

# Appendix C

## Biodiversity Development Assessment Report



# Battery Energy Storage System, Wallerawang Biodiversity Development Assessment Report

FINAL REPORT

Prepared for AECOM

15 February 2022

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- Astrid Mackegard (mapping).

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## Glossary

<b>Assessment Area</b>	All land within 500m of a linear development and 1500m of a broader development site
<b>BAM</b>	NSW Biodiversity Assessment Method
<b>BAM-C</b>	BAM Calculator
<b>BC Act</b>	NSW <i>Biodiversity Conservation Act 2016</i>
<b>BDAR</b>	Biodiversity Development Assessment Report
<b>BESS</b>	Battery Energy Storage System
<b>Biosecurity Act</b>	NSW <i>Biosecurity Act 2015</i>
<b>BOS</b>	Biodiversity Offsets Scheme
<b>CEMP</b>	Construction Environmental Management Plan
<b>DA</b>	Development Application
<b>DCDB</b>	Digital cadastral database
<b>DAWE</b>	Commonwealth Department of Agriculture, Water and Environment
<b>Development footprint</b>	The area of land that is directly impacted by the proposal
<b>Development site</b>	The broader area in which the subject land is located.
<b>DoIW</b>	Directory of Important Wetlands
<b>DPIE</b>	NSW Department Planning Industry and Environment
<b>DPI</b>	NSW Department of Primary Industries
<b>DTDB</b>	Digital topographic databases
<b>Ecosystem credit species</b>	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development
<b>EES</b>	NSW Environment, Energy and Science Group
<b>EP&amp;A Act</b>	NSW <i>Environmental Planning and Assessment Act 1979</i>
<b>EPBC Act</b>	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
<b>GDE</b>	Groundwater Dependent Ecosystem
<b>GIS</b>	Geographic Information System
<b>IBRA</b>	Interim Biogeographic Regionalisation of Australia
<b>LEP</b>	Local Environmental Plan
<b>LGA</b>	Local Government Area

<b>Locality</b>	Area located within 10 kilometres radius from the subject land
<b>LPI</b>	NSW Land and Property Information
<b>Matters of NES</b>	Matters of National Environmental Significance protected by a provision of Part 3 of the EPBC Act
<b>EES</b>	NSW Environment, Energy and Science Group
<b>PCT</b>	Plant Community Type
<b>SAII</b>	Serious and Irreversible Impact
<b>SALIS</b>	NSW Soil and Land Information System
<b>SEARs</b>	Secretary's Environmental Assessment Requirements
<b>SEPP</b>	NSW State Environmental Planning Policy
<b>SIS</b>	Species Impact Statement
<b>Species credits species</b>	A class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates
<b>SSD / SSI</b>	State Significant Development / State Significant Infrastructure
<b>Subject land</b>	The areas within or the combined areas of the development site, and any indirect and prescribed impacts.
<b>TEC</b>	Threatened Ecological Community
<b>TBDC</b>	Threatened Biodiversity Data Collection
<b>WM Act</b>	NSW <i>Water Management Act 2000</i>

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## Certification and Declarations

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I certify that this report has been prepared on the basis of the requirements of, and information provided under, the Biodiversity Assessment Method (DPIE 2020) and s6.15 of the *Biodiversity Conservation Act 2016*.

In preparing this assessment I have acted in accordance with the Accredited BAM Assessor Code of Conduct.

I declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest.

**Name:** Paul Price

**Signature:**

A handwritten signature in black ink, appearing to read 'Paul Price', with a long horizontal flourish extending to the right.

**Date:** 24/02/2022

**BAM Assessor Accreditation Number:** BAAS 18089



## Summary

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Neoen Australia Pty Ltd (Neoen) is seeking development consent to construct, operate and maintain a large-scale Battery Energy Storage System (BESS) at 173 Brays Lane, Wallerawang, NSW (the Site), as well as a new transmission line that would connect the BESS to the existing Transgrid 330 kilovolt (kV) substation at Wallerawang (the Project).

The project is considered State Significant Development (SSD) and will be assessed under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). Vegetation will be removed as part of the Project. As the Project is considered an SSD, the Biodiversity Offset Scheme (BOS) applies in accordance with Section 7.9 of the *Biodiversity Conservation Act 2016* (BC Act), and an assessment is required in accordance with the NSW Biodiversity Assessment Method (BAM) (DPIE 2020a), and the BC Act. This Biodiversity Development Assessment Report (BDAR) has been prepared by Accredited Assessor Paul Price (BAAS18089) and describes the outcome of the development assessment case (00024080/BAAS18089/21/00024081) conducted consistent with the BAM.

Field investigation, undertaken in accordance with the BAM, recorded 30.39 hectares of native vegetation within the subject land (inclusive of the Site, the transmission line corridor and other lands that could be impacted by the Project), representing no threatened ecological communities (TEC).

Consideration has been given to avoiding and minimising impacts to biodiversity where possible during the assessment and project design. As such such mitigation and management measures will be put in place to adequately address impacts associated with the Project, both direct, indirect and prescribed.

Habitat for five threatened species were recorded within the subject land where the vegetation integrity (VI) score of the impacted vegetation was calculated as 0.2 to 83.6. As such, in accordance with Section 10 of the BAM, offsets are required to be secured for the Project, including:

- 0.26 ha of PCT 677
- 0.67 ha of PCT 732
- 0.26 ha of Black Gum habitat
- 0.67 ha of Koala habitat
- 0.67 ha of Squirrel Glider habitat
- 0.67 ha of Eastern Pygmy-possum habitat.

The Project is not considered likely to result in a significant impact to species or communities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and as such a referral to the Minister for the Environment is not required.

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## Stage 1 – Biodiversity assessment

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# 1 Introduction

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Neoen Australia Pty Ltd (Neoen) is seeking development consent to construct, operate and maintain a large-scale Battery Energy Storage System (BESS) of approximately 500 megawatts (MW) and approximately 1000 megawatt-hour (MWh) at 173 Brays Lane, Wallerawang, NSW (the Site), as well as a new transmission line that would connect the BESS to the existing Transgrid 330 kilovolt (kV) substation at Wallerawang (the Project).

Biosis Pty Ltd was commissioned by AECOM to undertake a biodiversity assessment of the Project. The proposed BESS is to be constructed within the suburb of Wallerawang, in the Lithgow Local Government Area (LGA).

The Project is considered State Significant Development (SSD) under the *Environmental Planning and Assessment Act 1979* (EP&A Act) as it satisfies the requirements of Clause 8 of the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). An Environmental Impact Statement (EIS) has been prepared for the Project in accordance with Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of this assessment is to apply the NSW Biodiversity Assessment Method 2020 (BAM) (DPIE 2020a) to the Project in accordance with the NSW *Biodiversity Conservation Act 2016*, and provide AECOM with a Biodiversity Development Assessment Report (BDAR) to support the EIS for the Project.

## 1.1 Project description

As described above, the Project would comprise the construction and operation of a large-scale BESS, as well as a new underground transmission line that would connect the BESS to the existing Transgrid 330 kV substation at Wallerawang.

The proposed location of the BESS is on the southern part of Lot 4 Deposited Plan (DP) 751651. The Site is located approximately 1.25 km north west of the Transgrid Wallerawang 330 kV substation. This substation is located at Main Street, Wallerawang 2845 (Lot 91 of DP 1043967).

The proposed transmission line would be constructed using a combination of an underboring method known as horizontal directional drilling (HDD) and open trenching. HDD would be used where required to avoid areas of sensitivity, including Aboriginal heritage, biodiversity, Pipers Flat Creek, and rail crossings. The utilisation of this methodology will require the creation of both an entry and exit pit to facilitate the HDD. Both the entry and exit pits will be located on areas devoid of threatened species and native vegetation as such no impacts will be recorded. The remainder would be constructed using an open trenching methodology. The vast majority of the new transmission line would be installed underground except for where it connects to Transgrid Wallerawang 330kV substation within the substation site.

The new transmission line would traverse:

- Lot 8 and Lot 9 DP 252472
- Lot 2 DP 108089
- Lot 1 DP 108089
- Lot 10 DP 1168824
- Lot 1115 DP 1204803
- Lot 91 DP 1043967.

Key components of the Project are shown on Figure 13 and would include:



- Site establishment, including installation of fencing, environmental controls, grading, modification of dams, and other civil work including earthworks.
- Establishment of a new driveway and access road (up to 10 m wide), located at the south-western boundary of the Site, providing access to the Site from Brays Lane.
- Establishment of an internal access road and construction of a permanent car parking area with spaces for up to eight light vehicles.
- Construction of permanent operations and management (O&M) buildings, including staff amenities.
- Construction of new switch rooms and control room.
- Construction of new 330/33 kV substation on the Site (including outdoor switchgear (up to 330 kV) and transformers).
- A 10 m buffer (or Asset Protection Zone (APZ)) would be established around all battery storage infrastructure. This buffer area would comprise non-combustible ground cover with no vegetation present.
- Construction of stormwater controls (including swales and bioretention basins).
- Installation of two 45 kL metal water tanks.
- Provision of fire alert equipment.
- Construction of lighting and installation of security devices around the perimeter of the BESS compound, including cyclone mesh security fencing about 2.7 m high.
- Construction of 10 m high noise walls around all battery enclosures and high voltage transformers.
- Establishment of landscaping and screening vegetation.
- Upgrades to the Wallerawang 330 kV substation switchyard.
- Connection to the existing potable water supply and the 11kV transmission line in Brays Lane.
- Following completion of the construction activities, Neoen are proposing to subdivide Lot 4 DP 751651 to separate the existing rural residential use of the Lot from the proposed BESS.

The Project seeks to provide a critical element of the expanding renewable energy industry and support the future capacity and resilience of the NSW energy network through providing a large-scale energy storage system. The energy storage capacity provided by the Project would allow for increased installation of renewable energy sources while maintaining network stability and security.

The Project has been assessed as triggering the NSW Biodiversity Offset Scheme (BOS) through the following:

- The Project is considered to be SSD under the EP&A Act.

The NSW BC Act requires that the BAM be applied to all proposals that trigger the BOS, and that a BDAR is required to be submitted to the approval authority.

## 1.2 Purpose of this assessment

This BDAR will:

- Address the BAM (DPIE 2020a) and the BOS.
- Identify how the proponent has avoided and minimised impacts to biodiversity.

- Identify any potential impact that could be characterised as serious and irreversible.
- Describe the offset obligations required to compensate for any unavoidable biodiversity impacts resulting from the proposed development.
- Consider and assess the proposal in accordance with other relevant legislation such as the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

All biodiversity assessments have been undertaken in accordance with the BAM, and this BDAR has been prepared and reviewed by Accredited Assessor Paul Price (BAAS18089). This BDAR describes the outcome of the development assessment case (00024080/BAAS18089/21/00024081) conducted consistent with the BAM.

### 1.3 The subject land, development footprint and assessment area

The terms subject land, development footprint and assessment area are used throughout this BDAR and are defined as follows:

- The subject land is defined as the total area of proposed disturbance, encompassing the proposed development footprint and all areas that could be disturbed, including direct, indirect and prescribed impacts (Figure 1). The subject land is approximately 52.72 ha in area, and comprises the proposed development footprint, including the portion of Lot 4 /- DP 751651 that would be used to construct the BESS (the Site), and a 50 m buffer on the proposed transmission line that includes adjacent mapped native vegetation. The subject land is situated within the Lithgow LGA and the Central Tablelands (LLS) region. It is approximately 12 km north-west of the Lithgow central business district and is zoned as RU1 – Primary Production and IN1 – General Industrial and SP2 – Infrastructure (Rail Infrastructure Facilities) under the *Lithgow Local Environmental Plan 2014* (LEP). The subject land is bounded by farmland to the north and east, Ben Bullen State Forest to the west, and industrial zoned land to the south.
- The development footprint is the area of land that would be required to construct the Project (including the BESS, the new transmission line, and part of the Transgrid Wallerawang 330 kV substation. This area would be directly impacted by the Project. It comprises the clearing footprint, plant laydown, access roads and other associated construction works. The development footprint is approximately 25.29 ha in area. This development footprint corresponds to that area defined as the ‘Project Area’ in the EIS.
- The assessment area has been determined as per the BAM and includes the subject land and the area of land within the 1,500 m buffer zone surrounding the subject land.

### 1.4 Sources of information

Sources of information used in the assessment included relevant databases, spatial data, literature and previous site reports.

In order to provide a context for the assessment area, records of flora and fauna from within 5 kilometres (the locality) were collated from the following databases and datasets were reviewed:

- Commonwealth Department of Agriculture, Water and Environment (DAWE) Protected Matters Search Tool for matters protected by the EPBC Act.
- NSW Environment, Energy and Science (EES) BioNet Atlas of NSW Wildlife for species, populations and ecological communities listed under the BC Act.
- PlantNET (The Royal Botanic Gardens and Domain Trust).
- BirdLife Australia, the New Atlas of Australian Birds 1998-2020.

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Other sources of biodiversity information relevant to the assessment area were sourced from:

- The NSW Plant Community Types (PCTs), as held within the BioNet Vegetation Classification database (DPIE 2021a).
- Relevant vegetation mapping, such as the *State Vegetation Type Map: Central Tablelands Region Version 1.0. VIS\_ID 4778*.
- NSW BAM Calculator.
- Biodiversity Values map.
- Native vegetation regulatory map.
- BAM Important Areas maps.

Mapping was conducted using hand-held (uncorrected) GPS units (GDA94), mobile tablet computers running Collector for ArcGIS™ and aerial photo interpretation. The accuracy of this mapping is therefore subject to the accuracy of the GPS units (generally  $\pm 5$  metres) and dependent on the limitations of aerial photo rectification and registration.

Basemap data was obtained from NSW Land and property information (LPI) 1:25,000 digital topographic databases, with cadastral data, obtained from LPI digital cadastral database.

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

- Catchment Boundaries of New South Wales dataset.
- Mitchell Landscapes Version 3.1.
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7.
- Directory of Important Wetlands (DoIW).
- NSW Soil and Land Information System (SALIS).

Mapping has been produced using a Geographic Information System (GIS). The following maps and data have been provided:

- Digital mapping with aerial photography showing 1:1000 or finer.
- Site map as described in subsection 3.1.1 of the BAM.
- Location Map as described in subsection 3.1.2 of the BAM.
- Landscape map with features including 1,500 m buffer, as described in section 3.1.3 of the BAM.



## 1.5 Legislative requirements

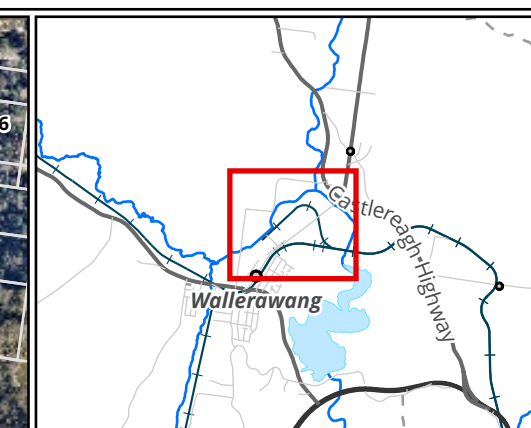
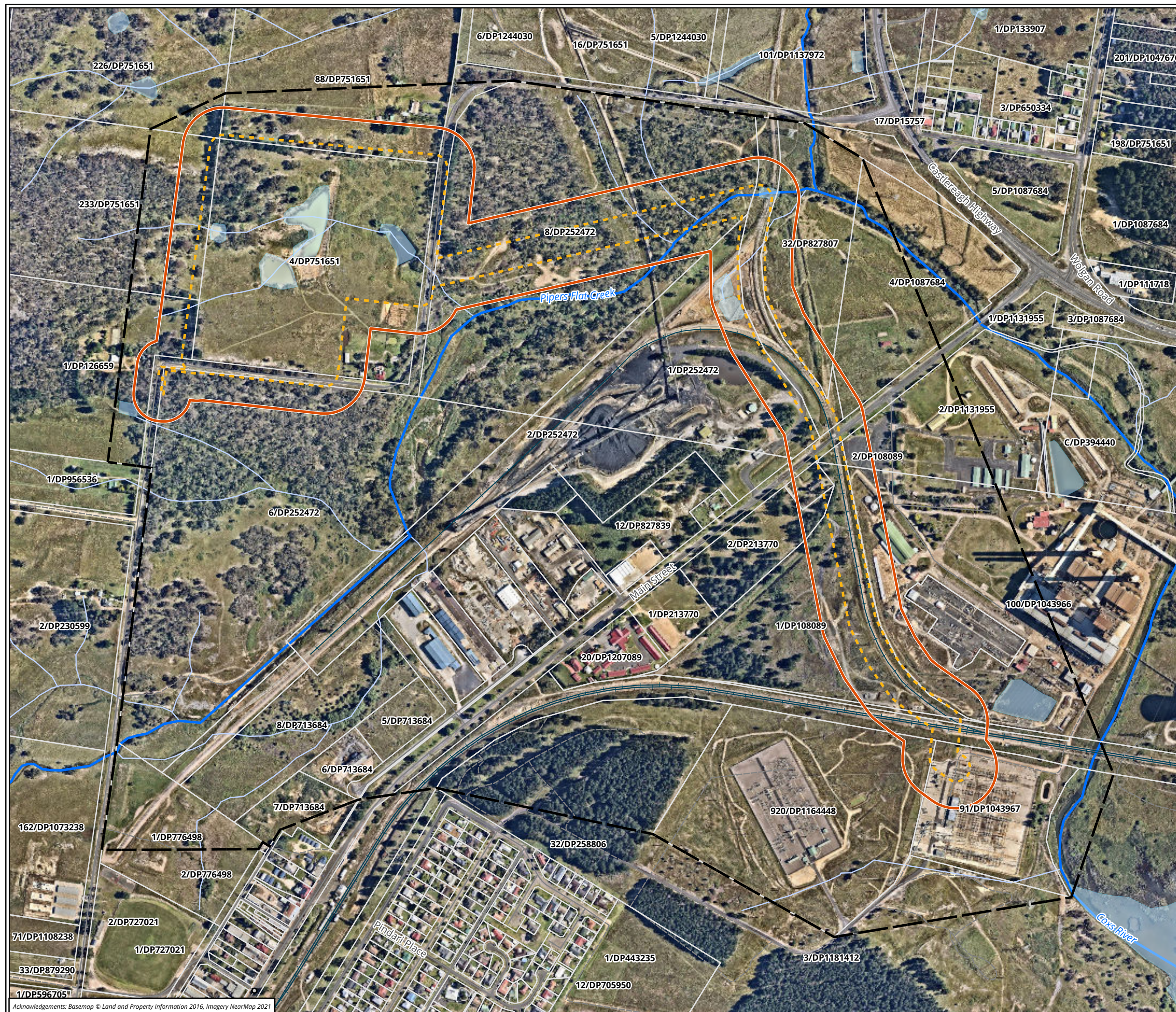
The Project has considered, or has been assessed against, relevant biodiversity legislation and government policy. This is provided in Table 1.

**Table 1 Legislation relevant to the project**

Legislation / Policy	Description	Relevance to the current assessment
<b>Commonwealth Acts</b>		
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	<p>Australian Government's key piece of environmental legislation. The EPBC Act applies to developments and associated activities that have the potential to significantly impact on MNES protected under the Act.</p> <p>Under the EPBC Act, the minister may agree to undertake a strategic assessment on the impacts of actions under a policy, plan or program.</p>	<p>Matters of National Environmental Significance (MNES) relevant to the Project include nationally threatened species and ecological communities and migratory species.</p> <p>Threatened species and ecological communities protected by the EPBC Act and present within the subject land are outlined in Sections 3, 4 and 10.</p>
<b>NSW Acts</b>		
<i>Environmental Planning and Assessment Act 1979</i>	Provides the overarching structure for planning in NSW and is supported by other statutory environmental planning instruments (EPIs).	Determines the approval pathway for the Project, and prescribes the consideration of relevant EPIs.
<i>Biodiversity Conservation Act 2016</i>	Key piece of legislation providing for the protection and conservation of biodiversity in NSW through the listing of threatened species and communities and key threatening processes.	Mandates the application of the NSW BOS and BAM.
<i>Biosecurity Act 2015</i>	Outlines biosecurity risks and impacts, and prescribes requirements for the management of risk to reduce the severity of impacts.	Biosecurity risks relevant to the current assessment include weeds, pest animals and pathogens that are known to occur, or potentially occur, within the subject land. Further details of biosecurity risks present assessment area are provided in Section 5.
<i>Fisheries Management Act 1994 (FM Act)</i>	Provides for the protection and conservation of aquatic species and their habitat throughout NSW.	The BAM focusses on impacts to terrestrial ecology and thus excludes items listed under the FM Act.
<b>NSW EPIs</b>		

Legislation / Policy	Description	Relevance to the current assessment
SEPP (Koala Habitat Protection) 2021.	This SEPP commenced on 17 March 2021 to replace and repeal the 2020 Koala SEPP. This 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 Lithgow LGA is listed under Schedule 1 as an area to which this SEPP applies.
Lithgow Local Environmental Plan 2014 (LEP).	This Plan aims to make local environmental planning provisions for land in Lithgow in accordance with the relevant standard environmental planning instrument under Section 3.20 of the Act.	The subject land is located within the Lithgow LGA. As such, the LEP applies.

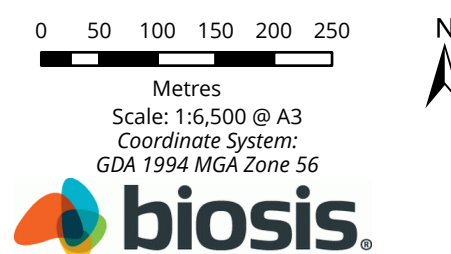




### Legend

- Subject land
- Development site
- Development footprint

Figure 1 Subject land



Matter: 34343, Date: 30 November 2021,  
GIS: AM, Checked by: PP, Last edited by: amackegard  
Location: P:\34300s\34343\Mapping\34343\_BDAR2020.aprx  
Layout: 34343\_F1\_Subject1 and



## 2 Landscape Context

This chapter describes the landscape and site context of the assessment area. In accordance with the BAM, a number of features are assessed within the subject land and within a 1,500 metre buffer around the subject land (Figure 2). These landscape features are used to identify biodiversity values that are important for the subject land and inform the habitat suitability of the subject land for threatened species. Other features, such as rivers, streams, estuaries and wetlands, habitat connectivity, karst areas or areas of outstanding biodiversity value are considered, where appropriate.

### 2.1 Landscape features

#### 2.1.1 IBRA bioregions and IBRA subregions

The subject land occurs within the Sydney Basin IBRA bioregion and the Capertee Uplands IBRA subregion. The Sydney Basin Bioregion lies on the central east coast of NSW and covers an area of approximately 3,624,008 hectares. It occupies approximately 4.53 % of NSW and is one of two bioregions contained wholly within the state. The bioregion extends from just north of Batemans Bay to Nelson Bay on the central coast, and almost as far west as Mudgee. The bioregion is bordered to the north by the Brigalow Belt South and North Coast bioregions, to the south by the South East Corner Bioregion and to the west by the South Eastern Highlands and South Western Slopes bioregions. The Sydney Basin Bioregion is one of the most species diverse in Australia. This is a result of the variety of rock types, topography and climates in the bioregion (DPIE 2016a).

#### 2.1.2 Rivers, streams, estuaries and wetlands

The subject land is located within the Central Tablelands LLS region and the Hawkesbury Catchment Management Area (CMA). The closest major waterbody is Lake Wallace located approximately 200 metres south-east of the development footprint. The closest major river is Coxs River which flows parallel to the proposed transmission line and flows into Lake Wallace, joining Pipers Flat Creek immediately to the east of the subject site.

Several watercourses dissect the subject land, including; Pipers Flat Creek, which is a 5<sup>th</sup> order (Strahler method) watercourse which flows west to east through the subject land and has been designated a 'Poor' freshwater fish community status grade (DPI 2021). Other mapped waterways include one unnamed 3<sup>rd</sup> order watercourse, one unnamed 2<sup>nd</sup> order watercourse and multiple unnamed 1<sup>st</sup> order watercourses.

Of most relevant to the Project are two unnamed 1<sup>st</sup> order drainage lines, both of which are ephemeral, flowing east to west across a predominantly cleared portion of the subject site and join within it to form a 2<sup>nd</sup> order drainage line, which is also ephemeral. These drainage lines have been modified through historical land use activities; namely, the construction of onsite farm dams and/or road/vehicle track construction. These drainage lines are ephemeral and while some minor degree of remaining channel form is discernible in limited sections, due to the level and extent of modification (vegetation clearing, dam construction, and historical land use) they no longer function as ephemeral waterways but simply as drainage lines as the lowest points in the landscape and do not sustain aquatic habitats and are typically lacking native riparian vegetation structures particularly in their downstream extents and surrounding the dams.

Pipers Flat Creek and the unnamed 3<sup>rd</sup> order tributary are mapped as Key Fish Habitats as part of broad scale mapping of the Hawkesbury Nepean Catchment published by the NSW Department of Primary Industries (DPI) within the subject land (DPI 2021).

