Plan for the species present within subject land which would be impacted by the Project. The Project would not adversely affect habitat critical to the survival of the species.

Will the proposal disrupt the breeding cycle of an important population?

No breeding habitat would be removed as a result of the Project. Therefore, there would be no disruption to the breeding cycle of an important population.

Will the proposal modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Habitat for the Large-eared Pied Bat present within the subject land is limited to 1.15 hectares of potential foraging habitat in the form of PCT 677. This is a small amount of foraging habitat in comparison to the larger and more intact habitat in the locality. The removal of this habitat is not anticipated to result in the species decline.

Will the proposal result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The Project is unlikely to result in the establishment of an invasive species that is harmful to the Large-eared Pied Bat. Habitat disturbance by introduced animals and predation by introduced pests are known threats to the species. However, the Project is unlikely to result in the establishment of these species.

Will the proposal introduce disease that may cause the species to decline?

The Project is highly unlikely to introduce disease that may cause the Large-eared Pied Bat to decline.

Will the proposal interfere substantially with the recovery of the species?

The National Recovery Plan for the species lists five specific objectives to ensure the persistence of viable populations of Large-eared Pied Bat throughout its geographic range. These include:

- Identify priority roost and maternity sites for protection.
- Implement conservation and management strategies for priority sites.

- Educate the community and industry to understand and participate in the conservation of the large-eared pied bat.
- Research the large eared pied bat to augment biological and ecological data to enable conservation management.
- Determine the metapopulation dynamics throughout the distribution of the large-eared pied bat

The Project would not interfere with any of these objectives within the National Recovery Plan.

Conclusion

Based on the above assessment, it is concluded that the Project would not have a significant impact on Large-eared Pied Bat as it would not result in the removal of any breeding or roosting habitat for the species. 1.15 hectares of potential foraging habitat would be removed as a result of the Project. The Project is unlikely to:

- Lead to the long term decrease in the size of an important population,
- Reduce the area of occupancy of an important population
- Fragment an existing population into two or more populations,
- Disrupt the breeding cycle of an important population
- Introduce disease or invasive species that may cause the species to decline,
- Negatively impact its habitat to the point the species is likely to decline or
- Interfere substantially with the recovery of the species.

Therefore, the Project does not require referral to the Minister.

Lathams Snipe

Latham's Snipe is listed as a migratory species under the EPBC Act. It is a non-breeding migrant to the south east of Australia including Tasmania, passing through New Guinea on passage. Latham's Snipe breed in Japan and on the east Asian mainland. Latham's Snipe are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in a range of vegetation types around wetlands, including sedges, grasses, lignum, reeds and rushes as well as in saltmarsh and creek edges on migration. They also use crops and pasture (DPIE EES, 2020c).

One individual of Latham’s Snipe was flushed from a small farm dam adjacent to the study area. Lake Wallace and the Coxs River within the study area also provide suitable roosting, foraging, sheltering and/or dispersal habitat for the species.

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species

Potential habitat for Latham’s Snipe within the study area includes the Cox’s River and vegetation immediately surrounding it. None of this vegetation will be removed as a result of the Project and no direct aquatic impacts to the Cox’s River are expected as a result of the Project. The Project has the potential to result in minor indirect impacts to the Coxs River through sedimentation and run off from construction activities. This indirect impact is anticipated to be minor with no significant impact to aquatic and wetland vegetation and is of low risk as a result of its management as part of a CEMP.

Therefore, no areas of important habitat for the species will be substantially modified, destroyed or isolated.

Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species

Habitat for Latham's Snipe within the study area includes areas of PCT 1299 along the Cox's River. The vegetation here is currently high in exotic species, particularly the Priority Weed *Rubus fruticosus aggregate.* Areas further south outside the study area within Lake Wallace contain higher quality habitat with lower abundances of weed species.

Mitigation measures to manage weeds on site as outlined in Section 9 will be implemented to prevent any spread of weeds throughout the subject land and into surrounding areas. With these mitigation measures, the Project is unlikely to result in an increase in invasive species to areas of potential habitat for Latham's Snipe.

Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

Latham's Snipe is a migratory species which breeds on the east Asian mainland. Therefore, there is no breeding habitat present within the subject land and the Project will not impact the breeding of the species.

The study area provides potential feeding and roosting habitat for Latham's Snipe. None of this habitat will be removed as a result of the Project and there is low risk of indirect aquatic impacts to the Cox's River as a result of the Project. Therefore, the Project will not seriously disrupt the lifecycle of an ecologically significant proportion of the population of Latham's Snipe.

Conclusion

One individual of Latham's Snipe was recorded adjacent to the study area. The Project will not remove, modify or isolate any potential habitat for Latham's Snipe. The Project is also unlikely to result in an increase in invasive species to areas of potential habitat for the species. Furthermore, as Latham's Snipe breeds on the east Asian mainland, there is no breeding habitat in the study area. Therefore, the Project will not seriously disrupt the lifecycle of the species.

The Project does not represent a significant impact to Latham's Snipe and as such a referral to the Minister is not required.

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