No local wetlands were identified within the subject land or development footprint. Two reservoirs are situated within 300 metres of the subject land, both of which contain some native vegetation. The native vegetation observed in these freshwater systems is made up of a range of water dependent or tolerant grasses, sedges, herbs and rushes, with a moderate cover of weeds also present. These reservoirs are not included in the DoIW of Australia (DAWE 2004) and are not classified as Ramsar Wetlands.

Ramsar wetlands are representative, rare or unique wetlands, or are important for conserving biological diversity. They are included on the List of Wetlands of International Importance developed under the Ramsar convention. No Ramsar Wetlands or "Important Wetlands" are located within the local area. The closest "Important Wetland" is situated over 60 kilometres south-east of the subject land and the closest Ramsar Wetland is located approximately 120 kilometres south-east of the subject land.

### **2.1.3 Habitat connectivity**

The subject land does not form part of any recognised biodiversity corridors, flyways or significant habitat connectivity features.

The primary connectivity features of the subject land consist of a small patch of native vegetation in the north-west and a large patch of native vegetation located within the subject land (in the location of the proposed transmission line, between Brays Lane and the existing rail corridor) and Pipers Flat Creek, a 5<sup>th</sup> order watercourse that flows through the subject land. These connectivity features provide breeding, foraging and dispersal resources for terrestrial and arboreal mammals, flying mammals, and avifauna. Habitat fragmentation occurs across the subject land, however connectivity is preserved through bushland extending west towards Ben Bullen State Forest and riparian vegetation associated with Pipers Flat Creek. Across the broader landscape, the subject land exists on the fringes of a larger patch of native vegetation extending north-west of the subject land.

Aquatic habitat corridors for fish species across the subject land include Pipers Flat Creek and associated tributaries. Given the extent of modification to habitats along the first and second order waterways identified as being interrupted by the series of inline dams, most particular the barrier to fish passage presented by the dams, limit available connectivity along these specific drainage lines. The Vegetated Riparian Corridors (VRZ) identified within the subject land may also provide movement and dispersal areas for semi-terrestrial species, such as amphibians.

### **2.1.4 Geological features**

There were no recorded karst, caves, crevices, cliffs or other areas of geological significance within the subject land.

Ben Bullen State Forest, which is located within the 1,500 metre buffer area surrounding the subject land, may contain areas of geological significance given the mountainous terrain and catchment areas present.

### **2.1.5 Areas of outstanding biodiversity value**

Under the BC Act, the Minister for the Environment has the power to declare Areas of Outstanding Biodiversity Value (AOBVs). To date no AOBVs have been declared within the development footprint or subject land.

### **2.1.6 NSW (Mitchell) Landscape**

The subject land occurs within the Capertee Plateau Mitchell Landscape (Mitchell 2002). This 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. The general elevation is between 800 and 1000 metres and the local relief is approximately 100 to 120 metres.

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Common vegetation communities found in this landscape are woodlands typically consisting of Rough-barked Apple *Angophora floribunda*, Red Stringybark *Eucalyptus macrorhyncha*, Red Box *Eucalyptus polyanthemos*, Yellow Box *Eucalyptus melliodora*, Blakely's Red Gum *Eucalyptus blakelyi* in open valleys, Scribbly Gum *Eucalyptus sclerophylla*, Red Stringybark Red Box and Broad-leaved Ironbark *Eucalyptus fibrosa* on talus slopes, and Silvertop Ash *Eucalyptus sieberi* and Sydney Peppermint *Eucalyptus piperita* on sandstone peaks.

### **2.1.7 Hydrology**

The subject land is mapped on the Groundwater Dependent Ecosystems (GDE) Atlas as containing High and Moderate Potential Terrestrial GDEs (BOM 2021). Two plant communities, *Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion* and *Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion*, that are known to be GDEs are mapped within the subject land (further discussed in section 3 of this report).

One watercourse, Pipers Flat Creek, within the subject land is designated on the Biodiversity Values Map (DPIE 2021b) as "Protected Riparian Land".

### **2.1.8 Additional landscape features**

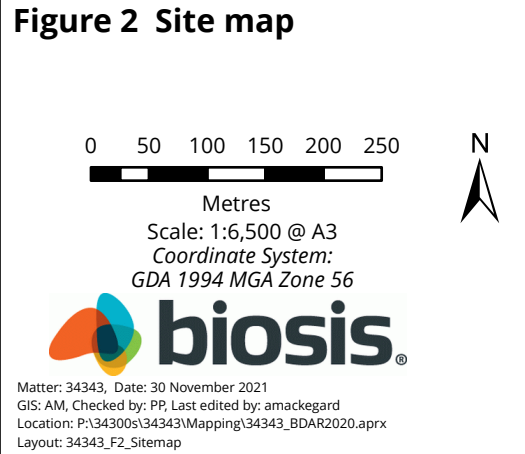
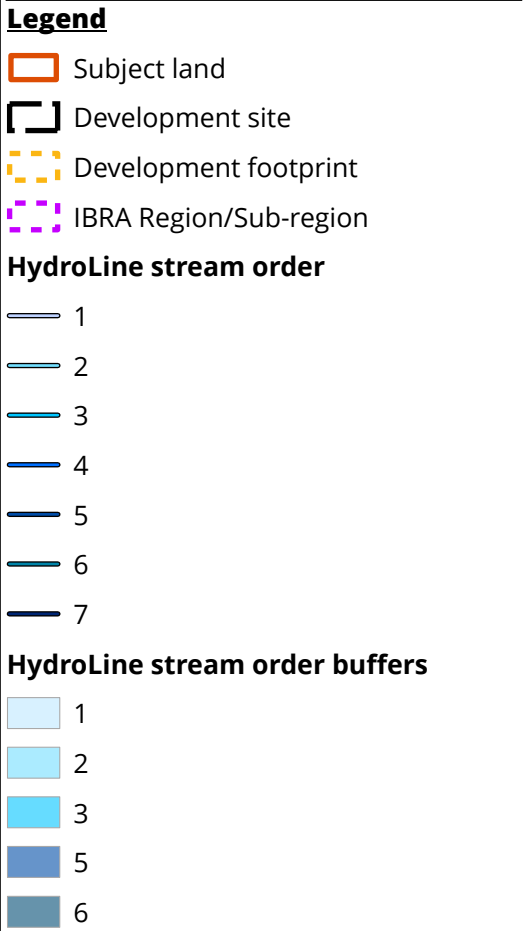
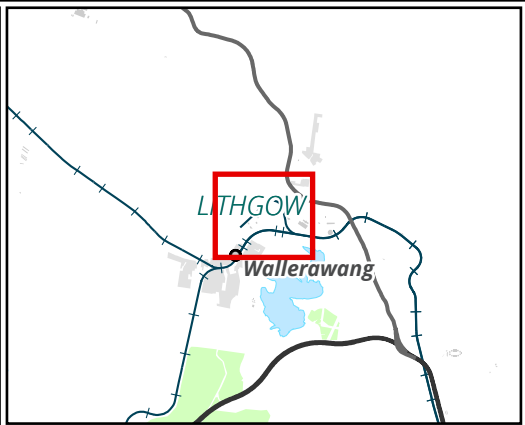
The subject land and 1,500 metre assessment area do not contain any soil hazard features or other additional features that are required to be assessed according to any Secretary's Environmental Assessment Requirements.

## **2.2 Native vegetation cover**

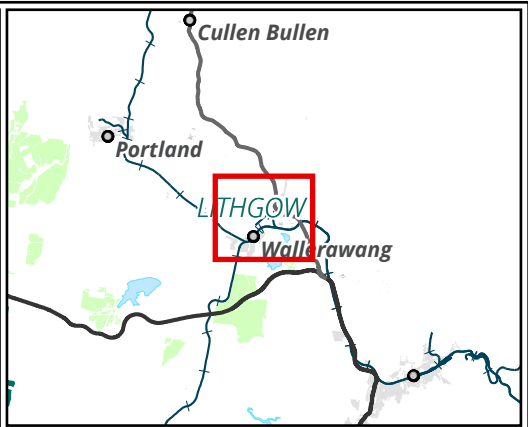
In accordance with section 3.2 of the BAM, native vegetation cover must be estimated for a 1,500 metre buffer around the subject land to determine the landscape context of the subject land. The extent of native vegetation on the subject land and immediate surrounds was mapped using State Vegetation Type Map: Central Tablelands Region Version 1.0. VIS\_ID 4778 (DPIE 2018), with edits made to the layer to improve line-work and where obvious changes to vegetation extent had occurred.

The total mapped area of the 1,500 metre buffer area around the subject land is 1,503 hectares, with the area of native vegetation mapped within the buffer being 396 hectares. This is a native vegetation cover of approximately 26% (>10 –30 % class as defined in Section 3.2.3 of the BAM) and this value was entered into the BAM Calculator.









**Legend**

- Subject land
- Development site
- Development footprint
- Assessment area
- IBRA Region/Sub-region
- Cliff top

**HydroLine stream order**

- 1
- 2
- 3
- 4
- 5
- 6

**Strahler stream order buffers**

- 1
- 2
- 3
- 4
- 5
- 6

**Mitchell landscapes**

- Bgr, Bathurst Granites
- Cpt, Capertee Plateau
- Npp, Newnes Plateau

**Figure 3 Location map**

0 120 240 360 480 600

Metres

Scale: 1:16,000 @ A3

Coordinate System:

GDA 1994 MGA Zone 56



Matter: 34343, Date: 30 November 2021  
GIS: AM, Checked by: PP, Last edited by: amackegard  
Location: P:\34300s\34343\Mapping\34343\_BDAR2020.aprx  
Layout: 34343\_F3\_Location



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## 3 Native vegetation

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The proposed development is located within a mosaic of agricultural and environmental lands. The environmental lands are situated along watercourses, reserves or roads and contain native woodland vegetation and terrestrial and aquatic fauna habitat features. However, the predominantly linear nature of these reserves means that they are subject to edge effects and are symptomatic of past disturbances that have occurred more broadly in the landscape associated with land clearing, irrigation development, cropping, livestock grazing and weed invasion.

The subject land supports 39.52 hectares of native vegetation with varying levels of disturbance. As such, the Project's development footprint can be defined as three distinctly different board vegetation types, medium, low and disturbed. The medium quality native vegetation, which was also deemed the highest quality, was limited to isolated patches located with the North West corner of the Lot where the BESS facility is proposed and a small section of the proposed transmission easement (Figure 5). This vegetation type contained large trees, an understorey with most of the structural components still intact and a number of species that characterise the PCT. The lowest quality and disturbed patches either support remnant canopy tree cover but generally have few large trees and have a modified understorey invaded by introduced pasture grasses and weeds or consists of exotic grasslands where the native canopy has been removed, such as the recorded railway corridor located in the eastern portion of the transmission line easement.

### 3.1 Native vegetation extent

The extent of native vegetation, TECs and vegetation integrity within the subject land was determined using the results of site investigations and Section 4 of the BAM (DPIE 2020a).

Figure 4 shows the native vegetation extent recorded within the subject land, development footprint and 1,500 metre assessment area, as assessed during field investigations undertaken in March and June 2021. The figure includes all areas of native vegetation (native ground cover and areas with canopy).

#### 3.1.1 Changes to mapped native vegetation extent

There were some differences between the actual native vegetation extent and that visible on aerial imagery. Portions of the development footprint had previously been mapped as cleared land by DPIE (DPIE 2018) that in actuality included patches of native vegetation. This was particularly relevant for vegetation identified within the North-Western portion of the proposed location of the BESS facility.

#### 3.1.2 Areas that are not native vegetation

Parts of the subject land mapped as Urban Native / Exotics with no native over storey or mid storey cover met the definition of non-native vegetation. Areas not shown as native vegetation cover within the subject land, and which do not provide habitat for threatened species, are not included for further assessment in accordance with Section 5.1.1.5 of the BAM (DPIE 2020a). Non-native vegetation which does provide habitat for threatened species is required to be assessed.

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## 3.2 Plant community types and ecological communities

### 3.2.1 Review of existing information

Existing information regarding native vegetation was reviewed to inform field investigations including:

- Existing vegetation mapping, including: State Vegetation Type Map: Central Tablelands Region Version 1.0. VIS\_ID 4778 (DPIE 2018).
- Database searches.

Based on the results of the background review and the requirements of the BAM with respect to this BDAR, appropriate surveys were designed for the subject land and development footprint.

### 3.2.2 Field investigation

A systematic biodiversity assessment was conducted 17-18 March 2021, 16 June 2021 and 12 November 2021 by Paul Price (Senior Restoration Ecologist, Accredited Assessor #BAAS18089), under the terms of Biosis' Scientific Licence issued by the Environment Energy and Science (EES) under the *National Parks and Wildlife Act 1974* (SL100758, expiry date 31 March 2022). Fauna survey was conducted 17-18 March 2021 by Anthony Cable (Senior Ecologist and Technical Lead) and 10, 15 and 16 November 2021 by Sarah Allison (Project Zoologist) and Zoe Goold (Project Zoologist) under approval 11/355 from the NSW Animal Care and Ethics Committee (expiry date 31 January 2022).

The BAM assessment was carried out by Paul Price and overseen by Accredited Assessor Rebecca Dwyer (#BAAS17067).

The development site was surveyed in accordance with the BAM (DPIE 2020a), which involved:

- The identification and mapping of Plant Community Types (PCTs) according to the structural definitions held in the BioNet Vegetation Classification database, with reference to information provided in State Vegetation Type Map: Central Tablelands Region Version 1.0. VIS\_ID 4778 (DPIE 2018).
- Undertaking floristic plots within each vegetation zone in accordance with Section 4 of the BAM (DPIE 2020a), considering varying condition states and avoidance of ecotones, areas of disturbance, and edges.
- The identification of native and exotic plant species, according to the Flora of NSW (Harden 1992, 1993, 2000, 2002) with reference to recent taxonomic changes.
- Targeted searches for plant species of conservation significance according to the *Surveying threatened plants and their habitats* (DPIE 2016b).
- Incidental observations using the “random meander” method (Cropper 1993).
- Identification of previous and current factors threatening the ecological function and survival of native vegetation within and adjacent to the development site.
- An assessment of the natural resilience of the vegetation of the Site.
- Identifying and mapping fauna habitats (e.g. hollow-bearing trees, rock outcropping etc.), assessing their condition and value to threatened fauna species, and considering threatened species' habitat constraints.
- Observations of animal activity and searches for indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, scratches and diggings).

- Targeted surveys for threatened fauna species.

The conservation significance of plant species and plant communities was determined according to:

- BC Act for significance within NSW.
- EPBC Act for significance within Australia.

Detailed field mapping and collection of GPS point locations were conducted using hand-held (uncorrected) tablet units (Samsung Galaxy Tab X) running the ArcGIS Collector and Field Maps applications, using the inbuilt GPS, and aerial photo interpretation. Spatial locations are therefore considered to have an accuracy of generally  $\pm 5$  metres.

Areas of native vegetation for which a PCT could validly be assigned were identified and delineated in the field, and their condition determined and assigned. Identification of PCTs within the subject land was confirmed with reference to the community profile descriptors (and diagnostic species tests) held within the State Vegetation Type Map: Central Tablelands Region Version 1.0. VIS\_ID 4778 (DPIE 2018) and NSW BioNet Vegetation Classification database (DPIE 2021a). Locations of floristic plots surveyed are shown on Figure 6.

Further details of targeted survey for threatened flora and fauna species are provided in Section 4.2 below.

### 3.2.3 Plant community types

The following PCTs were assessed as present within the subject land:

- PCT 677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion (Table 2).
- PCT 732 - Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion (Table 3).

Table 2 to Table 3 provide detailed descriptions of the two PCTs recorded within the subject land. PCTs recorded within the subject land are shown on Figure 5 and Figure 6.

**Table 2 PCT 677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion**

677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion	
<b>Common name</b>	<i>Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion</i>
<b>Vegetation formation</b>	Grassy Woodlands
<b>Vegetation class</b>	Subalpine Woodlands
<b>Extent within subject land</b>	6.41 ha
<b>Condition</b>	This community at the subject land was recorded in two conditional states of moderate and low.
<b>Description</b>	Low condition PCT 677 (approx. 4.85 ha within the subject land) was primarily recorded at the bushland/urban native exotic interface (Figure 5). As a result, the recorded low conditional state lacked both structural and floristic diversity primarily within the mid and ground layer strata. The upper stratum consisted of a dominant canopy of Black Gum <i>Eucalyptus aggregata</i> supported by a reduced native mid storey stratum of scattered Silver Wattle <i>Acacia dealbata</i> . Other recorded flora species within an observed

**677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion**

	<p>lower mid storey stratum were primarily exotic, with species such as Hawthorn <i>Crataegus monogyna</i>, Sweet Briar <i>Rosa rubiginosa</i> and Blackberry <i>Rubus anglocandicans</i> being most common. The reduced native ground layer stratum was confirmed to contain a number of native grasses and forb's with species such as Tussock Grass <i>Poa labillardierei</i> var. <i>labillardierei</i>, Bidgee-widgee <i>Acaena novae-zelandiae</i>, Common Woodruff <i>Asperula conferta</i> and Weeping Grass <i>Microlaena stipoides</i> var. <i>stipoides</i>. As a result of the disturbed nature of the conditional state, exotic species dominated the stratum with species such as Phalaris <i>Phalaris aquatica</i>, Cocksfoot Grass <i>Dactylis glomerata</i> and Paspalum <i>Paspalum dilatatum</i> being recorded.</p> <p>Moderate condition PCT 677 (approx. 1.55 ha within the subject land) was recorded at the eastern portion of the proposed transmission alignment (Figure 5). The upper stratum consisted of a dominant canopy of Black Gum with occasional representations of Black Sally <i>Eucalyptus stellulata</i>. A native mid storey stratum was not present within the conditional state. The mid storey stratum consisted primarily of Hawthorn, Small-leaved Privet <i>Ligustrum sinense</i> and Blackberry.. The ground layer stratum was well represented by mixed dominance of both native and exotic flora. Native species recorded with the stratum included Common Everlasting <i>Chrysocephalum apiculatum</i>, Longhair Plumegrass <i>Dichelachne crinita</i>, Wattle Matt-rush <i>Lomandra filiformis</i> subsp. <i>coriacea</i>, Tussock Grass, Wild Sorghum <i>Sorghum leiocladum</i>, Kangaroo Grass <i>Themeda triandra</i> and Weeping Grass. Exotic flora species recorded within the stratum were primarily limited to soft wood perennials and grasses with recorded species such as Branched Centaury <i>Centaureum tenuiflorum</i>, Flaxleaf Fleabane <i>Cirsium vulgare</i>, Serrated Tussock <i>Nassella trichotoma</i> and Phalaris.</p>
<b>Survey effort</b>	<p>PCT 677 Low : One BAM plot/transect</p> <p>PCT 677 Moderate : One plot/transect (Figure 6)</p>
<b>Justification of PCT</b>	<p>The subject land is within the South Eastern Highlands IBRA bioregion.</p> <p>The community occurs as an open woodland with a densely grassy groundlayer and a sparse to absent shub layer.</p> <p>The landscape position predominantly occurs on drainage lines and associated flats.</p> <p>Dominance of Black Gum, White Sally and/or Black Sally trees.</p> <p>The BioNet PCT Identification tool identified PCT 677 from the species recorded at the subject land.</p>
<b>Justification of condition</b>	<p>Low conditioned PCT 677 tree species richness (2) and percentage tree cover (10.1 %) was recorded to be distinctly below the PCT benchmark of 4 and 26% respectively. Furthermore, floristic surveys failed to document a shrub species richness or percentage cover, thus failing to meet that of the PCT benchmark requirements of 8 species and 9% cover. Similar results were also recorded within the other characteristic growth forms, by where the Grass and Grass-like growth form (7 species, 18.1% cover) failed to meet that of the PCT benchmarks of 8 species and 46% cover and the forb growth form (7 species, 0.7% cover) failed to meet the PCT benchmarks of 18 species and 11% cover. The growth forms of 'Fern' and "Other" were not recorded within the floristic plot. Four high threat weeds (HTW) (Hawthorn, St. Johns Wort <i>Hypericum perforatum</i>, Paspalum and Sweet Briar) were also recorded within the conditional state equating to a cover of 9.3%.</p>



**677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion**

As a result of the reduced species diversity, low native cover abundance and abundance of high threat weed species, the conditional state of 'low' is justified.

The moderate condition PCT 677 tree species richness (2) and percentage tree cover (5.1 %) was recorded to be distinctly below the PCT benchmark of 4 and 26% respectively. Again, floristic surveys failed to document a shrub species richness or percentage cover, thus failing to meet that of the PCT benchmark requirements of 8 species and 9% cover. The bulk of the floristic diversity of the conditional state was recorded within the Grass and Grass-like growth form by where 14 species with a cover of 29.1% were recorded. Whilst exceeding that of the species richness benchmark of 8, the conditional state failed to meet the required benchmark percentage cover of 46%. Whereas forb growth forms (10 species, 0.9% cover) failed to meet the PCT benchmarks of 18 species and 11% cover. In similarity to that of the low conditional state, the growth forms of 'Fern' and "other" were not recorded within the floristic plot. Four HTW (Hawthorn, St. Johns Wort, Paspalum and Sweet Briar) were also recorded within the conditional state equating to a percentage cover of 1.2 %.

As a result of the recorded species diversity/ cover abundance within the canopy and ground layer stratum and the reduced cover of HTW, the conditional state of 'moderate' is justified.

**TEC Status**

Not listed under State or Commonwealth legislation.

**Estimate of percent cleared value of PCT (BioNet)**

95% (DPIE 2021a).

**PCT 677 -Low condition**



**677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion**

**PCT 677 –Moderate condition**



**Table 3 PCT 732 - Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion**

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

<b>Common name</b>	Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion
<b>Vegetation formation</b>	Grassy Woodlands
<b>Vegetation class</b>	Southern Tableland Grassy Woodland
<b>Extent within subject land</b>	21.28 ha
<b>Condition</b>	This community at the subject land was recorded in three conditional states of non-offsetable grasslands (NOG), scattered trees and moderate.
<b>Description</b>	The PCT 732 NOG (approx. 12.96 ha) was primarily recorded within proposed battery storage area, located in the western portions of the development footprint (Figure 5). As a result of the historical clearing and pasture improvement, the recorded NOG conditional state lacked both native structural and floristic diversity within all strata. A distinguishable canopy layer was not recorded within the vegetation conditional state. Additionally, a native shrub layer was limited to occasional specimens of Sifton Bush <i>Cassinia sifton</i> only. The ground layer stratum was recorded to contain a reduced representation of native grass and forbs species dominated by a composite of exotic pasture species. Native flora species included in the stratum included Common Couch <i>Cynodon dactylon</i> , <i>Deyeuxia quadriseta</i> , Paddock Lovegrass <i>Eragrostis leptostachya</i> , Hairy Panic <i>Panicum effusum</i> and Variable Raspwort <i>Haloragis heterophylla</i> . Exotic flora recorded within the stratum included Browntop Bent, Sweet Vernal Grass <i>Anthoxanthum odoratum</i> , <i>Panicum gilvum</i> , Lamb's Tongues <i>Plantago lanceolata</i> , Catsear <i>Hypochaeris</i>



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

	<p><i>radicata</i> and Rat's Tail Fescue <i>Vulpia myuros</i>.</p> <p>The PCT 732 scattered trees (approx. 0.33 ha) was primarily recorded in the north east corner of subject area (Figure 5). As a result of the historical clearing and pasture improvement, the recorded scattered trees conditional state lacked both native structural and floristic diversity within all strata. As such, distinguishable native mid and ground layer stratum were not recorded within the vegetation conditional state. The ground layer stratum was recorded to contain a reduced representation of native grass and forbs species dominated mixture of exotic pasture species. Native flora species included in the stratum included Common Couch and Variable Raspwort. Exotic flora recorded within the stratum included <i>Paspalum dilatatum</i>, Sweet Vernal Grass, Lamb's Tongues and Rat's Tail Fescue.</p> <p>Moderate condition PCT 732 (approx. 7.98 ha) was recorded within two locations within the development footprint area (Figure 5). The upper stratum consisted of a mixed canopy of Broad-leaved Peppermint <i>Eucalyptus dives</i>, Brittle Gum <i>Eucalyptus mannifera</i> subsp. <i>mannifera</i> and White Sally <i>Eucalyptus pauciflora</i>. As a result of the historical clearing and under scrubbing, the native mid storey stratum was characterised by a low open shrub layer represented by grouped stands of Native Blackthorn <i>Bursaria spinosa</i> subsp. <i>lasiophylla</i>, Dolly Bush <i>Cassinia aculeata</i>, Prickly Teatree <i>Leptospermum continentale</i> and Sifton Bush. The ground layer stratum was observed to contain a number of low shrubs, grasses and forb species. Native flora recorded within the vegetation type included <i>Bossiaea buxifolia</i>, Button Everlasting <i>Coronidium scorpioides</i>, Wattle Matt-rush, Weeping Grass, Ringed Wallaby Grass <i>Rytidosperma caespitosum</i> and Sticky Everlasting <i>Xerochrysum viscosum</i>. Exotic flora species recorded within the conditional state included the HTW's of Browntop Bent <i>Agrostis capillaris</i>, St. Johns Wort, Sweet Briar and Blackberry.</p>
<b>Survey effort</b>	<p>PCT 732 NOG : three BAM plot/transect</p> <p>PCT 732 scattered trees : One plot/transect</p> <p>PCT 732 Moderate : One plot/transect (Figure 6)</p>
<b>Justification of PCT</b>	<p>The subject land is within the South Eastern Highlands IBRA bioregion.</p> <p>The community occurs as an open forest with a sparse shrub layer and grassy groundcover.</p> <p>The landscape position predominantly occurs on undulating granite tablelands of the upper Cocks and Abercrombie River valleys.</p> <p>Dominance of Broad-leaved Peppermint trees.</p> <p>The subject land occurs between 600 m and 1100 m elevation.</p> <p>The BioNet PCT Identification tool identified PCT 732 from the species recorded at the subject land.</p>
<b>Justification of condition</b>	<p>PCT 732 NOG did not record a canopy or sub canopy with the conditional state across the three replicate plots, thus failing the required tree species richness and percentage tree cover PCT benchmark of 4 and 25% respectively. The recorded shrub species richness (1) and percentage cover (0.4%) across the three replicates also failed to meet that of the PCT benchmark requirements of 7 species and 5% cover. Similar results were also recorded within the other characteristic growth forms, by where the Grass and</p>

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

Grasslike growth form across the three replicate (3 species, 23.6% cover) failed to that the PCT benchmarks of 9 species and 37% cover.

The forb growth form across the three replicates provided a mean species richness of 1 and a percentage cover of 0.1%. As such, the conditional state failed to that the forb growth form PCT benchmarks of 16 species and 9% cover. The growth forms of 'Fern' and "other" were not recorded within the three floristic plots. Four HTW's (Sheep Sorrel *Acetosella vulgaris*, Browntop Bent, St. Johns Wort and Paspalum) were also recorded within the conditional state equating to a mean cover of 15.3% across the three replicates. As a result of the reduced species diversity, low native cover abundance and abundance of high threat weed species and a calculated vegetation integrity (VI) score of 0.2 (Table 6) the conditional state of 'NOG' is justified.

PCT 732 scattered trees conditional state tree species richness (1) and percentage tree cover (5%) was recorded to be below that of the PCT benchmark of 4 and 25% respectively. A native mid story stratum was not observed within the vegetation conditional state. The 'grass and grass like' growth form recorded a species richness (2) and percentage tree cover (1.1 %), thus failing to meet that of the PCT benchmarks of 9 species and a percentage cover 37%. Similar results were recoded within the 'forb' growth form, where the species richness of 2 and percentage cover of 0.2% failed to meet the PCT growth form benchmarks of 16 species and 9% cover. Again, due to the disturbed nature of the conditional type, the growth forms of 'fern' and 'other' were not recorded thus failing that of their associated PCT benchmarks. Four HTW's (Sheep Sorrel, St. Johns Wort, Blackberry *Rubus anglocandicans* and Paspalum) were also recorded within the conditional state with a percentage cover of 35.3%. As a result of the recorded species diversity/ cover abundance within all recorded strata the conditional state of 'scattered trees' is justified.

The moderate condition PCT 732 tree species richness (3) and percentage tree cover (20.5 %) was recorded to be below that of the PCT benchmark of 4 and 25% respectively. Similar results were also documented in association with the shrub growth form for the conditional state, by where a recorded species richness of 5 and percentage cover of 5.5% failed to meet the PCT benchmark condition of 7 species, yet exceeded that of the PCT benchmark percentage cover requirements by 0.5%.

The bulk of the floristic diversity of the conditional state was recorded within the Grass and Grasslike growth form by where 10 species with a cover of 74.1% were recorded. These results exceeded that of the species richness benchmark of 9 and percentage cover of 37%. The forb growth form species richness of 12 and percentage cover of 1.6% was recorded to be below that of the PCT benchmark of 16 and 9% respectively. The growth forms of 'Fern' and "other" were not recorded within the floristic plot. Six HTW (Sheep Sorrel, Browntop Bent, St. Johns Wort Paspalum, Sweet Briar and Blackberry) were also recorded within the conditional state equating to a cover of 4.7%.

As a result of the recorded species diversity/ cover abundance within all recorded strata and the reduced cover of HTW, the conditional state of 'moderate' is justified.

**TEC Status**

Not listed under State or Commonwealth legislation

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

**Estimate of percent cleared value of PCT (BioNet)** 65 % (DPIE 2021a).

**PCT 732 NOG condition**



**PCT 732 - Scattered trees condition**





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

**PCT 732 –Moderate condition**



### **3.2.4 Threatened ecological communities**

Vegetation identified within the subject land was not found to form part of any TEC under the BC Act or EPBC Act.

## **3.3 Vegetation integrity assessment**

### **3.3.1 Vegetation zones and patch size class**

PCTs within the subject land were assessed and stratified, based on broad condition state, into vegetation zones in accordance with Section 4.3 of the BAM. This resulted in four vegetation zones identified within the development footprint. Table 4 describes each of the zones, and provides details on the numbers of BAM floristic plots undertaken in each zone.

Patch size classes for each vegetation zone present within the subject land were assessed as per Section 4.3.2 of the BAM (DPIE 2020a) using a select process in ArcGIS. All native vegetation with a gap of less than 100 metres from the next area of native vegetation (or  $\leq 30$  metres for non-woody ecosystems), is considered a single patch, with a patch able to extend onto adjoining land.

The minimum patch size that was entered into the BAM-C was 101 hectares. Patch size classes for each vegetation zone are also outlined in Table 4 below.

**Table 4 Vegetation zones within the subject land**

Vegetation zone	Plant Community Type	Condition	BAM plots completed	Impact assessment area	Max. patch size development footprint
<b>677_Low</b>	677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion	Low	1	1.61 ha	>100 ha
<b>677_Moderate</b>	677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion	Moderate	1	0.81 ha	>100 ha
<b>732_Moderate</b>	732 - Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion	Moderate	1	3.44 ha	>100 ha
<b>732_Scattered Trees</b>	732 - Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion	Scattered trees	1	0.24 ha	>100 ha
<b>732_NOG</b>	732 - Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion	NOG	3	10.7 ha	>100 ha

### 3.3.2 Vegetation integrity

Vegetation integrity, or condition, was assessed using data obtained from undertaking BAM plots within the vegetation zones, as per Section 4.3.4 of the BAM (DPIE 2020a). Plot data was collected via:

- A 20 m x 50 m quadrat and 50 m transect for assessment of site attributes and function.
- A 20 m x 20 m quadrat, nested within the larger quadrat for full floristic survey to determine composition and structure of the PCT.

The minimum number of BAM plots per vegetation zone was determined using Table 3 of the BAM (DPIE 2020a). A total of seven BAM plots have been completed within the vegetation zones present within the development footprint, details are provided in Table 5 and shown on Figure 6.

**Table 5 BAM plots completed within the subject land**

BAM plot reference	Vegetation zone	BAM plot reference	Vegetation zone
<b>34343_Plot 1</b>	677_Moderate	<b>34343_Plot 5</b>	732_NOG
<b>34343_Plot 2</b>	677_Low	<b>34343_Plot 6</b>	732_NOG
<b>34343_Plot 3</b>	732_Moderate	<b>34343_Plot 7</b>	732_NOG
<b>34343_Plot 4</b>	732_NOG		

Assessment of vegetation integrity was undertaken using standard benchmark data as outlined in the BAM and held in the BioNet Vegetation Classification database. A list of flora species was compiled for each BAM plot completed and is included in Appendix 3. Records of all flora species will be submitted to EES for incorporation into the Atlas of NSW Wildlife.

### 3.3.3 Vegetation integrity score

Plot data was entered into the BAM calculator to determine vegetation integrity score. Plot data are presented in Appendix 3, with vegetation integrity scores for each vegetation zones provided in Table 6.

**Table 6 Vegetation zone integrity scores**

Vegetation zone	Composition score	Structure score	Function score	Vegetation integrity score*	IBRA subregion
<b>677_Low</b>	40.5	30.2	84.6	46.9	Capertee Uplands
<b>677_Moderate</b>	54.2	42.0	61.6	51.9	Capertee Uplands
<b>732_Moderate</b>	87.6	87.0	76.5	83.6	Capertee Uplands
<b>732_NOG</b>	10.2	36.5	0	0.2	Capertee Uplands

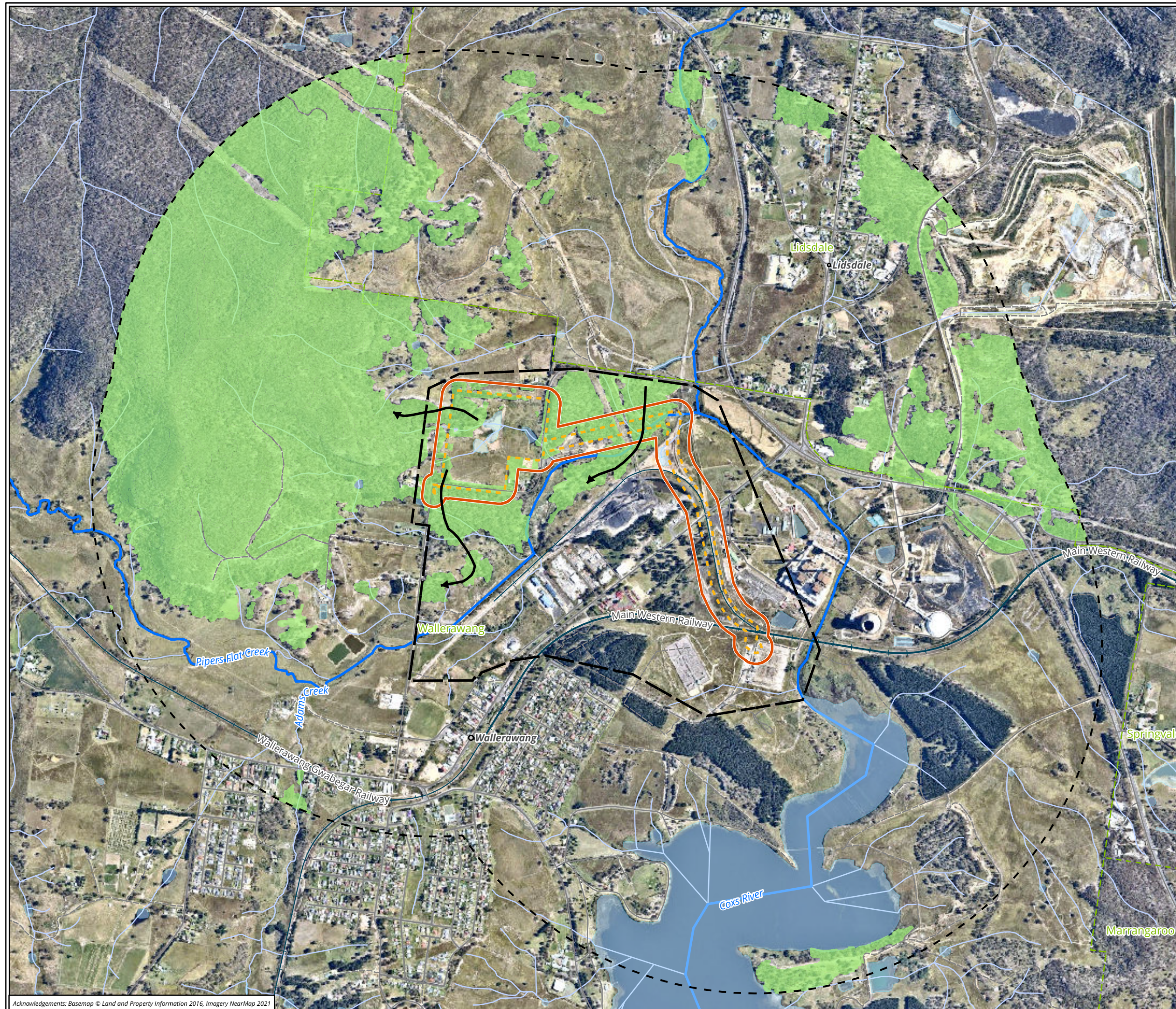
\*Benchmark (pristine) condition vegetation would receive a VI score of 100.

As outlined in Section 9.2.1 of the BAM, an offset is required for impacts on native vegetation where the vegetation integrity score is:

- $\geq 15$  where the PCT is representative of an endangered or critically endangered ecological community.
- $\geq 17$  where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community.
- $\geq 20$  where the PCT is not representative of a TEC or associated with threatened species habitat.

As such, ecosystem credit offsets are not required for the vegetation zone 732\_NOG due to the VI score of 0.2.





#### Legend

- Subject land
- Development site
- Development footprint
- Assessment area
- Habitat connectivity
- Native vegetation

**Figure 4 Native vegetation extent**

0 120 240 360 480 600

Metres

Scale: 1:16,000 @ A3

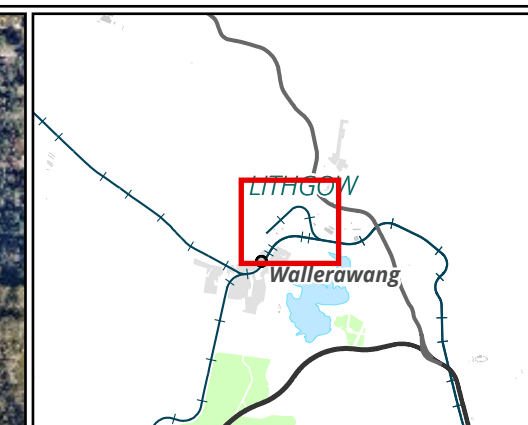
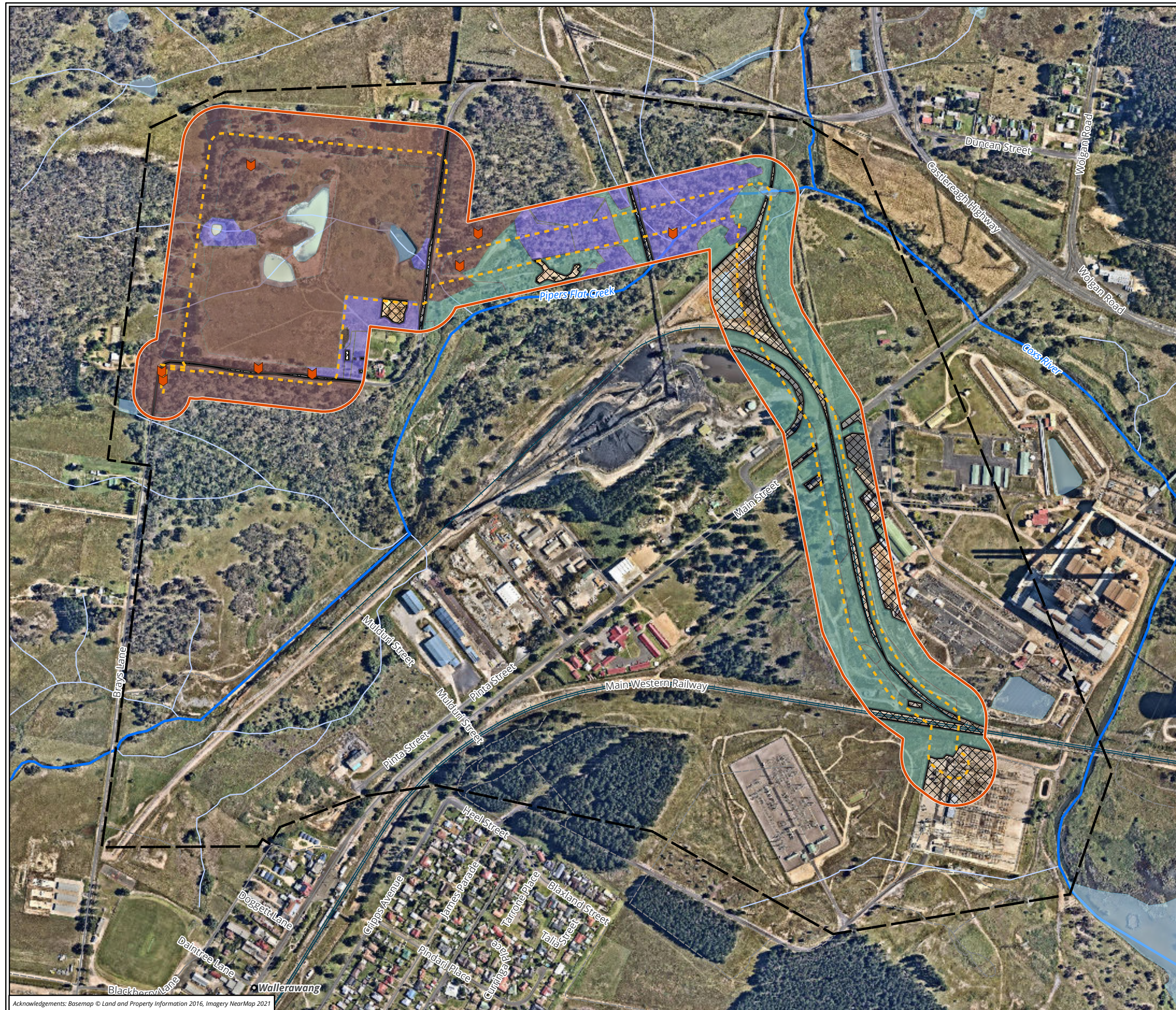
Coordinate System:

GDA 1994 MGA Zone 56



Matter: 34343, Date: 30 November 2021 GIS: AM, Checked by: PP, Last edited by: amackegard Location: P:\34300s\34343\Mapping\34343\_BDAR2020.aprx Layout: 34343\_F4\_NativeVeg





#### Legend

- Subject land
- Development site
- Development footprint
- Hollow-bearing tree
- Cleared

#### Plant Community Type

- Urban Native/Exotic
- 677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion
- 732 - Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion

**Figure 5 Vegetation within the subject land**

0 50 100 150 200 250

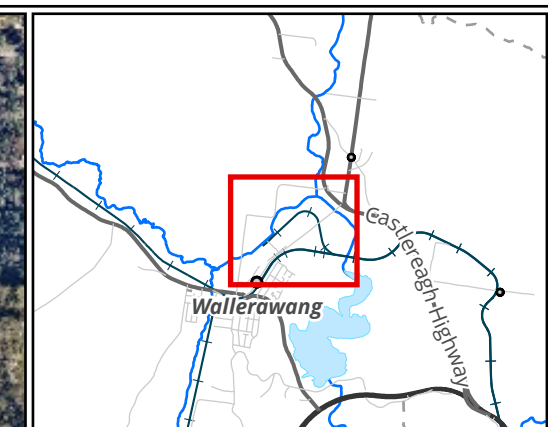
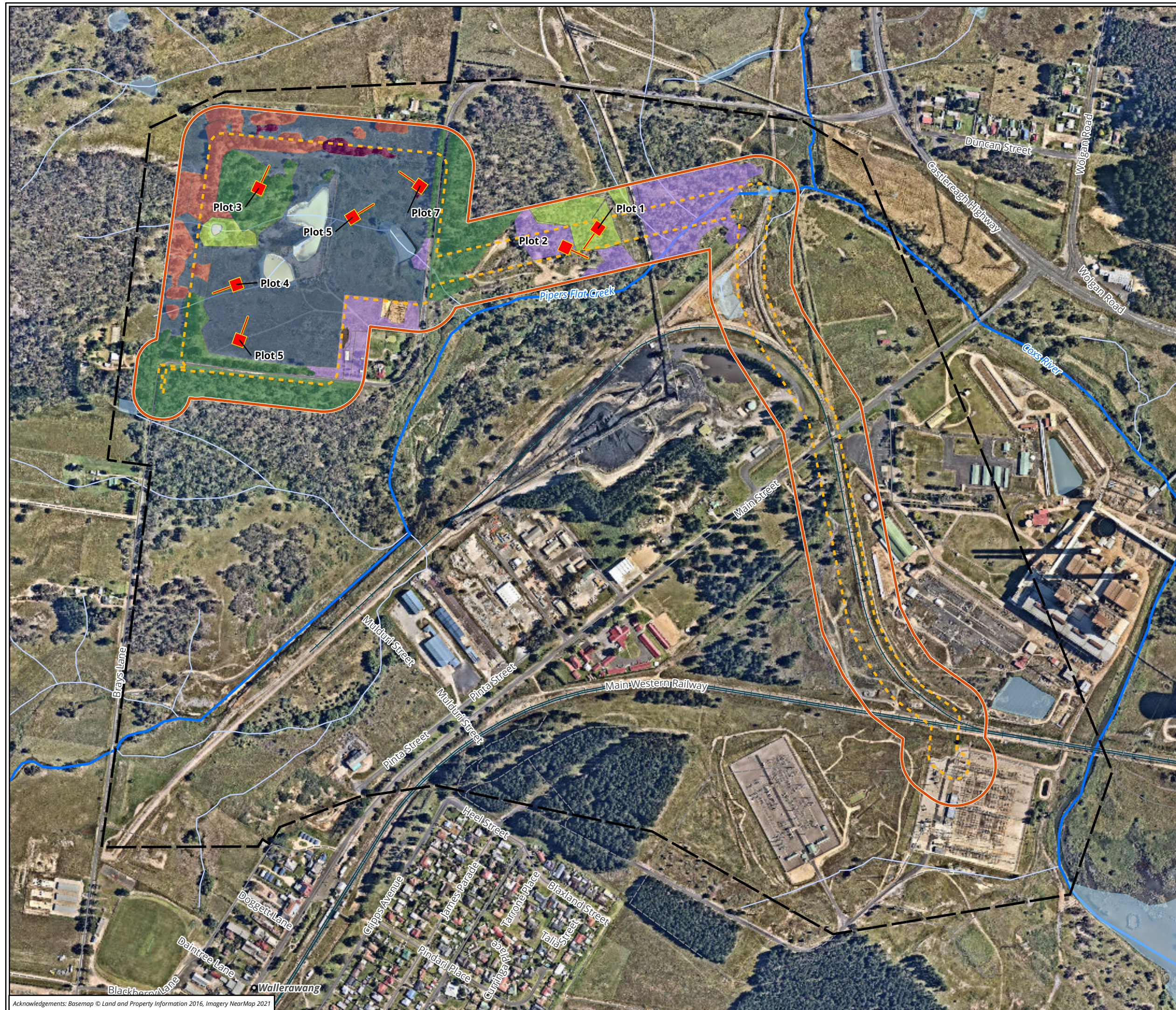
Metres

Scale: 1:6,500 @ A3  
Coordinate System:  
GDA 1994 MGA Zone 56



Matter: 34343, Date: 30 November 2021  
GIS: AM, Checked by: PP, Last edited by: amackegard  
Location: P:\34300s\34343\Mapping\34343\_BDAR2020.aprx  
Layout: 34343\_FS\_BiosisVeg





- Legend**
- Subject land
  - Development site
  - Development footprint
  - BAM plot
- Vegetation Zones**
- 677-Low
  - 677-Moderate
  - 732-Low
  - 732-Moderate
  - 732-NOG
  - 732-Scattered Trees

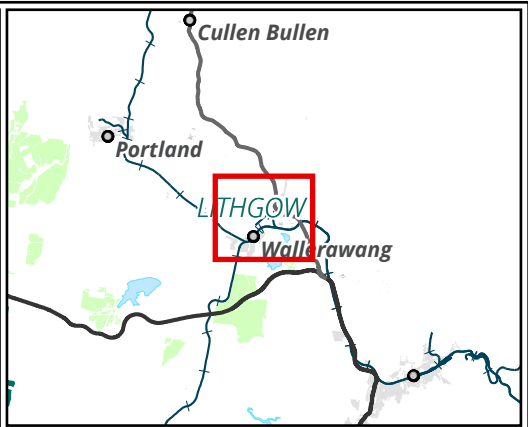
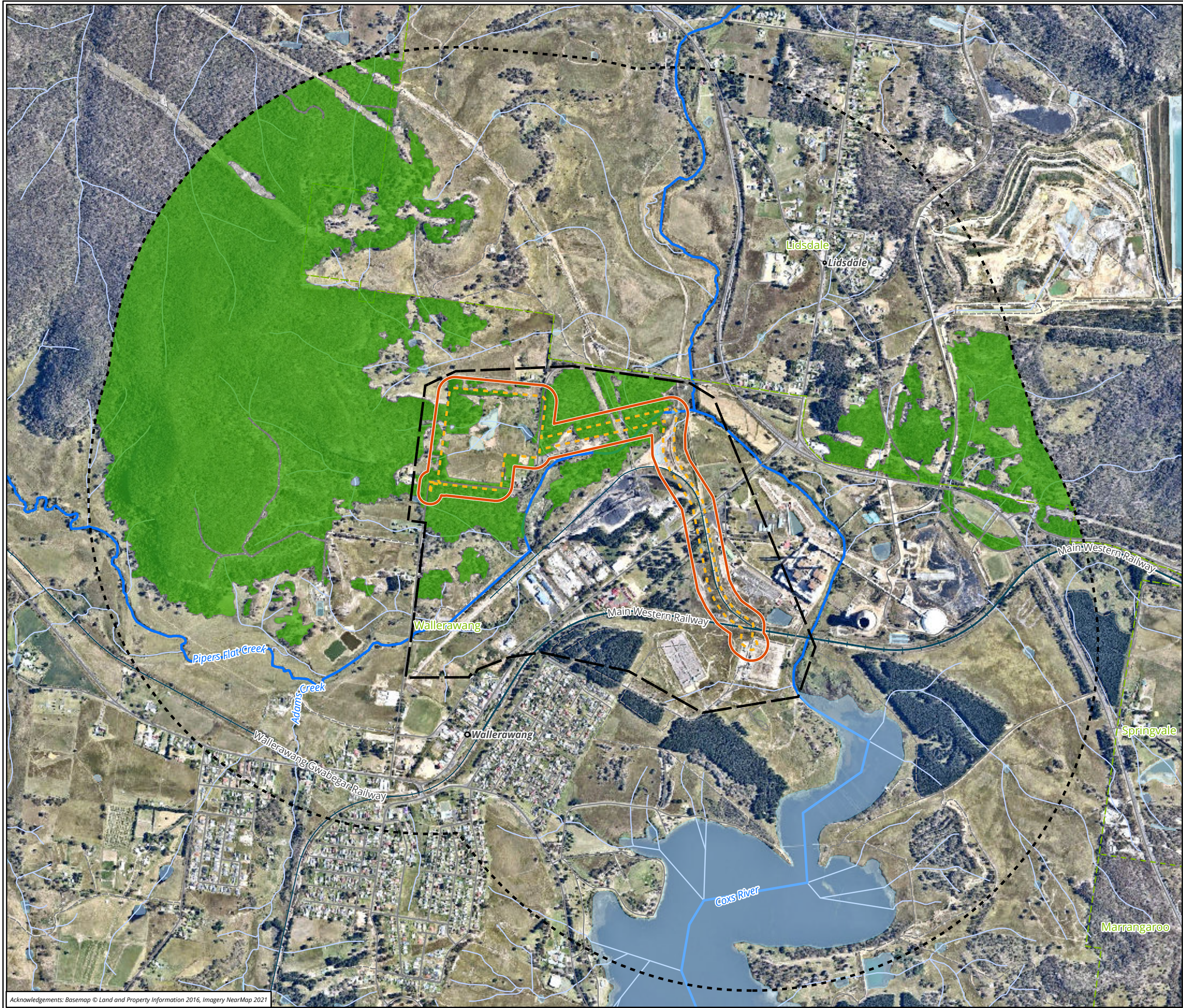
**Figure 6 Vegetation zones and plot locations**

0 50 100 150 200 250  
Metres  
Scale: 1:6,500 @ A3  
Coordinate System:  
GDA 1994 MGA Zone 56

**biosis**

Matter: 34343, Date: 30 November 2021  
GIS: AM, Checked by: PP, Last edited by: amackegard  
Location: P:\34300s\34343\Mapping\34343\_BDAR2020.aprx  
Layout: 34343\_F6\_VegZones





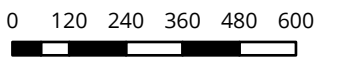
**Legend**

- Subject land
- Development site
- Development footprint
- Assessment area

**Patch size**

≥100ha (677 Low, 677 Moderate,  
732 Low, 732 Moderate, 732 NOG,  
732 Scattered trees)

**Figure 7 Patch size**



Metres  
Scale: 1:16,000 @ A3  
Coordinate System:  
GDA 1994 MGA Zone 56



Matter: 34343, Date: 30 November 2021  
GIS: AM, Checked by: PP, Last edited by: amackegard  
Location: P:\34300s\34343\Mapping\34343\_BDAR2020.aprx  
Layout: 34343\_F7\_PatchSize



## 4 Threatened species

### 4.1 Predicted species (ecosystem credit species)

A list of predicted species (ecosystem credit species) expected to occur within the subject land was generated as per Section 5 of the BAM. Impacts to these species require assessment, however targeted survey is not required as these species are assumed to occur, based on the occurrence of the PCTs, habitat constraints, native vegetation cover in the landscape and calculated patch sizes. These species are identified as ecosystem credit species in the Threatened Biodiversity Data Collection (TBDC). Table 7 lists the ecosystem credit species that could not be discounted from using the subject land on occasion, based on geographical restrictions or a lack of suitable habitat.

These species were considered when prescribing management and mitigation measures for the Project.

**Table 7 Ecosystem credit species (predicted species) with potential to occur**

Species name	Common name
<i>Anthochaera phrygia</i>	Regent Honeyeater (foraging)
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo (foraging)
<i>Chthonicola sagittata</i>	Speckled Warbler
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)
<i>Daphoenositta chrysoptera</i>	Varied Sittella
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle
<i>Glossopsitta pusilla</i>	Little Lorikeet
<i>Grantiella picta</i>	Painted Honeyeater
<i>Hieraaetus morphnoides</i>	Little Eagle (foraging)
<i>Hirundapus caudacutus</i>	White-throated Needletail
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake (foraging)
<i>Lathamus discolor</i>	Swift Parrot (foraging)
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat
<i>Neophema pulchella</i>	Turquoise Parrot
<i>Ninox connivens</i>	Barking Owl (foraging)
<i>Ninox strenua</i>	Powerful Owl (foraging)
<i>Petaurus australis</i>	Yellow-bellied Glider
<i>Petroica boodang</i>	Scarlet Robin
<i>Petroica phoenicea</i>	Flame Robin

Species name	Common name
<i>Phascolarctos cinereus</i>	Koala (foraging)
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox (foraging)
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Ba
<i>Stagonopleura guttata</i>	Diamond Firetail
<i>Tyto novaehollandiae</i>	Masked Owl (Foraging)
<i>Varanus rosenbergi</i>	Rosenberg's Goanna

The following ecosystem credit species were discounted from occurring within the subject land due to the absence of required habitat constraints:

- Glossy Black-Cockatoo *Calyptrorhynchus lathami* – absence of feed trees *Allocasuarina* and *Casuarina* species within the subject land.

## 4.2 Species credit species

Species credit species are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence, or components of their habitat. These candidate species are identified as species credit species in the TBDC. A targeted survey or an expert report is required to confirm the presence of these species on the subject land, or alternatively the species can be assumed to be present (DPIE 2020a).

Appendix 2 provides the full list of species credit species predicted to occur within the subject land based on the IBRA subregion within which the Project occurs, the native vegetation cover present within the 1,500 metre assessment area, the PCTs present within subject land, and patch sizes listed in Table 4. The potential for a species to occur within the subject land was assessed in accordance with Section 5.2 of the BAM and species with geographical restrictions, or habitat constraints not present, were not required to be assessed.

17 predicted species credit species have been excluded from occurring within the subject land based on a lack of suitable habitat, degradation of existing habitat and lack of required microhabitat features. Species credit species considered to potentially occur within the subject land, and thus considered 'candidate species credit species' have been either assumed present or the subject of the target of threatened species surveys. A detailed assessment of potential for occurrence, and potential for impact, for all species credit species predicted to occur within the subject land is provided in Appendix 2. Two species credit species (*Swainsona sericea* and *Prasophyllum petilum*) not predicted by the BAM Calculator (BAM-C) or BioNet to occur within the subject land were added to the assessment as candidate species credit species.

All candidate species credit species considered as part of this assessment, and their associated method of assessment, are listed in Table 8 (flora species) and Table 9 (fauna species).

**Table 8 Candidate species credit flora species**

Species name	Common name	Survey period	Method of assessment
<i>Eucalyptus aggregata</i>	Black Gum	All year	Targeted survey

Species name	Common name	Survey period	Method of assessment
<i>Leucochrysum albicans</i> var. <i>tricolor</i>	Hoary Sunray	September – April	Targeted survey
<i>Prasophyllum petilum</i>	Tarengo Leek Orchid	September – December	Targeted survey
<i>Swainsona sericea</i>	Silky Swainson-pea	September – November	Targeted survey
<i>Thesium australe</i>	Austral Toadflax	November – February	Targeted survey
<i>Veronica blakelyi</i>	-	December – February	Targeted survey

**Table 9 Candidate species credit fauna species**

Species name	Common name	Survey period	Method of assessment
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	November - January	Assumed present
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	December – February	Targeted survey
<i>Paralucia spinifera</i>	Purple Copper Butterfly	September, October, December	Assumed present
<i>Cercartetus nanus</i>	Eastern Pygmy Possum	All year	Assumed present.
<i>Petaurus norfolcensis</i>	Squirrel Glider	All year	Targeted survey
<i>Petauroides volans</i>	Greater Glider	All year	Targeted survey
<i>Phascolarctos cinereus</i>	Koala	All year	Targeted survey

#### 4.2.1 Threatened species survey details

Targeted threatened species surveys within the subject land were undertaken in March 2021, October 2021 and November 2021. Surveys undertaken and weather observations for each survey date are shown in Table 10. Weather observations were recorded using a handheld Kestrel device for some 2021 data. Weather observations were sourced from Lithgow (Cooerwull) weather station (station number 063226).

**Table 10 Weather observations during targeted flora and fauna surveys**

Survey undertaken	Survey date	Temperature (°C)		Rain (mm)	Wind (km/h)
		Min	Max		
<ul style="list-style-type: none"> <li>Flora habitat assessment.</li> <li>Fauna habitat assessment – hollow-bearing trees and large stick-nest searches.</li> <li>Habitat mapping – Purple Copper Butterfly.</li> </ul>	17-18 March 2021	12.4	17.9	6.6	7
<ul style="list-style-type: none"> <li>Targeted flora survey – Black Gum.</li> </ul>	16 June 2021	-2.0	15.5	0.1	7
<ul style="list-style-type: none"> <li>Targeted fauna survey – microbats (ultrasonic recording).</li> </ul>	10 – 16 November 2021	4.2	20.7	66.4	5 – 19

Survey undertaken	Survey date	Temperature (°C)		Rain (mm)	Wind (km/h)
		Min	Max		
<ul style="list-style-type: none"> <li>Targeted flora survey – Hoary Sunray, Tarengo Leek Orchid, Silky Swainson-pea and <i>Veronica blakelyi</i>.</li> </ul>	12 November 2021	4.9	12.2	4.4	19 (3 pm)
<ul style="list-style-type: none"> <li>Targeted fauna survey – Koala, Squirrel and Greater Glider (spotlighting and call playback).</li> </ul>	15 – 16 November 2021	4.4	15.6	0	9 (3 pm)

#### 4.2.2 Targeted threatened flora surveys and results

An initial site assessment was undertaken on 17 and 18 March 2021 to map broad scale vegetation types. An additional site visit was undertaken on 16 June 2021 to undertake targeted flora survey for Black Gum *Eucalyptus aggregata* and finalise a detailed flora assessment of the subject land.

Native vegetation within subject land has been subject to a varying land use history of; grazing, agricultural, clearing, dumping and recreational impacts contributing to degradation of understorey vegetation, and thus threatened species habitats. Habitats for threatened flora species within the north-western portion of the development site are considered low to moderate due to the degree of management, grazing and history of pasture improvement. Open areas are typically dominated by exotic pasture grasses and herbaceous exotics well suited to the low lying and typically damp habitat. Habitats supported by vegetation identified within the proposed eastern transmission line were considered to be of moderately higher quality as a result of the lower levels of disturbance present in the understorey and the presence of mature canopy trees. However, overall the vegetation occurs as edge effected patches across the subject land.

Targeted threatened flora survey, undertaken on the dates listed in Table 10 above, were done so in accordance with the required BAM survey guideline, *NSW Surveying threatened plants and their habitats* (DPIE 2020c). Targeted threatened flora survey was undertaken throughout the development footprint, utilising a minimum 10 metre separated transects, with the exception of private land areas, where access could not be arranged. Portions of the development footprint were not subject to targeted survey for threatened flora, as suitable habitat was not present.

Targeted threatened flora surveys undertaken for the Project are detailed in Table 8, and a detailed assessment of candidate flora species credit species is provided in Appendix 2.

#### Survey method and effort

The targeted survey for Black Gum was undertaken on 16 June 2021. Targeted survey for the remaining flora species, Hoary Sunray, Tarengo Leek Orchid, Silky Swainson-pea and *Veronica blakelyi* were surveyed on 12 November 2021 to coincide with the relevant flowering periods as described in the TBDC.

Two ecologists walked through all suitable habitat for each target species at 10 metre spaced transects for Black Gum and 5 metre spaced transects for all remaining species. The transect spacing is consistent with the spacing described within the *NSW Surveying threatened plants and their habitats* (DPIE 2020b). When encountered all individual plants were recorded using a using hand-held (uncorrected) GPS Tablet. Figure 8 shows the targeted flora survey effort.

Targeted flora surveys were undertaken by the qualified and experienced Biosis ecologists outlined in Table 11.



**Table 11 Targeted flora survey personnel and relevant experience**

Staff member	Role	Relevant experience
<b>Paul Price</b>	Senior Restoration Ecologist BAM Accredited Assessor	Over 10 years' experience undertaking targeted flora surveys in NSW.

## Results

Targeted surveys resulted in the detection of a population of Black Gum, containing 258 individuals within the subject land. The remaining vegetation in the moderate and low condition PCT 677 across the subject land contained an approximate count of 1000 plus individual specimens of Black Gum.

Table 12 provides a summary of the results of the targeted flora surveys completed.

**Table 12 Summary of targeted flora survey method and results**

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
<b><i>Eucalyptus aggregata</i></b>	Black Gum	10m separated transect searches of areas of potential habitat in June 2021	Recorded during targeted survey. 258 individuals recorded.	258 individuals recorded.
<b><i>Prasophyllum petilum</i></b>	Tarengo Leek Orchid	5m separated transect searches of areas of potential habitat in November 2021	Not recorded during targeted survey	n/a
<b><i>Swainsona sericea</i></b>	Silky Swainson-pea	5m separated transect searches of areas of potential habitat in November 2021	Not recorded during targeted survey	n/a
<b><i>Veronica blakelyi</i></b>	-	5m separated transect searches of areas of potential habitat in November 2021	Not recorded during targeted survey	n/a

### 4.2.3 Targeted threatened fauna species

Fauna habitat within the subject land and development footprint were generally found to be in good condition, with localised areas of good quality habitat identified. A number of key habitat features were recorded across the landscape such as: patches of well-structured vegetation not subject to edge effects, and habitat connectivity corridors.

Threatened fauna species survey included habitat assessment to determine suitable microhabitats across the subject land and development footprint and, where necessary, targeted species survey to determine presence/absence of species and/or their habitats were completed.

Fauna habitat assessment was undertaken to determine whether the vegetation to be impacted by the Project contained microhabitats suitable to support the candidate fauna species credit species, as outlined in Appendix 2.

## Fauna habitat assessments

Fauna habitat assessment was undertaken to determine the presence of microhabitats and other critical habitat components (habitat constraints) suitable for all fauna species outlined in Table 9 and Appendix 2. Habitat assessments focussed on the presence of the following features within the subject land:

- Habitat trees including large and/or hollow-bearing trees, stick nests, availability of flowering shrubs and canopy/understorey feed tree species.
- Soil type and presence of cliffs, overhangs and other rocky areas.
- Condition and type of native vegetation and the presence of exotic species.
- Presence and condition of pools and waterways.
- Quantity of ground litter and woody debris.
- Searches for indirect evidence of fauna (i.e. feathers, tracks and scats).
- General degradation of the site as a result of past and current disturbances such as vegetation clearing and industrial land management practices.
- Topography and landscape morphology.
- Presence of Flying-fox camps.

Several habitat features with potential to support threatened species credit species were identified during these habitat assessments. These features have been summarised in Table 13.

**Table 13 Habitat features with potential to support threatened species credit species**

Habitat feature	Presence within the development footprint
<b>Hollow-bearing trees</b>	Habitat trees supporting hollows of a variety of size classes from small (<50 mm diameter) through to large (150 - 400 mm diameter) were present across the subject land. These trees have the potential to provide breeding resources for a range of native fauna species including threatened microbats, Eastern Pygmy-possum <i>Cercartetus nanus</i> and Squirrel Glider <i>Petaurus norfolcensis</i> . Large hollows adjacent to the subject land were of poor quality for fauna due to the vertical aspect of entrances, these hollows will not be removed by the proposed works.
<b>Feed tree species</b>	Tree species within PCT 732 in the north-west of the subject land provide potential foraging habitat for Koala and Greater Glider. Across the subject land flowering tree species may also provide foraging resources for Squirrel Glider, Eastern Pygmy Possum and Grey-headed Flying Fox as well as a range of more common bird and mammal species. Vegetation within PCT 677 was limited in providing microhabitats suitable for most threatened species such as suitable flowering shrubs for arboreal mammal species and native ground cover species for foraging and shelter by terrestrial species.
<b>Caves, overhangs and disused mines</b>	Sandstone formations in the Blue Mountains to the north and east of the subject land provide caves and rocky overhangs. These environments provide potential breeding habitat for threatened microbats including Large-eared Pied Bat and Large Bent-winged Bat as well as Sooty Owl, and potentially Masked Owl. Disused mines can also provide suitable roosting habitat for threatened microbats,

Habitat feature	Presence within the development footprint
	one disused coal mine 'Western Main' is located to the west of the subject land, adjacent to Ben Bullen State Forest and is approximately 2 kilometres from the subject land.
<b>Rocky outcrops and sandstone crevices</b>	The surface geology of the Blue Mountains, in the Great Dividing Range to the east of the subject land supports rocky outcrops, sandstone crevices, and caves. These features provide potential habitat for native frogs and reptiles including the threatened Giant Burrowing Frog, Red-crowned Toadlet and Broad-headed Snake. The subject land occurs at the base of the mountains primarily on alluvial soils associated with Piper's Flat Creek and did not contain any rock outcropping or surface geology suitable for these species.
<b>Major and minor watercourses and waterbodies (i.e. dams)</b>	Piper's Flat Creek runs in the east of the subject land is a Stahler Order 5 waterway. This waterway runs through agricultural areas, cleared areas and remnant vegetation within the subject land. A high level of exotic species were observed on the banks of the waterway which is characterised by soils of recent alluvium with unconsolidated sands and gravels. Farm Dams occur on the Curran Bullen soil landscape which is characterised by hard setting topsoils. Waterways and dams lacked outcropping rock and complexity of micro-habitats and do not provide suitable habitat for threatened amphibian species. The aquatic habitat of Piper's Flat Creek is heavily degraded and does not contain suitable microhabitats for threatened fish species. A small ephemeral drainage line dissects the north-western section of the Project area. This waterway runs through agricultural areas and small sections of degraded remnant vegetation. Small stands of Black Gum has been recorded at either end of the drainage line only.
<b>Woody debris and leaf litter</b>	Woody debris and leaf litter occurred in low abundance in the remnant vegetation patches across development footprints and impact assessment area. The subject land does not support complex habitat for species reliant on these features due to a lack of woody debris and history of disturbance through land clearing and ongoing livestock grazing.

Field capture of detailed fauna habitat information allowed for confirmation of presence/absence of habitat features and microhabitats for a range of candidate threatened species across surveyed portions of the subject land and development footprint. Fauna habitat assessments were captured using ArcGIS polygons attributed with specific habitat criteria that allowed for planning of further targeted survey for select species, or the exclusion of the potential for occurrence of various candidate species from the subject land.

These field captured polygons have also been used to refine species polygons developed for those species either recorded by targeted survey or assumed present. Further detail is provided in Section 4.4.

## Mammals

Targeted mammal surveys were undertaken for the Koala (breeding habitat only), Greater Glider, Squirrel Glider and Eastern Pygmy Possum, due to its consideration as candidate species credit species and the potential availability of habitat within the subject land. The survey guidelines and requirements for the targeted surveys is detailed in Table 14.



**Table 14 Survey guidelines and requirements for mammal surveys**

Survey guidelines	Survey requirements
<i>EPBC Act referral guidelines for the vulnerable Koala (DoE 2014)</i> <i>Biodiversity Assessment Method (BAM) (DPIE 2020)</i>	<b>Koala</b> <ul style="list-style-type: none"> <li>• Call playback.</li> <li>• Spotlight survey.</li> </ul>
<i>Threatened Biodiversity Survey and Assessment Guidelines for Developments and Activities (Working Draft) (DEC 2004)</i>	<b>Squirrel Glider, Greater Glider</b> <ul style="list-style-type: none"> <li>• Spotlight survey.</li> </ul>
<i>Threatened Biodiversity Survey and Assessment Guidelines for Developments and Activities (Working Draft) (DEC 2004)</i>	<b>Eastern Pygmy Possum</b> <ul style="list-style-type: none"> <li>• Species assumed present and habitat polygon generated.</li> </ul>

### Survey method and effort

All woodlands and trees within the development footprint were identified and recorded during the general fauna habitat assessment described above and this ensured a focused effort for targeted surveys.

Targeted survey for Koala was undertaken over two survey nights, 15 – 16 November 2021. Two ecologists undertook spotlighting on foot through all woodland habitats to detect eye shine. Call playback was undertaken at two locations in the subject land (Figure 8) and involved a 10 minute listening period followed by two minutes of call playback, played twice (total of four minutes call playback) and ending with a ten minute listening period.

Threatened mammal surveys were undertaken by the Biosis ecologists outlined in Table 15.

**Table 15 Targeted mammal survey personnel and relevant experience**

Staff member	Role	Relevant experience
<b>Sarah Allison</b>	Project Zoologist	Over 5 years' experience undertaking targeted arboreal and terrestrial mammal surveys across NSW.
<b>Zoe Goold</b>	Project Zoologist	One year experience assisting arboreal mammal survey.

### Results

Targeted fauna survey was conducted over two nights; weather conditions are provided in Table 10. Conditions on the 15 November started poor with wind approximately 19 kilometres an hour (moderate wind) observed, survey was commenced once windy conditions began to ease (approximately 8:15 pm) and a light wind was observed for the remainder of the night. Survey was conducted when the moon was approximately three quarters full with cloud cover of approximately 70 % on the 15 November and clear conditions on the 16 November.

One Squirrel Glider was detected during targeted survey within PCT 732 vegetation (Figure 8). A Sugar Glider was also observed further south within vegetation comprising low condition PCT 677, it is noted identification

of the two species can be difficult to discern and identification was made by an experienced observer after visually inspecting the individuals multiple times over a prolonged period (> 10 minutes).

The vegetation in the north-west corner of the subject land could not be surveyed both nights due to access issues and as such, presence has been assumed for Koala and Greater Glider and species polygons have been created.

Spotlighting alone is not considered effective for detection of Eastern Pygmy-possum, the species is not associated with the PCTs within the subject land (DPIE 2020c). However suitable potential foraging habitat occurs within the PCT 732 vegetation of the subject land, and the subject land is connected to large areas of habitat within National Parks in the wider area. Therefore this species has been assumed present within PCT 732 in the subject land.

Table 16 provides a summary of the results of the mammal surveys completed.

**Table 16 Summary of mammal survey method and results**

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
<i>Phascolarctos cinereus</i>	Koala	<ul style="list-style-type: none"> <li>2 nights call-playback and spotlighting</li> <li>15 – 16 November 21</li> </ul>	Not detected	3.69 ha of PCT 732
<i>Petaurus norfolcensis</i>	Squirrel Glider	<ul style="list-style-type: none"> <li>2 nights spotlighting</li> <li>15 – 16 November 21</li> </ul>	Species detected	3.69 ha of PCT 732
<i>Cercartetus nanus</i>	Eastern Pygmy Possum	<ul style="list-style-type: none"> <li>Baited remote camera survey/Assumed present</li> </ul>	Assumed present	3.69 ha of PCT 732
<i>Petauroides volans</i>	Greater Glider	<ul style="list-style-type: none"> <li>2 nights spotlighting</li> <li>15 – 16 November 21</li> </ul>	Assumed present	3.69 ha of PCT 732

### Microchiropteran bats

Two microchiropteran bat species, Large-eared Pied Bat and Large Bent-winged Bat were identified as candidate species credit species for the subject land.

#### Survey method and effort

Ultrasonic call analysis was undertaken using Anabat Insight software and relevant published reference call guides (Pennay, Law, & Reinhold 2004). Analysis was run through custom filters/a decision tree to remove noise (frequencies below 7kHz) and files/passes with less than three pulses. The custom decision tree/filter was then run using characteristic frequency and duration to identify calls to genus, or species level where possible.

Any calls identified by the system as significant or uncommon species were checked manually against the NSW reference calls, by visual comparison of sonograms with published reference calls by an experienced bat expert, to ensure accurate results. In addition, calls were chosen for manual vetting from each species/genus grouping for quality assurance of data.

Targeted survey for the threatened microbat species included the use of three ultrasonic detectors over six nights (10 – 16 November 2021). The total survey effort of 18 nights meets the survey requirements specified in '*Species credit threatened bats and their habitats* (OEH 2018). The detectors were set to record 30 minutes

before sunset and stop 30 minutes after dawn. Units were placed in a position that maximised the likelihood of recording bats in accordance with the guidelines (along waterways and in flyways).

Microbat surveys were undertaken by the Biosis ecologists and experienced bat expert as outlined in Table 17.

**Table 17 Targeted microbat survey personnel and relevant experience**

Staff member	Role	Relevant experience
<b>Sarah Allison</b>	Project Zoologist	Over 5 years' experience surveying and identifying microchiropteran bats. Two years' experience identification of bat calls.
<b>Zoe Goold</b>	Project Zoologist	One year experience surveying microchiropteran bats.

Sandstone outcrops containing potential caves, overhangs and crevices occur within 2 kilometres of the subject land. Call sequences containing characteristics consistent with those of the Large Bent-winged Bat were recorded during targeted survey and as such this species has been recorded as present within the subject land. Calls sequences displaying characteristic features consistent with those known for Eastern Cave Bat *Vespadelus troughtoni* were recorded by detectors during survey. As the calls of this species occur within a similar frequency range and contain characteristics consistent with other *Vespadelus* species which may also occur in the region, this species could not be identified with confidence based on call analysis alone. No suitable breeding habitat was identified for the Large Bent-winged Bat or Eastern Cave Bat within the development footprint or within 100 metres of the subject land. As such, in accordance with the guideline for species credit threatened bats (OEH 2018) no habitat important to breeding occurs within the subject land, species polygons have not been developed and further survey or assessment is not required for these species.

Potential calls with characteristics attributed to Little Pied Bat *Chalinolobus picatus* listed vulnerable under the BC Act, were recorded with low to moderate confidence. The low confidence assigned was due to the short sequence and interference of other bat calls in the recording. In addition, the species distribution is generally further west of the subject land. For confidence in this identification further assessment and analysis would be recommended, however, as there is no breeding habitat present within 100 metres the subject land for this species, it is not considered to be impacted and no further assessment is required for the Project.

Calls with characteristics attributed to a total of ten microchiropteran bat species and one species complex (*Vespadelus species*) were detected within and near the subject land. Species recorded include one species credit species listed vulnerable under the BC Act, Large Bent-winged Bat, and one ecosystem credit species listed vulnerable under the BC Act, *Saccolaimus flaviventris*. An additional potential four species were recorded, however, due to similarities in call characteristics including similar shapes and overlapping frequency these species have been grouped as *Vespadelus* species complex. The species included are Little Forest Bat *Vespadelus vulturnus*, Southern Forest Bat *Vespadeuls regulus*, Large Forest Bat *Vespadelus darlingtoni* and Eastern Cave Bat *Vespadelus troughtoni*. Eastern Cave Bat is listed Vulnerable under the BC Act.

The Large Bent-winged Bat and Eastern Cave Bat are species credit species for breeding habitat only, suitable potential habitat for this species occurs in the locality (within 2 kilometres of the subject land) in the form of caves and overhangs associated with rocky escarpments and disused mines. No suitable breeding habitat occurs within 100 metres of the subject land and therefore, in accordance with species credit bat guidelines (OEH 2018), a species polygon has not been developed for this species. The habitat for the remainder of the



threatened microbat species are treated as ecosystem credits under the BAM and impacts to these species are assessed in conjunction with the impacts to PCTs. No further assessment of these species is required.

Table 18 provides a summary of the results of the microbat surveys completed.

**Table 18 Summary of microbat survey method and results**

Species name	Common name	Survey method	Survey results	Species Polygon (ha) or count
<b><i>Chalinolobus dwyeri</i></b>	Large-eared Pied Bat	<ul style="list-style-type: none"> <li>• Ultrasonic recording</li> <li>• 10 – 15 November 2021</li> </ul>	Not detected during survey	Not required, no suitable breeding habitat occurs within 100 m of the subject land.
<b><i>Miniopterus orianae oceanensis</i></b>	Large Bent-winged Bat	<ul style="list-style-type: none"> <li>• Ultrasonic recording</li> <li>• 10 – 15 November 2021</li> </ul>	Species recorded	Not required, no suitable breeding habitat occurs within 100 m of the subject land.

## Invertebrates

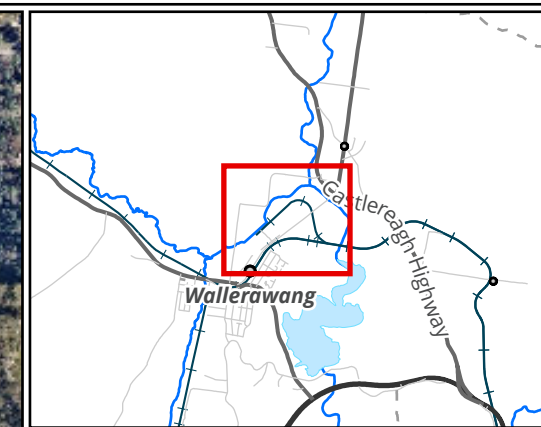
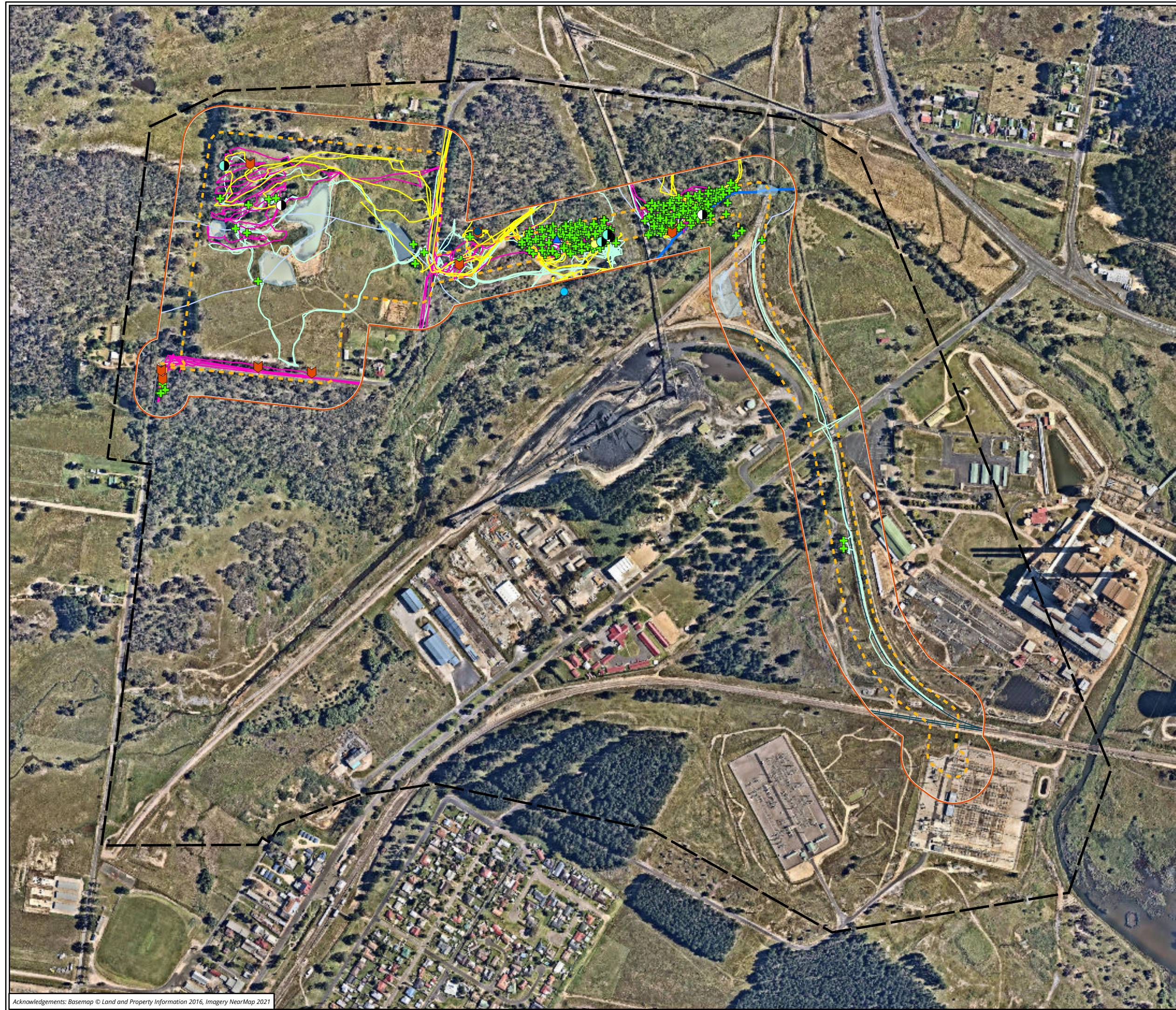
One invertebrate, Purple Copper Butterfly *Paralucia spinifera*, was identified as a candidate species for the subject land. Targeted survey could not be conducted for the species within the allowable surveyable period, and thus targeted survey was not performed. However, habitat mapping was carried out in March 2021 for the species, including mapping all areas containing *Bursaria spinosa* subsp. *lasiophylla* identified within the development footprint. The species was assumed to be present within all suitable habitat identified and mapped. As such, a species polygon has been prepared for the Purple Copper Butterfly and discussed further in Section 4.4.

## 4.3 Incidental flora and fauna surveys

Fauna surveys undertaken on an ongoing basis throughout the field campaign included incidental diurnal bird surveys, active searches of woody debris and leaf litter, incidental aural observations of frog species and incidental observations of various mammal species. The following threatened species were recorded during incidental fauna surveys:

- Dusky Woodswallow *Artamus cyanopterus*
- Little Eagle *Hieraaetus morphnoides*





- Legend**
- Subject land
  - Development site
  - Development footprint
  - Anabat
  - Call playback
  - Hollow-bearing tree
- Threatened flora records**
- ▲ Black Gum - *Eucalyptus aggregata* (BioNet record)
  - + Black Gum - *Eucalyptus aggregata* (Biosis record)
- Threatened fauna records (Biosis)**
- Dusky Woodswallow, *Artamus cyanopterus cyanopterus*
  - Little Eagle, *Hieraaetus morphnoides*
  - Squirrel Glider, *Petaurus norfolcensis*
- Targeted surveys**
- Initial habitat and vegetation survey
  - Night targeted fauna survey
  - Targeted flora survey

**Figure 8 Targeted species mapping**

0 50 100 150 200 250

Metres

Scale: 1:6,500 @ A3

Coordinate System:

GDA 1994 MGA Zone 56



Matter: 34343, Date: 30 November 2021  
 Drawn by: AM, Checked by: PP, Last edited by: amackegard  
 Location: P:\34300s\34343\Mapping\34343\_BDAR2020.aprx  
 Layout: BDAR\_F8\_TargetedSurveys



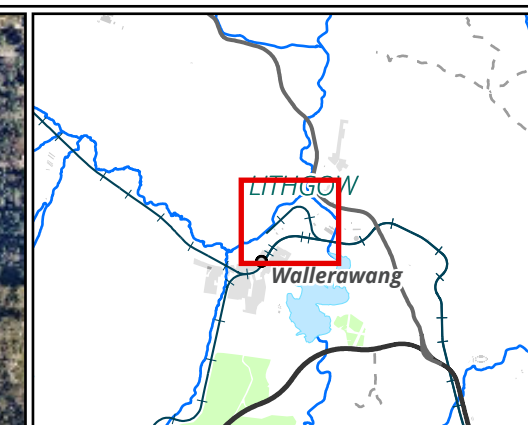
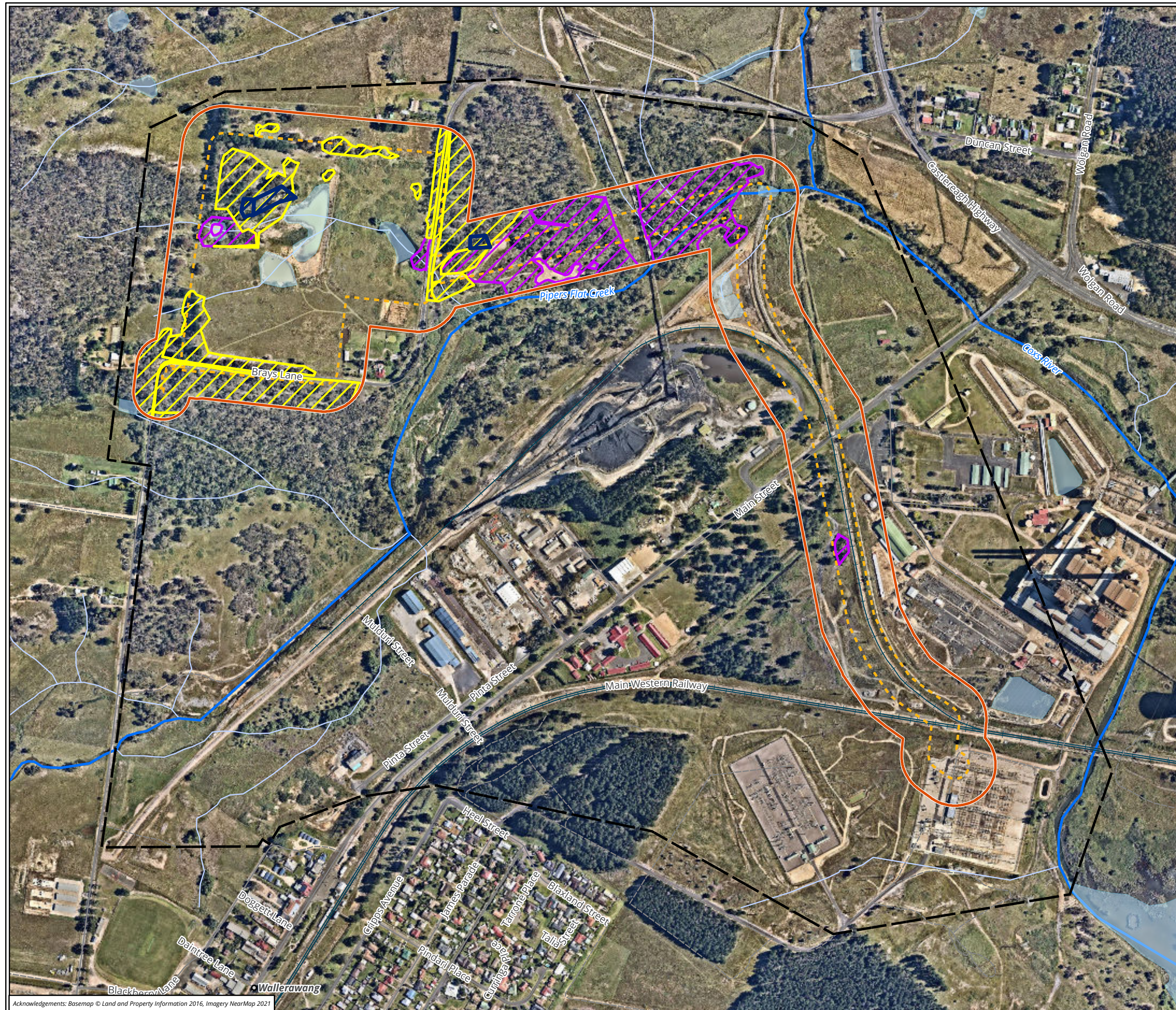
## 4.4 Threatened species summary and polygons

Table 19 provides details of threatened species and their habitat impacted by the Project and outlines the attributes that comprise the threatened species polygons. The presence of threatened species and their habitat impacted by the Project is illustrated on Figure 9.

**Table 19 Threatened species polygons within the development footprint and impact assessment area**

Threatened species	Impact (ha / No. indiv.)	Unit of measure	Biodiversity risk weighting	Polygon attributes
<b>Flora</b>				
<i>Eucalyptus aggregata</i>	2	Count	2	0.26
<b>Fauna</b>				
Eastern Pygmy-possum <i>Cercartetus nanus</i>	0.67	Area	2	0.67
Koala <i>Phascolarctos cinereus</i>	0.67	Area	2	0.67
Squirrel Glider <i>Petaurus norfolcensis</i>	0.67	Area	2	0.67





#### Legend

- Subject land
- Development site
- Development footprint

#### Threatened species polygons

- Purple Copper Butterfly habitat
- Squirrel Glider, Greater Glider, Eastern Pygmy-possum, and Koala habitat
- Black Gum habitat

**Figure 9 Threatened species polygons**

0 50 100 150 200 250

Metres

Scale: 1:6,500 @ A3

Coordinate System:

GDA 1994 MGA Zone 56



Matter: 34343, Date: 14 February 2022  
 GIS: AM, Checked by: PP, Last edited by: amackegard  
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 Layout: 34343\_F9\_ThrSpPolygon



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## Stage 2 – Impact assessment (biodiversity values)

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## 5 Avoid and minimise impacts

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This section demonstrates the efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with BAM, including an analysis of alternatives:

- Modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology.
- Routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route.
- Alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location.
- Alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site.
- Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design.
- Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal.

### 5.1 Actions to avoid/minimise project impacts

The principal means to reduce impacts on biodiversity values within the development footprint and subject land is to avoid and/or minimise the removal of native vegetation and fauna habitat. Additional recommendations include measures to mitigate residual impacts after all measures to avoid and minimise impacts have been considered.

#### Site selection and planning

The development footprint has been selected, in part, to minimise impacts to native vegetation and flora and fauna habitats present within the broader subject land. Key design elements were altered in the early design phase to reduce direct impacts to native vegetation and focus impacts within the part of the subject land containing non-native vegetation and more heavily disturbed native vegetation.

The BESS footprint is located such that direct impacts to better condition native vegetation (e.g. in the north-west corner of the site) are avoided and the east /west fauna and riparian corridors are maintained.

The proposed eastern transmission line was selected in the final design as direct impacts to vegetation were originally considered to be less than within the proposed southern transmission line. In addition, the final design proposes to install the transmission line connection underground using trenching in less sensitive areas (predominantly the rail corridor) and underboring at environmentally sensitive locations (including watercourses and GDEs). Thus, underboring native vegetation across the eastern transmission line will be an indirect impact, and all direct impacts to native vegetation will be avoided along the proposed transmission line corridor.

Figure 10 shows the proposed development footprint, while Figure 11 shows the alternative footprint including the southern transmission line that was initially considered.



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## Construction

Direct and indirect impacts to biodiversity values retained within the subject land (e.g. winter flowering mature eucalypts and other canopy trees) and adjoining the subject land may occur if adequate mitigation and management measures are not in place during construction of the Project.

The following mitigation and management measures are to be implemented in order to mitigate and manage potential direct and indirect impacts during construction:

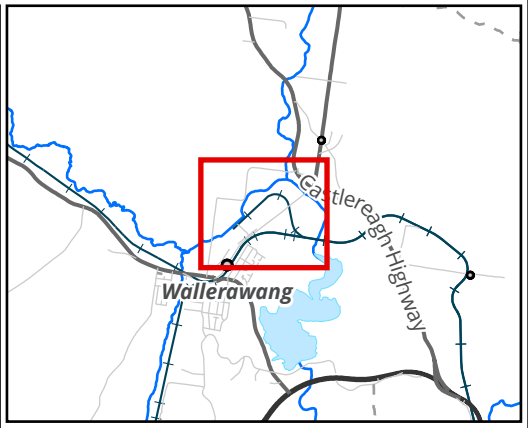
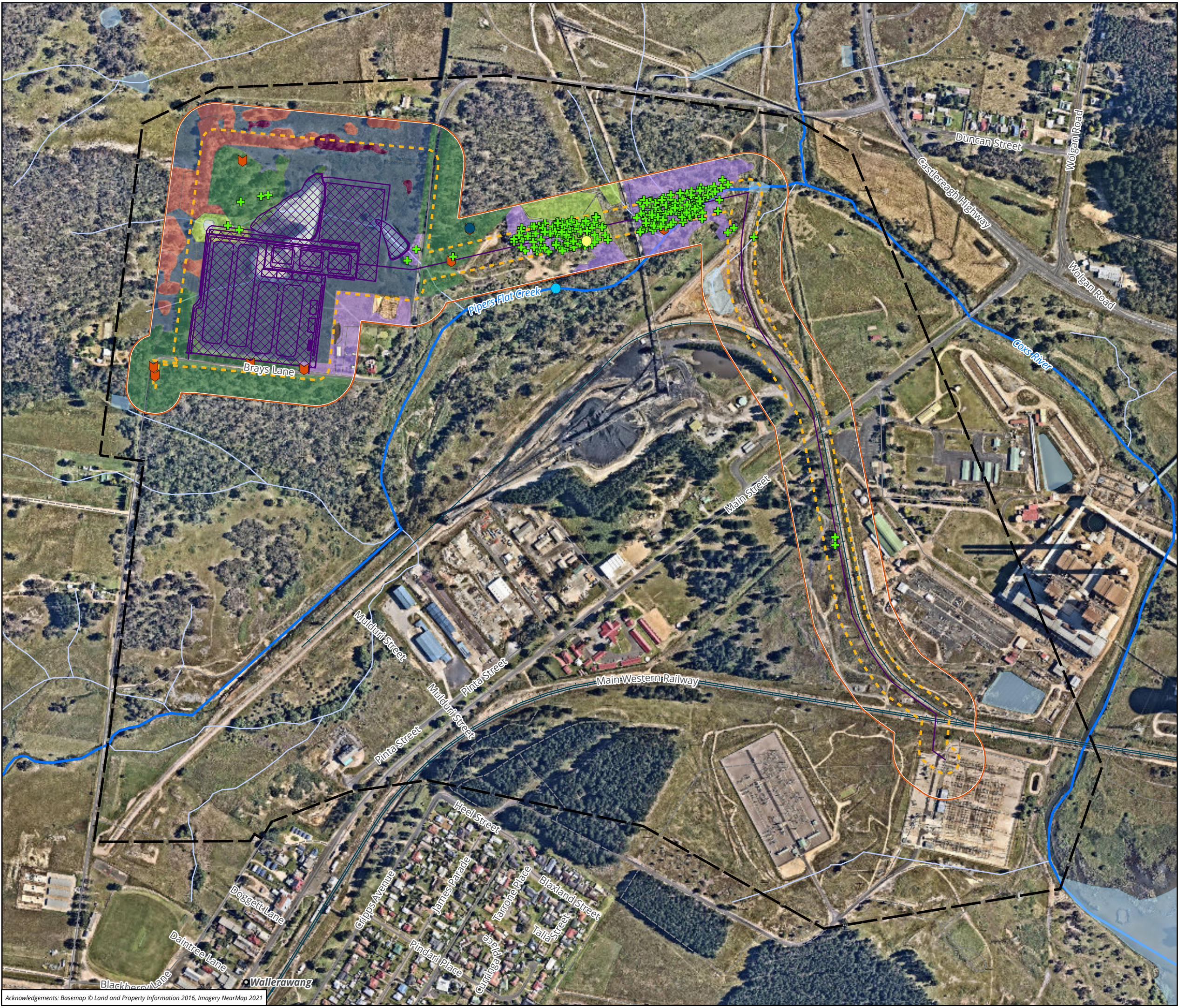
- Prior to construction, a Construction Environmental Management Plan (CEMP) is to be developed which includes standard measures, including:
  - Installation of appropriate exclusion fencing to the boundary of the retained vegetation and retained native trees in construction areas where there is some potential for accidental encroachment. This will include appropriate signage such as 'No Go Zone' or 'Environmental Protection Area'. Identification of any 'No Go Zones' in site inductions for all construction personnel.
  - All site perimeter fencing is to be of a design that excludes terrestrial fauna, so as to minimise the risk of Koala ingress to the construction site.
  - All material stockpiles, vehicle parking and machinery storage should be located within the areas proposed for clearing, and not in areas of native vegetation that are to be retained.
  - Sedimentation and erosion control measures including silt fencing, sediment traps, etc. to prevent sediment-laden stormwater exiting the construction areas and to prevent scouring and erosion of land beyond the development footprint. All erosion and sediment control measures are to be constructed and installed in accordance with relevant guidelines, are to be regularly maintained for the duration of the construction period and are to be carefully removed at completion of works.
  - Sediment and erosion control measures should follow recommendations of *The Blue Book – Managing Urban Stormwater: Soils and Construction* (Landcom 2004)
  - Dust suppression measures to ensure dust deposition beyond the construction area is minimised.
  - Weed and pathogen management including weed hygiene protocols for personnel, machinery and construction materials entering and exiting construction areas to minimise risk of weed and pathogen introduction and spread.
  - Waste management is to ensure food scraps and other organic waste that may attract introduced predators (e.g. fox, cats) or other pests (e.g. rats) is not stored for prolonged periods within the construction site.
- As far as practicable, all construction activities are to be undertaken during daylight hours to minimise noise impacts on fauna utilising adjacent habitats.
- Selection and retention of suitable logs (>10 cm diameter only) and hollows for placement within retained native vegetation adjoining the subject land.
- Where appropriate native vegetation cleared from the subject land should be mulched for re-use on the site to stabilise bare ground.
- Security lighting within the construction site is to be minimised and where required, is to be oriented such that light spill beyond the subject land and in to patches of retained vegetation is minimised.

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## Operation

- Stormwater generated and discharged from the site is not to be substantially different in volume relative to the pre-development regime to protect downstream communities from erosion impacts.
- All perimeter fencing and is to be of a 'fauna-friendly' design i.e. barbed wire free, which minimises potential impacts to flying and gliding arboreal mammals (e.g. sugar gliders) which may utilise retained trees within the subject land.





**Legend**

- Subject land
- Development site
- Development footprint
- Hollow-bearing tree
- Construction footprint
- Construction footprint

**Fauna sightings (Biosis record)**

- Dusky Woodswallow, *Artamus cyanopterus cyanopterus*
- Little Eagle, *Hieraaetus morphnoides*
- Squirrel Glider, *Petaurus norfolcensis*

**Flora sightings (Biosis record)**

- Black Gum - *Eucalyptus aggregata*

**Vegetation Zones**

- 677-Low
- 677-Moderate
- 732-Low
- 732-Moderate
- 732-NOG
- 732-Scattered Trees

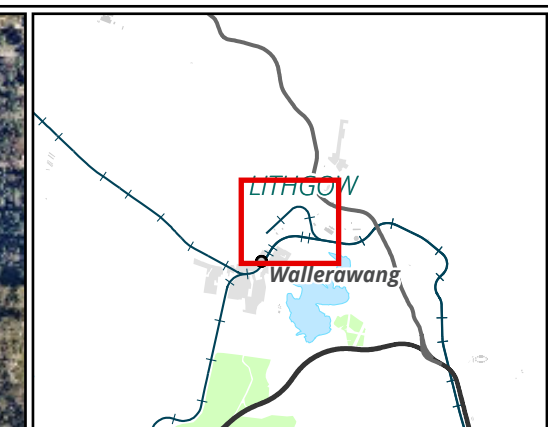
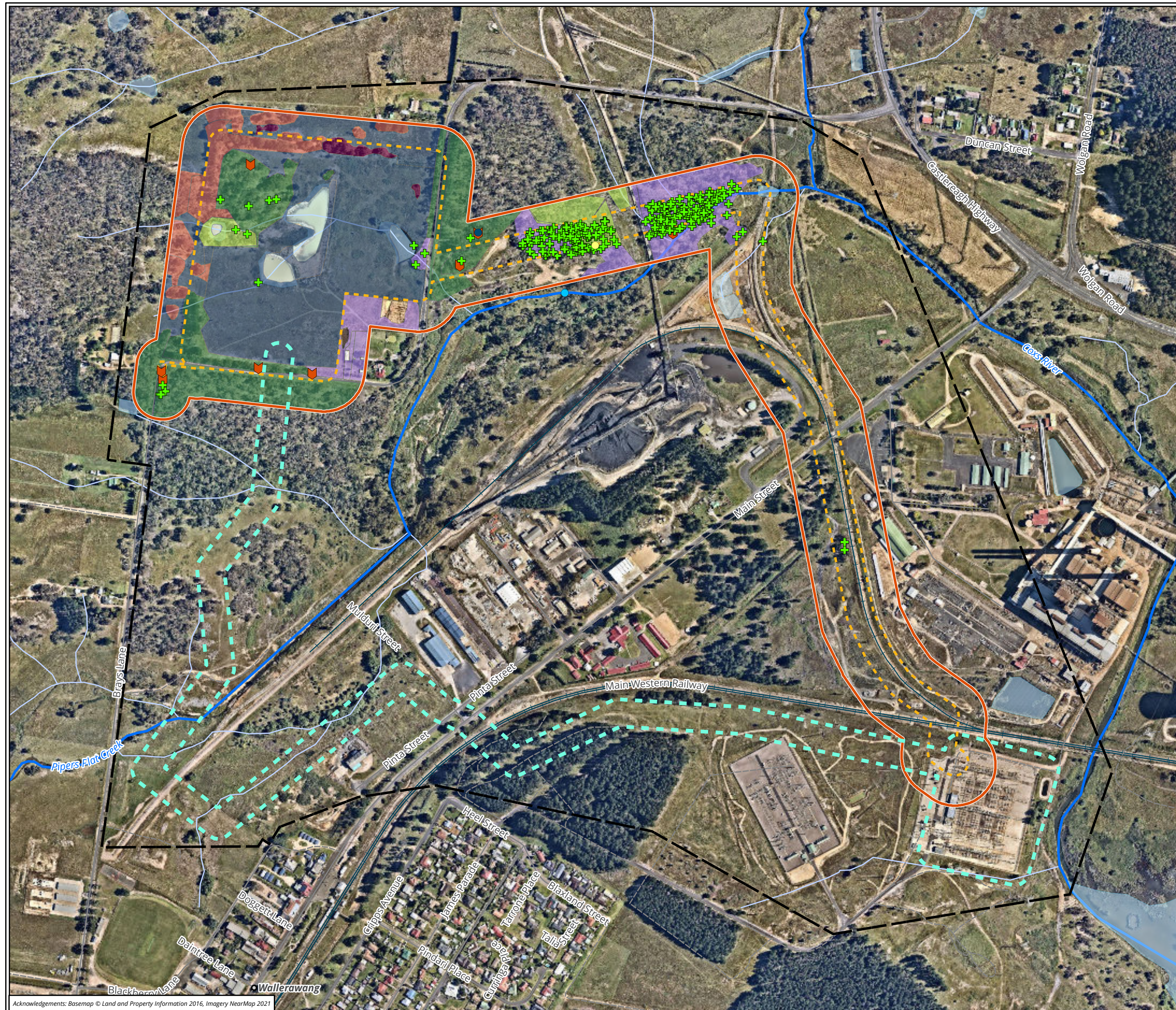
**Figure 10 Final development footprint**

0 50 100 150 200 250  
Metres  
Scale: 1:6,500 @ A3  
Coordinate System:  
GDA 1994 MGA Zone 56

**biosis**

Matter: 34343, Date: 10 February 2022,  
GIS: AM, Checked by: PP, Last edited by: amackegard  
Location: P:\34300s\34343\Mapping\34343\_BDAR2020\_part2.aprx  
Layout: 34343\_F10\_DevFootprint





#### Legend

- Subject land
- Development site
- Development footprint
- Alternative development footprint
- Hollow-bearing tree

#### Fauna sightings (Biosis record)

- Dusky Woodswallow, *Artamus cyanopterus cyanopterus*
- Little Eagle, *Hieraaetus morphnoides*
- Squirrel Glider, *Petaurus norfolcensis*

#### Flora sightings (Biosis record)

- Black Gum - *Eucalyptus aggregata*

#### Vegetation Zones

- 677-Low
- 677-Moderate
- 732-Low
- 732-Moderate
- 732-NOG
- 732-Scattered Trees

**Figure 11 Alternate options and avoidance**

0 50 100 150 200 250  
Metres

Scale: 1:6,500 @ A3  
Coordinate System:  
GDA 1994 MGA Zone 56



Matter: 34343, Date: 14 February 2022  
GIS: AM, Checked by: PP, Last edited by: amackegard  
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Layout: 34343\_F11\_AlternateOptions



## 6 Impacts that are unable to be avoided

Assessment of direct and indirect impacts unable to be avoided has been undertaken in accordance with the BAM (DPIE 2020b). The following direct and indirect impacts are unable to be avoided in progressing the Project.

### 6.1 Direct impacts

Direct impacts include vegetation clearing calculated from the development footprint. Direct impacts arising from the Project include:

- 0.26 ha of PCT 677.
- 0.67 ha of PCT 732.
- 0.26 ha of Black Gum habitat.
- 0.67 ha of Koala habitat.
- 0.67 ha of Squirrel Glider habitat
- 0.67 ha of Eastern Pygmy-possum habitat.

These impacts will be permanent and will occur from the outset of the development. Mitigation measures outlined in Section 5.1 above will help to minimise the potential impacts to biodiversity values that remain present within the subject land.

Assessment of the above impacts is provided in Table 20.

**Table 20 Summary of direct impacts to vegetation**

Potential direct impact	Location / description of impact	Significance of impact
<b>Removal of native vegetation and flora and fauna habitats</b>	Removal of 0.93 ha of native vegetation from two PCTs throughout the development footprint, supporting habitat for a range of threatened and non-threatened flora and fauna species.	The majority of the vegetation and habitats impacted by the Project has undergone historical modification through clearing and other detrimental landuse practices, and all native vegetation identified within the development footprint is in low or moderate condition. Whilst the removal native vegetation and threatened species' habitats by the Project could be considered an impact, when considered in the context of the size of the Project Area, and the general landscape through which the development traverses, the impact of native vegetation removal are not considered to be significant. Substantial efforts have been made through the Project to reduce and minimise impact to native vegetation habitats, and this process has resulted in the residual impacts being largely comprised of degraded, fragmented, and edge effected ecological values.
<b>Removal of</b>	The Project will result in the	As with impacts to native vegetation, impacts to threatened flora



Potential direct impact	Location / description of impact	Significance of impact
<b>known mapped habitat for threatened flora species and individual plants</b>	removal of the following threatened flora individuals / habitat: <ul style="list-style-type: none"> <li>Black Gum – two individuals, 0.31 ha of known habitat.</li> </ul>	species and habitats are not considered significant when assessed in the context of the scale of the Project. Direct impacts to a total of two individual plants, and 0.31 ha of known mapped habitat, are considered to be an acceptable outcome for a Project with impacts spanning such a large area. Again, it should be noted that significant efforts have been undertaken to minimise and avoid impacts to threatened flora over the course of the Project and underboring along the transmission line will avoid the majority of Black Gum habitat identified within the subject land.
<b>Removal of known habitat for threatened fauna species</b>	The Project will result in the removal of the following threatened flora individuals / habitat: <ul style="list-style-type: none"> <li>0.67 ha of Squirrel Glider, Greater Glider, Koala and Eastern Pygmy Possum habitat.</li> </ul>	As with impacts to native vegetation, overall direct impacts to threatened fauna habitats are not considered significant when assessed in the context of the scale of the Project. Targeted surveys and habitat assessments have concluded that the majority of the development footprint supports only marginal quality habitat for threatened fauna species, having undergone degradation through historical landuse. Removal of higher quality habitat in the north-west corner has been avoided. In addition, the underboring of the eastern transmission line will avoid all direct impacts to native vegetation in this area. Impacts to potential microbat habitat at the site have been assumed based on the presence of potential habitat within the subject land and the lack of targeted survey using ultrasonic call data.

### 6.1.1 Loss of hollow-bearing trees

Six hollow-bearing trees were identified within the proposed development footprint i.e. within the transmission line easement and along Brays Lane (proposed vegetation trimming for oversized vehicle access). These trees have the potential to provide roosting habitat for Large-eared Pied Bat and Large Bent-winged Bat. Given the Project involves the installation of an underground transmission line in this portion of the development footprint, the hollow-bearing trees will not be removed. However, the indirect impacts from underboring native vegetation may occur here.

The two hollow-bearing trees located on Brays Lane potentially will be removed during the site construction phase of the Project through branch and vegetation trimming to make allowances for heavy-rigid plant and machinery accessing the site. The recorded hollows were considered low quality and provided limited roosting opportunities to microbat species.

## 6.2 Indirect impacts

Potential indirect impacts arising from the Project are outlined and addressed in Table 21. Indirect impacts have been assessed based on a number of factors, including:

- The presence of native vegetation and habitats directly adjacent to the development footprint, i.e. within the subject land, and the potential for those retained patches of vegetation and habitat to be negatively affected by the Project.



- The presence of biodiversity values on and adjacent to watercourses and the potential for impacts relating to changes to local hydrology.
- Landscape scale impacts to species habitat connectivity.

**Table 21 Avoidance and minimisation of impact**

Indirect impact	Assessment / likelihood of occurrence
<b>Inadvertent impacts on adjacent habitat or vegetation</b>	<p>Impacts to the vegetation associated with the transmission line are being prevented through the utilisation of an underboring method known as horizontal directional drilling (HDD). HDD would be used where required to avoid areas of sensitivity, including Aboriginal heritage, biodiversity, Pipers Flat Creek, and rail crossings. The remainder would be constructed using an open trenching methodology which will occur in areas of low conservation value. The vast majority of the new transmission line would be installed underground except where the line enters and connects to the Transgrid Wallerawang 330kV substation.</p> <p>Additional inadvertent impacts may potentially occur to adjacent vegetation during construction and operational phase can be prevented or minimised through appropriate exclusion fencing, implementation of a CEMP detailing environmental protection measures, strict water quality practices and stormwater controls, and by ensuring lighting is directed towards the developed area, rather than towards the surrounding remnant vegetation.</p>
<b>Reduced viability of adjacent habitat due to edge effects</b>	<p>Adjacent habitats are currently subject to a high degree of edge effects due to prior clearing and surrounding existing residential and agricultural land use. Since a small and localised patch of vegetation (0.93 ha) is to be directly impacted by the Project, an increase to edge effects is not expected to occur to the remnant vegetation surrounding the subject land, as a result of the proposed development. In addition, a large proportion of native vegetation within the subject land will be underbored, thus edge effects are not expected to be exacerbated as a result.</p>
<b>Reduced viability of adjacent habitat due to noise, dust or light spill</b>	<p>It is predicted that the adjacent habitat will be impacted in a small way by noise, dust and light spill, during construction and operation of the future development of the subject land. However, this will be managed via measures outlined in a CEMP.</p> <p>The development is expected to be periodically serviced by medium and light vehicular traffic. Currently, the majority of the site is zoned as RU1 - Rural. The Project may therefore result in a minor change to the functioning of the development site and the amount or type of vehicular traffic, noise and light pollution. Indirect impacts from lighting may affect foraging of threatened microbats, but impacts are not considered significant as it is highly unlikely that species abundance will be diminished.</p>
<b>Transport of weeds and pathogens from the site to adjacent vegetation</b>	<p>Weeds occurring within the subject land are common with those occurring within adjacent vegetation to be retained. Increased transport of pathogens and weeds is unlikely to occur, but will be managed by biosecurity measures outlined in the CEMP.</p>
<b>Increased risk of starvation, exposure</b>	<p>The habitat present in the subject land considered marginal for most fauna</p>

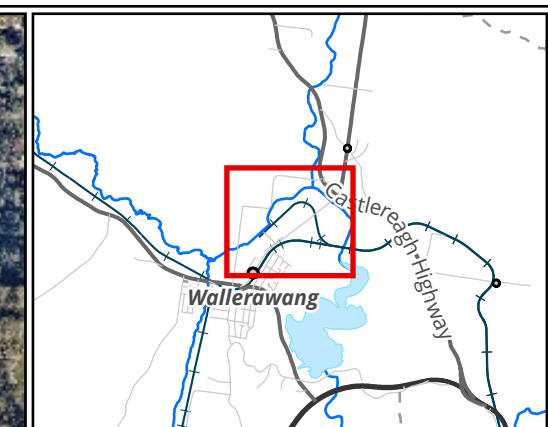


Indirect impact	Assessment / likelihood of occurrence
<b>and loss of shade or shelter</b>	species given the disturbed condition, however is potential habitat for Purple Copper Butterfly, Koala, Squirrel Glider, Greater Glider, Eastern Pygmy-possum and several threatened microbat species. The proposed future development will not result in an increased risk of starvation, exposure and loss of shade or shelter to native species due to the small total area of vegetation being removed, and it very small proportion of commensurate habitats available in the immediate vicinity.
<b>Loss of breeding habitats</b>	No specialist breeding habitat will be impacted by the proposed future development. Retained vegetation in adjacent lots and along riparian corridors within the local area provides higher quality habitat and will not be reduced by the proposed works.
<b>Trampling of threatened flora species</b>	A population of the threatened flora species, Black Gum, was identified within both the site proposed for the BESS and along the transmission line corridor. Under the current proposal, it is anticipated that only two will be impacted as a part of the Project whilst the transmission line will be installed underground using underboring at environmentally sensitive locations. The Project will avoid direct impacts to the main Black Gum population and will minimise foot traffic where the threatened flora species is present. Thus trampling of threatened flora species is unlikely.
<b>Inhibition of nitrogen fixation and increased soil salinity</b>	The NSW DPIE Hydrogeological Landscape and Salinity Hazard Maps did not identify any areas of inland soil salinity risk. Any future excavations or soil disturbance resulting from the Project would be largely restricted to areas having undergone significant previous disturbance through cattle grazing and vehicular traffic. As such it is not considered likely that the future development of the subject land would result in substantial changes to the level of nitrogen fixation or soil salinity in the locality.
<b>Fertiliser drift</b>	The site has a long history of grazing over its total extent. Exotic species dominance within cleared areas indicate a pattern of pasture improvement.. The proposal will cease these activities and not contribute to fertiliser drift into surrounding areas with future practices. No fertiliser is proposed to be used.
<b>Rubbish dumping</b>	Standard environmental controls for the development would ensure potential impacts are minimised. Works would follow an approved Waste Management Plan.
<b>Wood collection</b>	Future development proposed within the subject land is unlikely to increase access to any retained vegetation, beyond current access capacity. Based on the future industrial use of the subject land, future landholders are not expected to be likely to undertake wood collection within the retained vegetation to a level that it will have a detrimental effect. Unauthorised access and collection of wood is expected to be minimal.
<b>Removal and disturbance of rocks, including bush rock</b>	The subject land does not support bush rock.
<b>Increase in predators</b>	The subject land is already largely cleared and heavily fragmented. The



Indirect impact	Assessment / likelihood of occurrence
	vegetation clearance proposed from within the development footprint is unlikely to increase predatory species populations.
<b>Increase in pest animal populations</b>	<p>The proposal occurs in a rural and semi-industrial area with impacts including introduced domestic pets such as cats <i>Felis catus</i> currently occurring within the locality. Pest animals such as Rats <i>Rattus rattus</i> and European Rabbit <i>Oryctolagus cuniculus</i> are also widely spread within the region and are likely to occur across the locality. The proposal will not result in an increase in available habitat for these species and is unlikely to lead to an increase in pest animal populations.</p> <p>Suitable waste disposal implemented during and post construction will further reduce the resources available for pest species.</p>
<b>Changed fire regimes</b>	The subject land is largely cleared of vegetation. Appropriate APZs and fire mitigation systems will be implemented for the future development and the proposal will not result in an increased risk of fire.
<b>Disturbance to specialist breeding and foraging habitat, e.g. Beach nesting for shorebirds</b>	No specialist breeding and foraging habitat will be indirectly impacted by the proposed work. Direct impacts to breeding and foraging habitat for Koala and Squirrel Glider will be offset. The proposal is unlikely to constitute significant disturbance, to adjacent habitats as underboring will avoid the majority of vegetation clearing and once the works are completed minimal disturbance will be generated to adjacent areas (occasional maintenance if required).
<b>Fragmentation of movement corridors</b>	Movement corridors are currently restricted in width and availability through the locality. The occurrences of habitat connectivity occurs predominantly in east – west bands along drainage lines or roads. The development footprint crosses a number of features that provide opportunities for movement of biodiversity values across the landscape. However, most of these features will not be directly impacted by the Project (with underboring across the proposed eastern transmission line). The Project will result in the removal of 0.93 ha of native vegetation that fringes the subject land to the north and west. Remnant vegetation along Pipers Flat Creek and within the proposed eastern transmission line will remain intact and not be fragmented.





**Legend**

- Subject land
- Development site
- Development footprint
- Prescribed impacts
- Black Gum - *Eucalyptus aggregata* (Biosis record)

**Plant Community Type**

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

Figure 12 Prescribed impacts

0 50 100 150 200 250  
Metres  
Scale: 1:6,500 @ A3  
Coordinate System:  
GDA 1994 MGA Zone 56

**biosis**

Matter: 34343, Date: 30 November 2021  
Drawn by: AM, Checked by: PP, Last edited by: amackegard  
Location: P:\34300s\34343\Mapping\34343\_BDAR2020.aprx  
Layout: BDAR\_F12\_PrescribedImpacts



### 6.3 Prescribed impacts

Assessment of prescribed biodiversity impacts are outlined and addressed in Table 22 below and shown in Figure 12.

**Table 22 Assessment of prescribed impacts**

Prescribed impact	Assessment / likelihood of occurrence
<b>Karst, caves, crevices, cliffs, rocks and other geological features of significance</b>	No areas of geological significance occur within the subject land. The development will not impact on threatened species or ecological communities associated with karst, caves, crevices or cliffs.
<b>Occurrences of human-made structures and non-native vegetation</b>	Several human-made structures will be impacted by the development, however no threatened species or communities associated with human-made structures will be impacted by the development. Non-native vegetation has been mapped across the development footprint, however never in sufficient quantities, or suitable locations to provide valuable habitat to threatened species.
<b>Corridors or other areas of connectivity linking habitat for threatened entities</b>	As the subject land is already largely cleared, the removal of 0.93 ha of native vegetation is expected to have a limited impact on the connectivity of threatened species habitat, such as the Black Gum, Purple Copper Butterfly, Large Bent-winged Bat, Eastern Cave Bat, Dusky Woodswallow, Little Eagle Koala, Eastern Pygmy-possum, Greater Glider and Squirrel Glider. Further, a large portion of the development footprint will be subject to underboring and thus the vegetation identified within this area will not be directly removed. The occurrences of habitat connectivity occurs predominantly in east – west bands along drainage lines or roads, and remnant vegetation along Pipers Flat Creek. Vegetation within the proposed eastern transmission line will remain intact and will not be fragmented. All flora and fauna species and ecological communities recorded as present within the subject land rely on habitat connectivity to some degree for persistence. Habitat connectivity is more important for species with reproductive strategies that require movement of individuals or reproductive material through the landscape.
<b>Water bodies or any hydrological processes that sustain threatened entities</b>	The proposed works are not expected to further impact hydrological process within the subject land. Several small dams and ephemeral drainage lines occur within the subject land. The dams appear to be of low foraging quality for fauna as they are highly modified due to the construction, and are heavily degraded due to previous agricultural use of the landscape. Removal of the dams within the development footprint are not considered likely to have a significant or substantial impact on threatened species. The dams within the development footprint will be decommissioned and backfilled as part of the Project and Biosis recommend that a dam dewatering is implemented, whereby all rescued fauna are relocated to adjacent dams and/or waterways. Pipers Flat Creek flows through the development footprint, however, underboring is proposed to be used to install the transmission line under



Prescribed impact	Assessment / likelihood of occurrence
	sensitive areas such as Pipers Flat Creek.
<b>Protected animals that may use the proposed wind farm development site as a flyway or migration route</b>	There are no wind turbines involved in this project.
<b>Where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community</b>	The Project may result in increased vehicle traffic during the construction and, to a lesser extent, during the operational phase of the Project. This increased vehicle traffic has the potential to impact upon native fauna species that are active during the day, and generally with a higher potential for impact in areas where refuge/forage habitat exists immediately adjacent to areas where vehicle movements will occur. However, the majority of the development occurs in locations that are generally already cleared of native vegetation.

## 6.4 Impacts considered uncertain

There are no impacts considered uncertain for the current assessment.

## 6.5 Impacts to Groundwater Dependent Ecosystems (GDE)

Assessment of the potential for the subject land to support GDEs was undertaken using the Australian Government's Bureau of Meteorology Groundwater Dependant Ecosystems Atlas (BOM 2019). The subject land is mapped on the GDE Atlas as containing both Aquatic and Terrestrial GDEs (BOM 2021).

GDEs are defined as ecosystems that require access to groundwater to meet all or some of their water requirements in order to maintain their ecological components and processes. The dependence of GDEs on groundwater varies from seasonal or episodic, to continual. They can range in size from a few square metres to many square kilometres (DPIE 2021).

Impacts to GDEs will occur as a result of the Project through direct removal of vegetation comprising the surface expression of the GDE, and through indirect impact associated with impacts on groundwater through vectors such as drawdown and aquifer interference.

The potential for groundwater dependence has been mapped by the Australian Bureau of Meteorology (BOM) and included in the GDE Atlas. This data has been used to assess the potential for GDEs to be present within and surrounding the impact area, and to determine the PCTs to which these GDEs equate, which are likely to be subject to potential impacts. Two plant communities that are known to be GDEs are mapped as occurring within the development footprint. These include:

- PCT 677 - *Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion*. This vegetation community occurs in a small pocket at the north-west of the development footprint and within the vegetated area east of Brays Lane.
- PCT 732 - *Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion*. This vegetation community occurs in small pockets at the north-west.

The groundwater is considered to be approximately 10 metres below ground level (bgl) where drawdown and aquifer interference are unlikely to be issues. As such it is not expected that the Project will not result in significant groundwater dewatering.



## 6.6 Aquatic habitat impacts relating Fisheries Management Act matters

There are no aquatic habitat impacts relating to the *Fisheries Management Act 1994*.

## 6.7 Impacts to Matters of National Environmental Significance (MNES)

An assessment of the impacts of the Project on Matters of National Environmental Significance (MNES), against heads of consideration outlined in Commonwealth of Australia (2013) was prepared to determine whether referral of the Project to the Commonwealth Minister for the Environment is required. MNES relevant to the Project are summarised in Table 23.

**Table 23 Assessment of the proposed development against the EPBC Act**

Matter of NES	Project specifics	Potential for significant impact
<b>Threatened species</b>	The following threatened species listed under the EPBC Act are predicted/known to occur within the subject land : <ul style="list-style-type: none"><li>• Black Gum (known)</li><li>• Koala (predicted)</li><li>• Purple Copper Butterfly (predicted)</li><li>• Greater Glider (predicted)</li></ul>	Two Black Gum specimens will be removed for the Project, based on the significant population of Black Gum within the broader subject area, it has been deemed that there is no potential for significant impact.  As a result of the Project's design to avoid higher quality vegetation within the subject land it has been deemed that there is no potential for significant impact to Koala, Greater Glider Purple or Copper Butterfly populations.
<b>Threatened ecological communities</b>	There are no TECs recorded within the subject land.	No potential for impact.
<b>Migratory species</b>	Migratory species are unlikely to occur within the subject land given in location in the landscape.	No direct impact is expected to any migratory listed species.
<b>National Heritage Places</b>	There are no National Heritage Places within the subject land.	No potential for impact.
<b>Wetlands of international importance (Ramsar sites)</b>	The closest Important Wetland to the subject land is Towra Point Nature Reserve, which is situated approximately 120 km south-east of the subject land.	No potential for impact.



## 7 Mitigation and management of impacts

Identification of measures to mitigate or manage impacts has been undertaken in accordance with the BAM (DPIE 2020a), including considerations such as:

- Techniques, timing, frequency and responsibility.
- Identification of measures for which there is risk of failure.
- Evaluation of the risk and consequence of any residual impacts.
- Documentation of any adaptive management strategy proposed.

Identification of measures for mitigating impacts related to:

- Displacement of resident fauna.
- Indirect impacts on native vegetation and habitat.
- Mitigating prescribed biodiversity impacts.
- Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain.

**Table 24 Measures to mitigate and manage impacts**

Measures to mitigate and manage impacts	Action	Outcome	Timing	Responsibility
<b><i>Displacement of resident fauna</i></b>	All vegetation is to be inspected immediately prior to removal, by a qualified ecologist, to confirm absence of resident fauna.	No direct impact to resident fauna during vegetation removal.	Immediately prior to vegetation removal.	Qualified ecologist and construction contractor.
<b><i>Indirect impacts on native vegetation and habitat</i></b>	Install appropriate stormwater and erosion controls on site (in accordance with a CEMP) to avoid impacts to nearby waterways via stormwater collection systems	No further degradation to retained vegetation and habitats.	Ongoing/throughout earthworks.	Construction contractor.
	Impacts resulting from light spill can be mitigated by adapting from Part 4 (good lighting design principles) of the Dark Sky Planning Guideline (DPE 2016), including: <ul style="list-style-type: none"> <li>• Installing light fitting shields with an</li> </ul>	No indirect impact to fauna in retained vegetation and habitats.	Ongoing	Construction contractor.



Measures to mitigate and manage impacts	Action	Outcome	Timing	Responsibility
	opaque cover, mounted horizontally across the top of the lighting module. These shielding attachments allow only the downward projection of light. <ul style="list-style-type: none"> <li>• Direct lights downwards and avoid shining directly onto the public amenities, which have the potential to reflect light skywards.</li> <li>• Utilise low beam angles that are close to vertical where possible to minimise light glare.</li> </ul>			
<b>Mitigating prescribed biodiversity impacts</b>	With scope for the required removal of the residing dam, dam dewatering is to be undertaken to ensure that any fauna within the dams is salvaged and relocated (an ecologist would only be required on site when dam water levels are below 1/5 capacity).	No direct impact to resident fauna during dam dewatering.	Immediately prior to dam dewatering.	Qualified ecologist and construction contractor.
<b>Adaptive management strategies proposed to monitor and respond to impacts on biodiversity values that are uncertain</b>	Implementation of an appropriate CEMP during works.	Mitigate risk of impact to environmental controls during project construction.	Ongoing/throughout earthworks.	Construction contractor.

## 7.1 Adaptive management strategy

Construction and operational management plans will contain an adaptive management component. Adaptive management strategies will be receptive to any new and relevant data that may arise through ongoing assessment and monitoring and are key to the successful implementation of crucial objectives yet also allow flexibility to changing dynamics and ongoing feedback and results. This includes measures to monitor predicted and uncertain impacts which will trigger adaptive management actions and allow for effective and quick responses.



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## 8 Impact summary

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### 8.1 TECs and threatened species

This section outlines the impact summary for the Project which has identified and assessed impacts on TECs and threatened species that are at risk of a Serious and Irreversible Impact (SAIL) including:

- Addressing all criteria for each TEC listed as at risk of an SAIL present on the subject land.
- Addressing all criteria for each threatened species at risk of an SAIL present on the subject land.
- Documenting assumptions made and/or limitations to information.
- Documenting all sources of data, information, references used or consulted.
- Clearly justifying why any criteria could not be addressed.
- Identification of impacts requiring offset.
- Identification of impacts not requiring offset.
- Identification of areas not requiring offset.

Figure 13 shows the location of impacts requiring offset, impacts not requiring offset and areas not requiring assessment.

### 8.2 Serious and irreversible impacts

In accordance with Clause 6.7 of the BC Regulation an impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct because:

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

No vegetation communities or threatened species are considered to meet the above principles.



## 8.3 Identification of impacts requiring offset

### 8.3.1 Impacts to native vegetation (ecosystem credits)

As outlined in Section 9.2.1 of the BAM, 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:

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

On this basis, offsets are required for four vegetation zones as it has a vegetation integrity score greater than 20.

The offset requirement for the Project was calculated using the BAM Calculator. Table 25 provides a summary of the ecosystem credit offsets required for impacts from proposed development at the subject land.

**Table 25 Offsets required (ecosystem credits)**

Vegetation zone	Area (ha)	Impact	VI score	Offset required	TEC	HBTs	Credit requirement
677_Low		0.3	46.9	Yes	No	1	1
677_Moderate		0.23	51.9	Yes	No	1	7
732_Moderate		0.67	83.6	Yes	No	1	24
732_NOG		10.7	0.2	No	No	0	0

### 8.3.2 Impacts to threatened species and their habitat

As outlined in Section 9.2.2 of the BAM, an offset is also required for the impacts of the proposal on the habitat of threatened species assessed for ecosystem credits and associated with a PCT in a vegetation zone with a vegetation integrity score of  $\geq 17$ .

The offset requirement for the Project was calculated using the BAM Calculator. Table 26 provides a summary of the species credit offsets required for impacts from Project at the subject land.

**Table 26 Offsets required (species credits)**

Vegetation zone	Species	Habitat condition (vegetation integrity score) loss	Area (ha) / individuals	Biodiversity risk weighting	Credit requirement
677 Moderate	Black Gum	- 51.9	2 individuals	2	4
732 Moderate	Squirrel Glider	- 83.6	0.67 ha	2	28
732 Moderate	Koala	- 83.6	0.67 ha	2	28



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Species polygons for the above 60 species credit species impacted by the Project are illustrated in Figure 13 below. Habitat for Koala, Squirrel Glider, Eastern Pygmy Possum and Purple Copper Butterfly has been avoided through project design, polygons for these species are shown on Figure 13, illustrating avoidance.

#### **8.4 Identification of impacts not requiring offset**

Following assessment the following impacts do not require offsetting in accordance with BAM:

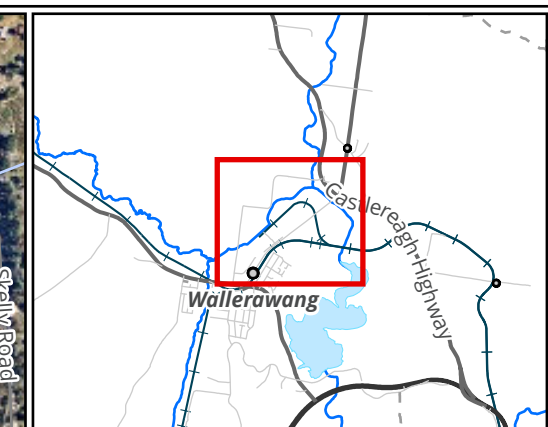
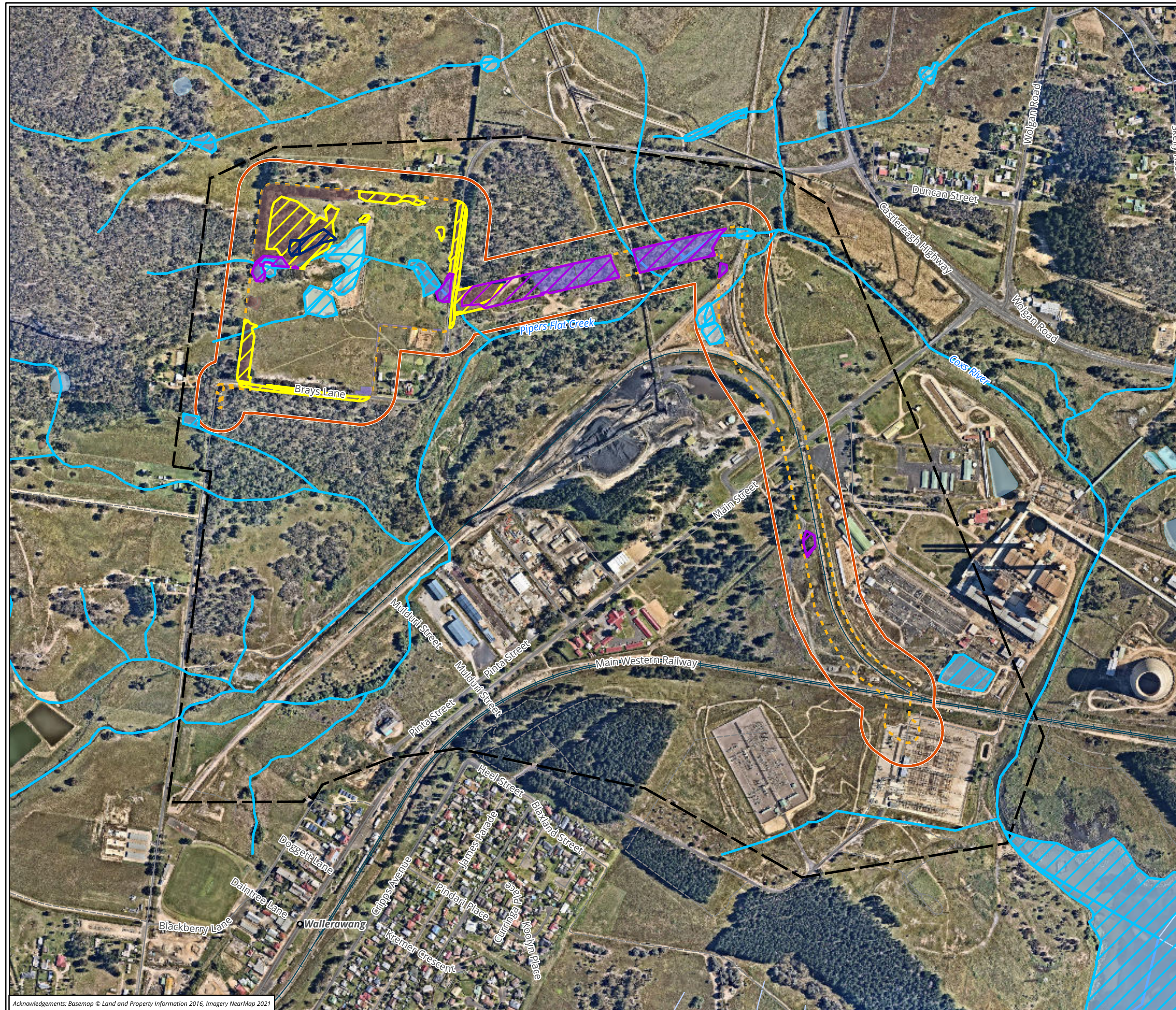
- Removal of 10.7 ha of NOG not requiring offsets.

#### **8.5 Identification of areas not requiring assessment**

Following assessment the following areas do not require assessment in accordance with BAM:

- Removal of 4.55 ha of cleared land/urban native exotic





#### Legend

- Subject land
- Development site
- Development footprint
- Indirect impacts**
- Purple Copper Butterfly habitat
- Black Gum habitat
- Squirrel Glider, Greater Glider, Eastern Pygmy-possum, and Koala habitat
- Waterways
- 677 - Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion
- 732 - Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion

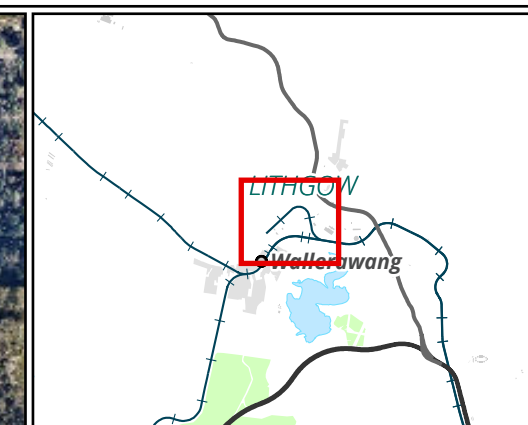
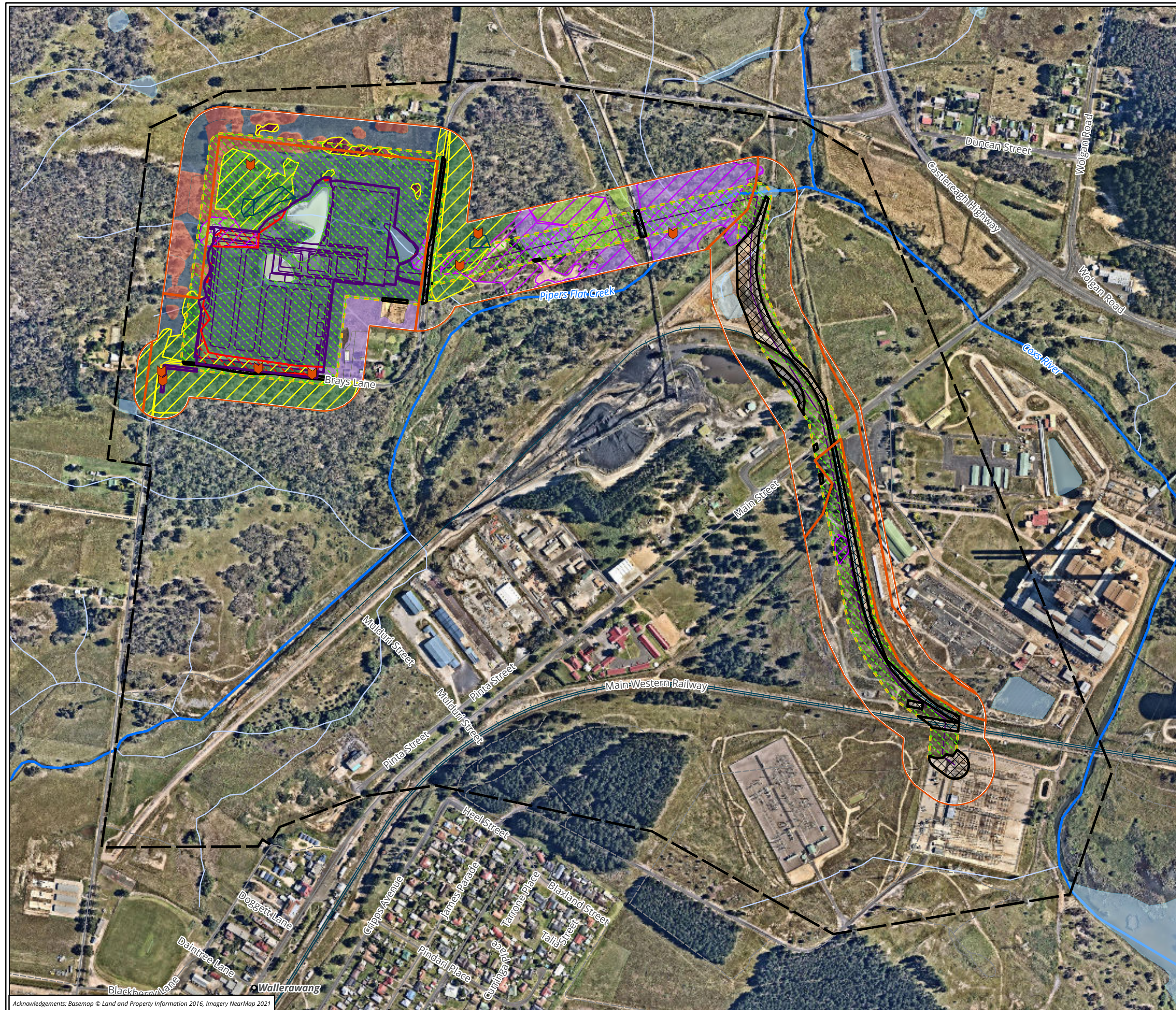
**Figure 13 Estimated zones of indirect impact for the proposal**

0 60 120 180 240 300  
Metres  
Scale: 1:7,500 @ A3  
Coordinate System:  
GDA 1994 MGA Zone 56



Matter: 34343, Date: 14 February 2022,  
GIS: AM, Checked by: PP, Last edited by: amackegard  
Location: P:\34300s\34343\Mapping\34343\_BDAR2020\_part2.aprx  
Layout: 34343\_F13\_IndirectImpact





#### Legend

- Subject land
- Development site
- Development footprint
- Impacts requiring offset diss
- Impacts not requiring offset
- Area not requiring assessment
- Construction footprint
- Hollow-bearing tree
- Black Gum habitat
- Squirrel Glider, Greater Glider, Eastern Pygmy-possum, and Koala habitat
- Purple Copper Butterfly habitat

#### Vegetation Zones

- 677-Low
- 677-Moderate
- 732-Low
- 732-Moderate
- 732-NOG
- 732-Scattered Trees

**Figure 14 Impacts requiring offset**

0 50 100 150 200 250

Metres

Scale: 1:6,500 @ A3

Coordinate System:

GDA 1994 MGA Zone 56



Matter: 34343, Date: 30 November 2021  
GIS: AM, Checked by: PP, Last edited by: amackegard  
Location: P:\34300s\34343\Mapping\34343\_BDAR2020\_F14Offsets.aprx  
Layout: 34343\_F14\_Offset



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## 9 Biodiversity credit report

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Offsetting through the transfer and retirement of biodiversity credits, or paying into the BCT Offset Fund, is required for the current assessment for impacts to three vegetation zones at the subject land. A biodiversity credit report is provided on the following pages.



## Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00024080/BAAS18089/21/00024081	Confidential Lithgow SSD Southern Easement	24/11/2021
Assessor Name	Report Created	BAM Data version *
Paul Price	24/02/2022	50
Assessor Number	BAM Case Status	Date Finalised
BAAS18089	Finalised	24/02/2022
Assessment Revision	Assessment Type	
0	Major Projects	

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

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAI	Ecosystem credits
<b>Black Gum grassy woodland of damp flats and drainage lines of the eastern Southern Tablelands, South Eastern Highlands Bioregion</b>												
1	677_Low	Not a TEC	46.9	46.9	0.03		High Sensitivity to Potential Gain			2.50		1



# BAM Credit Summary Report

2	677_mode rate	Not a TEC	51.9	51.9	0.23		High Sensitivity to Potential Gain			2.50		7
											<b>Subtotal</b>	<b>8</b>
<b>Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion</b>												
3	732_Mode rate	Not a TEC	83.6	83.6	0.67		High Sensitivity to Potential Gain			1.75		24
4	732_NOG	Not a TEC	0.2	0.2	10.7		High Sensitivity to Potential Gain			1.75		0
											<b>Subtotal</b>	<b>24</b>
											<b>Total</b>	<b>32</b>

## Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAI	Species credits
<b><i>Eucalyptus aggregata</i> / Black Gum ( Flora )</b>									
677_moderate	N/A	N/A	2			Vulnerable	Vulnerable	False	4
677_Low	N/A	N/A	0			Vulnerable	Vulnerable	False	0
<b>Subtotal</b>									<b>4</b>



## BAM Credit Summary Report

<b><i>Petaurus norfolcensis / Squirrel Glider ( Fauna )</i></b>									
732_Moderate	83.6	83.6	0.67			Vulnerable	Not Listed	False	28
								<b>Subtotal</b>	<b>28</b>
<b><i>Phascolarctos cinereus / Koala ( Fauna )</i></b>									
732_Moderate	83.6	83.6	0.67			Vulnerable	Vulnerable	False	28
								<b>Subtotal</b>	<b>28</b>



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## References

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## Appendices

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## Appendix 1 Survey methods

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### Appendix 1.1 Nomenclature

The flora taxonomy (classification) used in this report follows the most recent Flora of NSW (Harden 1992, Harden 1993, Harden 2000, Harden 2002). All doubtful species names were verified with the on-line Australian Plant Name Index (Australian National Botanic Gardens 2007). Flora species, including threatened species and introduced flora species, are referred to by both their common and then scientific names when first mentioned. Subsequent references to flora species cite the common names only, unless there is no common name, for which scientific name will be used. Common names, where available, have been included in threatened species tables and the complete flora list in Appendix 3.

Names of vertebrates follow the Census of Australian Vertebrates (CAVs) maintained by the DEE (DSEWPaC 2009). In the body of this report vertebrates are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only.

### Appendix 1.2 Permits and licences

The flora and fauna assessment was conducted under the terms of Biosis' Scientific Licence issued by EES (SL100758, expiry date 31 March 2022). The BAM Assessment and quality review of the BDAR was carried out by Accredited Assessor Paul Price (BAAS18089) and overseen by Accredited Assessor Rebecca Dwyer (BAAS17067).

### Appendix 1.3 Limitations

Field surveys were undertaken in accordance with the BAM. Ecological surveys provide a sampling of flora and fauna at a given time and season. Factors influencing detectability of species during survey include species dormancy, seasonal conditions, ephemeral status of waterbodies, and migration and breeding behaviours of some fauna. In many cases, these factors do not present a significant limitation to assessing the overall biodiversity values of a site.

The field surveys were conducted in autumn, winter and spring. The range of survey seasons is considered substantial and suitable to determine the presence of a wide range of threatened flora species. All targeted flora and fauna surveys were completed within the allowable survey periods according to the TBDC.

Surveys undertaken, combined with habitat assessments and desktop analysis are considered sufficient to reach the conclusions herein in regards to this and all other species' likelihood of occurrence within the subject land.

Database searches, and associated conclusions on the likelihood of species to occur within the assessment area, are reliant upon external data sources and information managed by third parties.



## Appendix 2 BAM Candidate species assessment

Table A. 1 Threatened flora species assessment

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
<b><i>Eucalyptus aggregata</i></b> <b>Black Gum</b>	V	V	Yes	Small to medium sized woodland tree that grows in the wetter, cooler areas of the Southern Highlands on the lowest parts of the landscape in poorly drained flats and hollows adjacent to creeks and small rivers. Associated with a variety of communities including Eastern Riverine Forests, Montane Bogs and Fens, Temperate Montane Grasslands, Subalpine Woodlands and Southern Tableland Wet Sclerophyll Forest. Grows in alluvial soils.	High	Yes	Yes - targeted survey undertaken March 2021.	Yes	A population of this species was identified within the subject land. A total of 258 individuals were recorded.
<b><i>Eucalyptus pulverulenta</i></b> <b>Silver-leafed Gum</b>	V	V	Yes	Mallee or small tree that grows as an understorey plant in a variety of communities including Upper Riverina Dry Sclerophyll Forests, Southern Tableland Dry Sclerophyll Forests, Southern Tableland	Negligible	No	No	No	This species has been previously recorded on 2 occasions within 10 km of the subject land, with closest record being 2 km from the subject land. Potential habitat for this species in the development footprint is not



Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				Grassy Woodlands and Tableland Clay Grassy Woodlands. Grows in shallow, infertile soils.					present, as the species predominantly grows in rocky areas. Suitable habitat is not present within the subject land. In addition, all <i>Eucalyptus</i> species were mapped during targeted survey for Black Gum, and no individuals of Silver-leafed Gum were identified during targeted flora surveys.
<b><i>Leucochrysum albicans</i> var. <i>tricolor</i></b> <b>Hoary Sunray</b>	E	-	Yes	Small perennial herb that grows in disturbed areas and inter-tussock spaces in grasslands, woodlands and forests. Grows in a variety of soils including clays, clay loams, stony and gravelly.	Moderate	No	Yes – targeted survey undertaken November 2021.	No	This species has been not been previously recorded within 10 km of the subject land. Whilst limited potential habitat for this species in the subject land is present, it was not was identified during targeted flora surveys.
<b><i>Prasophyllum petilum</i></b> <b>Tarengo Leek Orchid</b>	E	E	No	Terrestrial orchid found growing in open sites and patchy forest in Natural Temperate Grassland, Box-Gum Woodlands, Temperate Montane Grasslands, Southern Tableland Grassy Woodlands, Subalpine Woodlands, Tableland Clay Grassy Woodlands, Western Slopes Grassy Woodlands. This species	Moderate	No	Yes – targeted survey undertaken November 2021.	No	This species has been not been previously recorded within 10 km of the subject land. Whilst limited potential habitat for this species in the subject land is present, it was not was identified during targeted flora surveys.



Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				is cryptic and most visible when flowering between October and December. Grows in fertile soils.					
<b><i>Swainsona sericea</i></b> <b>Silky Swainson-pea</b>	V	-	No	Prostrate or erect perennial, growing to 10 cm tall. Has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. There is one isolated record from the far north-west of NSW. Its stronghold is on the Monaro. Also found in South Australia, Victoria and Queensland. Found in Natural Temperate Grassland and Snow Gum Woodland on the Monaro. Also found in Box-Gum Woodland in the Southern Tablelands and South West Slopes.	Moderate	No	Yes – targeted survey undertaken November 2021.	No	This species has been not been previously recorded within 10 km of the subject land. Whilst limited potential habitat for this species in the subject land is present, it was not was identified during targeted flora surveys.
<b><i>Thesium australe</i></b> <b>Austral Toadflax</b>	V	V	Yes	Small, straggling herb and root parasite found growing on damp sites in grassland, grassy woodlands and coastal headlands often in association with Kangaroo Grass <i>Themeda triandra</i> in a variety of	Low	No	Yes – targeted survey undertaken November 2021.	No	This species has been previously recorded on 4 occasions within 10 km of the subject land, with closest record being 4.2 km from the subject land. Whilst marginal potential habitat for this species is located with the



Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPBC	BC							
				communities including New England Dry Sclerophyll Forests, Western Slopes Grasslands, Northern Tableland Wet Sclerophyll Forests, Brigalow Clay Plain Woodlands, Subalpine Woodlands and Maritime Grasslands.					transmission line corridor, the species not recorded during targeted flora surveys.
<b><i>Veronica blakelyi</i></b>	-	V	Yes	Occurs in eucalypt forest, often in moist and sheltered areas. Associated canopy species include <i>Eucalyptus dives</i> , <i>E. dalrympleana</i> , <i>E. rossii</i> and <i>E. pauciflora</i> . The species appears to re-sprout after fire, although an optimal fire regime (frequency, intensity, etc) is unknown.	Low	No	Yes – targeted survey undertaken November 2021.	No	This species has been previously recorded on 7 occasions within 10 km of the subject land, with closest record being approximately 3.2 km from the subject land. Whilst potential habitat for this species in the development footprint is present, no specimens were identified during targeted flora surveys.



**Table A. 2 Threatened fauna species assessment**

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
<b><i>Anthochaera Phrygia</i></b> <b>Regent Honeyeater</b>	CE	CE	Yes	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. Once recorded between Adelaide and the central coast of Queensland, its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years flocks converge on flowering coastal	Moderate	No	No	Low	May forage on occasion as part of large broad-scale movements, however, the subject land is not within mapped important areas.



Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				woodlands and forests. The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks. Also nests in mistletoe haustoria (DPIE 2020c). This species is relevant to the Cumberland and Wollemi IBRA subregions.					
<b><i>Aprasia parapulchella</i></b> <b>Pink-tailed Legless Lizard</b>	V	V	No	Fossorial species, which lives beneath surface rocks and occupies ant burrows. It feeds on ants, particularly their eggs and larvae. Thought to lay eggs within the ant nests under rocks that it uses as a source of food and shelter. Key habitat features are a cover of native grasses, particularly Kangaroo Grass ( <i>Themeda australis</i> ),	Low	No	No	Low	The subject land provides limited surface rock with no areas of outcropping. The subject land does not contain microhabitats required by this species and as such the species is unlikely to utilise the subject land.



Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				sparse or no tree cover, little or no leaf litter, and scattered small rock with shallow embedment in the soil surface.					
<b><i>Botaurus poiciloptilus</i></b> <b>Australasian Bittern</b>	E	E	No	The Australasian Bittern is distributed across south-eastern Australia. Often found in terrestrial and estuarine wetlands, generally where there is permanent water with tall, dense vegetation including <i>Typha</i> sp. and <i>Eleocharis</i> sp. Typically this bird forages at night on frogs, fish and invertebrates, and remains inconspicuous during the day. The breeding season extends from October to January with nests being built amongst dense vegetation on a flattened platform of reeds.	Low	No	No	Low	The waterways and dams within the subject land are impacted by exotic grasses and livestock grazing. Potentially suitable waterways do not contain dense fringing or emergent aquatic vegetation, no records exist of this species within 10 km. The subject land does not contain microhabitats required by this species and as such the species is unlikely to utilise the subject land.
<b><i>Calidris ferruginea</i></b> <b>Curlew Sandpiper</b>	CE	E	No	Inhabits sheltered intertidal mudflats. Also non-tidal swamps, lagoons and lakes near	Low	No	No	N/A	There is no suitable habitat within the subject land for wading/ shorebird species.



Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				the coast. Infrequently recorded inland.					
<b><i>Callocephalon fimbriatum</i></b> <b>Gang-gang Cockatoo</b>		V	Yes	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.	Low	No	No	Low	No suitable hollows occur within the subject land. Areas adjacent to the subject land contained large hollows, however, these were considered of low quality for nesting due to the vertical position of the entrance which provides limited shelter from the weather. The subject land does not contain suitable microhabitats required for breeding by this species and therefore is unlikely to occur except on occasion as part of foraging or dispersal movements.
<b><i>Calyptorhynchus lathami</i></b> <b>Glossy Black-Cockatoo</b>		V	Yes	Inhabits forest with low nutrients, characteristically with key <i>Allocasuarina</i> species. Tends to prefer drier forest types. Often confined to remnant	Low	No	No	Low	No suitable hollows occur within the subject land. Areas adjacent to the subject land contained large hollows, however, these were

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead.					considered of low quality for nesting due to the vertical position of the entrance which provides limited shelter from the weather. The subject land does not contain suitable microhabitats required for breeding by this species and therefore is unlikely to occur except on occasion as part of foraging or dispersal movements.
<b><i>Cercartetus nanus</i></b> <b>Eastern Pygmy-possum</b>		V	Yes	Patchily distributed from the coast to the Great Dividing Range, and as far as Pillaga, Dubbo, Parkes and Wagga Wagga on the western slopes. Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Soft fruits are eaten when flowers are unavailable and it also feeds on insects. Will often nest in tree	Moderate	Yes	Presence assumed	Moderate	The north-west section of the subject land (PCT 732) contains potential low quality habitat for this species. Habitat is considered low quality due to the presence of hollows, limited understorey shrubby species and history of grazing of the land. The remainder of the subject land is degraded through exotic weed invasion and does not provide suitable microhabitat features (shrubby



Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				hollows, but can also construct its own nest. Because of its small size it is able to utilise a range of hollow sizes including very small hollows. Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5 ha area over a 5 month period.					understorey with foraging/nesting resources) to support the species.  The study area provides marginal habitat due to a low density of hollows and relatively degraded understorey lacking an abundance of foraging resources for this species. Records of this species in the locality occur in Newnes State Forest to the east.
<b><i>Chalinolobus dwyeri</i></b> <b>Large-eared Pied Bat</b>	V	V	Yes	Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands. Forages on small, flying insects below the forest canopy. Roosts in colonies of between 3 and 80 in caves, Fairy Martin nests and mines, and beneath rock overhangs, but usually less than 10 individuals. Likely that it hibernates during the cooler months. The only	High	Yes	Targeted survey.	Low	Rocky outcrop and escarpments associated with the Great Dividing Range east of the subject land, occur within 2 kilometres of the development footprint and provide suitable roosting habitat for this species. Given the proximity of the subject land to suitable habitat features it is likely this species occurs on occasion as part of dispersal and foraging movements. This

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				known existing maternity roost is in a sandstone cave near Coonabarabran.					species was recorded during targeted survey. However, the subject land is not within 100 metres of suitable roosting habitat and therefore the proposed works will not impact on breeding habitat for this species (OEH 2018).
<b><i>Dasyurus maculatus</i></b> <b>Spotted-tailed Quoll</b>	E		No	Quolls use hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites. Use communal 'latrine sites', often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks. Such sites may be visited by multiple individuals and can be recognised by the accumulation of the sometimes characteristic 'twisty-shaped' faeces deposited by animals.	Moderate	No	No	Low	Woody debris is limited in the subject land and dense shrubs/understorey are lacking across the impact area. No potential den sites were identified during the field assessment. The species is likely to forage across the subject land and may occur on occasion but is unlikely to be impacted by the proposed works.
<b><i>Grantiella picta</i></b>	V	V	No	Found mainly in dry open woodlands and forests, where it	Low	No	No	Low	No mistletoe were recorded within the impact area and this



Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
<b>Painted Honeyeater</b>				is strongly associated with mistletoe. Often found on plains with scattered eucalypts and remnant trees on farmlands.					species is unlikely to occur within the subject land except on occasion as part of dispersal movements.
<b>Haliaeetus leucogaster</b> <b>White-bellied Sea-Eagle</b>		V	Yes	A migratory species that is generally sedentary in Australia, although immature individuals and some adults are dispersive. Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans and carrion. Roosts and makes nest in trees.	Low	No	No	Low	No large stick nests were recorded during field investigation within or immediately adjacent to the impact area.
<b>Heleioporus australiacus</b> <b>Giant Burrowing Frog</b>	V	V	Yes	Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creeks. Can also occur within shale outcrops within sandstone formations. Known from wet	Low	No	No	Low	This species is associated with hanging swamps on sandstone shelves adjacent to perennial non-flooding streams. The subject land does not support essential micro-habitat features

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				and dry forests and montane woodland in the southern part range. Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water. Spends the majority of its time in non-breeding habitat 20-250m from breeding sites.					required by this species. Waterways within the subject land are degraded by land clearing and livestock presence and are not suitable for this species.
<b><i>Hieraaetus morphnoides</i></b> <b>Little Eagle</b>		V	Yes	The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species. It has often been recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland and forests.	Low	No	No	Low	No large stick nests were present during field investigation in the breeding season. This species may forage on occasion as part of a large home range but is unlikely to be impacted by the proposed works.
<b><i>Hirundapus caudacutus</i></b>	V		No	An aerial species found in feeding concentrations over	Low	No	No	Low	Species migrates to Australia and is often seen from October



Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
<b>White-throated Needletail</b>				cities, hilltops and timbered ranges. Breeds in Asia.					to April. White-throated Needletail forages aerially on insects and is more common in coastal areas, however this species may occur on occasion in the subject land. The proposed works are not likely to impact on the species as no breeding habitat will be impacted and aerial foraging will not be impacted.
<b><i>Hoplocephalus bungaroides</i></b> <b>Broad-headed Snake</b>	V	E	Yes	Mainly occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer.	Low	No	No	Low	The subject land does not support essential micro-habitat features as there is no rocky outcrops, surface rock or suitable escarpments.
<b><i>Lathamus discolor</i></b>	CE	E	Yes	The Swift Parrot occurs in	Low	No	No	Low	Highly mobile species foraging

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
Swift Parrot				woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> . Commonly used lerp infested trees included Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> . This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.					across large areas of New South Wales and breeding in Tasmania. The subject land is not within any mapped important areas for this species and as such the proposed works are not likely to have an impact to the species.
<i>Litoria booroolongensis</i>	E	E	Yes	The species is found in upland	Low	No	No	Low	The subject land contains one



Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
<b>Booroolong Frog</b>				rivers, montane creeks and lowland rivers and creeks, particularly in permanent rocky western-flowing streams and rivers on the slopes and tablelands of NSW, with some fringing vegetation cover such as ferns, sedges or grasses. The Booroolong Frog is often found in daylight on rocks by the water's edge or sheltering under rocks or amongst vegetation. Breeding occurs in spring and early summer when eggs are laid in submerged rock crevices. Tadpoles develop in slow-flowing connected or isolated pools and metamorphose in late summer to early autumn.					waterway and multiple farm dams. The subject land occurs at the base of the foothills of the western side of the Blue Mountains. The waterway in the subject land is impacted by historic clearing of the surrounding area for livestock grazing and does not contain significant rocky features (outcropping, boulders etc). The subject land does not contain microhabitats required by this species and as such the species is unlikely to utilise the subject land.
<b><i>Litoria littlejohni</i></b> <b>Littlejohn's Tree Frog</b>	V	V	Yes	Occurs in wet and dry sclerophyll forests and heath communities associated with sandstone outcrops between 280 and 1000 m. Littlejohn's Tree Frog prefers permanent					The subject land contains one waterway and multiple farm dams. The waterway in the subject land is impacted by historic clearing of the surrounding area for livestock

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				and semi-permanent rock flowing streams, but individuals have also been collected from semi-permanent dams with some emergent vegetation. Forages both in the tree canopy and on the ground, and has been observed sheltering under rocks on high exposed ridges during summer. The species breeds in autumn but will also breed after heavy rainfall in spring and summer. The species has been recorded calling in all seasons with variously reported peak calling periods. Eggs are laid in loose gelatinous masses attached to submerged twigs; eggs and tadpoles are most often recorded in slow-flowing pools that receive extended exposure to sunlight.					grazing and does not contain significant rocky features (outcropping, boulders etc). The subject land does not contain microhabitats required by this species and as such the species is unlikely to utilise the subject land.
<b><i>Lophoictinia isura</i></b> <b>Square-tailed Kite</b>		V	Yes	Typically inhabits coastal forested and wooded lands of tropical and temperate	Moderate	Yes	Yes	Low	No large stick nests were observed during field survey, conducted during the breeding



Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				Australia. In NSW it is often associated with ridge and gully forests dominated by <i>Eucalyptus longifolia</i> , <i>Corymbia maculata</i> , <i>E. elata</i> , or <i>E. smithii</i> . Individuals appear to occupy large hunting ranges of more than 100 km <sup>2</sup> . They require large living trees for breeding, particularly near water with surrounding woodland/forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.					period.
<b><i>Macquaria australasica</i></b> <b>Macquarie Perch</b>	E		No	Macquarie perch are found in both river and lake habitats, especially the upper reaches of rivers and their tributaries.	Low	No	No	Low	No recent records within the locality, microhabitats required are absent and habitat is degraded to the point the species is unlikely to use the subject land.
<b><i>Miniopterus orianae oceanensis</i></b>		V	Yes	Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and	Moderate	Yes	Targeted survey	Low	Rocky outcrop and escarpments associated with the Great Dividing Range east of

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
<b>Large Bent-winged Bat</b>				summer. Individuals may fly several hundred kilometres to their wintering sites, where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways.					the subject land, occur within 2 kilometres of the development footprint and provide suitable roosting habitat for this species. Given the proximity of the subject land to suitable habitat features it is likely this species occurs on occasion as part of dispersal and foraging movements. This species was recorded during targeted survey. However, the subject land is not within 100 metres of suitable roosting habitat and therefore the proposed works will not impact on breeding habitat for this species (OEH 2018).
<b><i>Ninox connivens</i> Barking Owl</b>		V	Yes	Generally found in open forests, woodlands, swamp woodlands, farmlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country. Territories are typically 2000 ha	Low	No	No	Low	Areas adjacent to the development footprint contain large hollows, however these are not considered suitable for use by Barking Owl as entrances are vertical, in broken limbs and trunks. The subject



Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				in NSW habitats. Hunts small arboreal mammals or birds and terrestrial mammals when tree hollows are absent.					land does not contain microhabitats required by this species and as such the species is unlikely to utilise the subject land.
<b><i>Ninox strenua</i></b> <b>Powerful Owl</b>		V	Yes	The Powerful Owl occupies wet and dry eucalypt forests and rainforests. It may inhabit both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm. It has a large home range of between 450	Low	No	No	Low	Areas adjacent to the development footprint contain large hollows, however these are not considered suitable for use by Powerful Owl as entrances are vertical, in broken limbs and trunks. The subject land does not contain microhabitats required by this species and as such the species is unlikely to utilise the subject land.

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				and 1450 ha.					
<b><i>Numenius madagascariensis</i></b> <b>Eastern Curlew</b>	CE		No	Occurs in sheltered coasts, especially estuaries, embayments, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats often with beds of seagrass.	Low	No	No	N/A	The subject land does not contain habitat suitable for this species.
<b><i>Paralucia spinifera</i></b> <b>Purple Copper Butterfly,</b> <b>Bathurst Copper Butterfly</b>	V	E	Yes	Commonly found in open woodland or open forest with a sparse understorey dominated by Blackthorn ( <i>Bursaria spinosa</i> subsp. <i>lasiophylla</i> ). Found in locations above 850 m altitude and is associated with exposure to full day sun, often with a west to north aspect. Also associated with extremes of cold.	Moderate	Yes	Species assumed present based on presence of suitable habitat.	Low	Impacts to areas containing suitable habitat have been avoided.
<b><i>Petauroides volans</i></b> <b>Greater Glider</b>	V		No	The distribution of the Greater Glider includes the ranges and coastal plain of eastern Australia, where it inhabits a variety of eucalypt forests and woodlands. Presence and	Moderate	Yes	Assumed present.	Moderate	Suitable foraging habitat exists in the north-west of the subject land. The subject land does not contain a high density of large hollows and connected vegetation to the west provides



Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				density of Greater Gliders is related to soil fertility, eucalypt tree species, disturbance history and density of suitable tree hollows. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe.					larger more intact habitat. The species has been assumed present in the north-west of the subject land in PCT 732, impacts to this habitat have been avoided.
<b><i>Petaurus norfolcensis</i></b> <b>Squirrel Glider</b>		V	Yes	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria that habits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range	High	Yes	Yes	Moderate	Suitable foraging habitat exists in the north-west of the subject land. The subject land does not contain a high density of large hollows and connected vegetation to the west provides larger more intact habitat. The species has been assumed present in the north-west of the subject land in PCT 732, impacts to this habitat have been avoided.
<b><i>Petrogale penicillata</i></b> <b>Brush-tailed Rock-wallaby</b>	V	E	Yes	Habitats range from rainforest to open woodland. It is found in areas with numerous ledges, caves and crevices particularly with northern aspects. The	Low	No	No	Low	The subject land does not contain rocky outcrops, escarpments or steep slopes. No suitable habitat occurs within the subject land for this

Species	Status		BAM predicted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				species forages on grasses and forbs.					species.
<b><i>Phascogale tapoatafa</i></b> <b>Brush-tailed Phascogale</b>		V	Yes	The Brush-tailed Phascogale had a scattered distribution centred around the Great Dividing Range. It prefers open forests with a sparse ground cover, but also inhabits mallee and rainforests. It feeds on insects and nectar, particularly in rough-barked trees. Nests and shelters in tree hollows, tree stumps and occasionally birds nests, and can use more than 40 nests in a year.	Low	Yes	No	Low	No records exist within 20 km of the subject land and this species is mainly found east of the Great Dividing Range. Suitable hollows occur within the subject land, however, the subject land does not contain a high density of hollows for use by this species which typically use a large number of nest sites. Spotlight survey did not detect this species, therefore this species is considered unlikely to occur in the subject land.
<b><i>Phascolarctos cinereus</i></b> <b>Koala</b>	V	V	yes	Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. Primary feed trees include <i>Eucalyptus robusta</i> , <i>E. tereticornis</i> , <i>E. punctata</i> , <i>E. haemostoma</i> and <i>E. signata</i> . They are solitary with	Moderate	No	Yes	Low	Potential habitat for this species occurs in the north-west of the subject land. No impacts will occur to the vegetation as a part of the Project. Spotlight and call back survey did not detect this species, therefore



Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
				varying home ranges.					this species is considered unlikely to occur in the subject land.
<b><i>Pseudomys novaehollandiae</i></b> <b>New Holland Mouse</b>	V		No	Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes. The home range of the New Holland Mouse can range from 0.44 ha to 1.4 ha. The New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals. The species is nocturnal and omnivorous, feeding on seeds, insects, leaves, flowers and fungi. It is likely that the species spends considerable time foraging above-ground for food. Breeding typically occurs between August and January, but can extend into autumn.	Low	No	No	Low	Habitat within the subject land is not suitable for this species as soil is alluvial clays and historical clearing has removed much of the mid-storey and native ground cover. Livestock grazing further impacts the suitability of land for this species due to compaction by hooved animals. No known populations occur within 10 km of the subject land.

Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
<i>Pteropus poliocephalus</i> <b>Grey-headed Flying-fox</b>	V	V	Yes	Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies, commonly in dense riparian vegetation.	Moderate	No	No	Low	No camps or individuals were recorded in the subject land or immediately adjacent during field investigations. May forage across the subject land on occasion on flowering eucalyptus species but it is not considered essential foraging habitat for this species. As such, a Significant Impact Criteria (SIC) assessment has not been completed for this species.
<i>Rostratula australis</i> <b>Australian Painted Snipe</b>	E	E	No	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, but have been recorded in brackish waters. Forages on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.	Low	No	No	No	The subject land does not provide suitable areas for foraging or breeding by this species.
<i>Tyto novaehollandiae</i>		V	Yes	The Masked Owl is found in range of wooded habitats that	Low	No	No	Low	No hollows suitable for breeding for this species were



Species	Status		BAM predic ted SCS	Habitat description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Candidate species rationale
	EPB C	BC							
<b>Masked Owl</b>				provide tall or dense mature trees with hollows suitable for nesting and roosting. It is mostly seen in open forests and woodlands adjacent to cleared lands. Prey includes hollow-dependent arboreal marsupials and terrestrial mammals.					<p>recorded within the subject land or immediately adjacent to the subject land. Large hollows recorded adjacent to the subject land will not be impacted and are not considered suitable for use due to the vertical position of entrances.</p> <p>Underboring in areas adjacent to where large hollows occur will provide temporary disturbance to these areas and is not expected to interrupt potential nest sites unless conducted during the breeding season.</p>

## Appendix 3 Flora

### Appendix 3.1 BAM plot field data

Table A. 3 Flora species recorded in the subject land from BAM plots

Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
		Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
<i>Acacia dealbata</i>	Silver Wattle			0.1	5										
<i>Acaena novae-zelandiae</i>	Bidgee-widgee	0.2	100	0.1	50										
<i>Acetosella vulgaris</i>	Sheep Sorrel					0.1	10	0.1	100					0.2	1000
<i>Agrostis capillaris</i>	Browntop Bent					2	1000	15	3000	10	1000	10	1000		
<i>Anthosachne scabra</i>	Wheatgrass, Common Wheatgrass	0.3	100												
<i>Anthoxanthum odoratum</i>	Sweet Vernal Grass									0.5	100			40	5000
<i>Aristida ramosa</i>	Purple Wiregrass									0.1	10				
<i>Asperula conferta</i>	Common Woodruff			0.1	30										
<i>Bromus catharticus</i>	Praire Grass													1	60
<i>Bossiaea buxifolia</i>						0.1	20								
<i>Bursaria spinosa</i> subsp. <i>lasiophylla</i>	Native Blackthorn					5	20								



Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
		Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
<i>Carex appressa</i>	Tall Sedge	0.1	2	0.2	5										
<i>Carex inversa</i>	Knob Sedge	0.1	100	0.2	1000	0.2	1000							0.1	30
<i>Cassinia aculeata</i>	Dolly Bush					0.1	1								
<i>Cassinia sifton</i>						0.1	1			0.3	5	0.1	1		
<i>Centaurium tenuiflorum</i>	Branched Centaury, Slender centaury	0.1	10	0.1	1	0.1	10	0.1	10					0.1	20
<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	Rock Fern					0.1	30								
<i>Chrysocephalum apiculatum</i>	Common Everlasting	0.1	10												
<i>Chrysocephalum semipapposum</i>	Clustered Everlasting	0.1	10												
<i>Cirsium vulgare</i>	Spear Thistle	0.1	2	0.1	10	0.1	1							0.2	30
<i>Conyza bonariensis</i>	Flaxleaf Fleabane	0.1	100	0.1	20	0.1	10			0.1	2			0.1	20
<i>Coronidium rutidolepis</i>								0.1	10						
<i>Coronidium scorpioides</i>	Button Everlasting					0.1	5								
<i>Crataegus monogyna</i>	Hawthorn	0.2	10	3	10										
<i>Cynodon dactylon</i>	Common Couch	0.5	1000					5	1000	0.2	100	5	500	1	1000
<i>Dactylis glomerata</i>	Cocksfoot			0.5	200	2	1000							0.3	200

Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
		Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
<i>Deyeuxia quadriseta</i>								20	1000			10	1000		
<i>Dichelachne crinita</i>	Longhair Plumegrass	0.1	1												
<i>Dichelachne micrantha</i>	Shorthair Plumegrass					0.1	10								
<i>Dichondra repens</i>	Kidney Weed	0.1	1000												
<i>Echium plantagineum</i>	Patterson's Curse	0.1	2	0.1	2									01	1
<i>Eragrostis leptostachya</i>	Paddock Lovegrass											0.1	1		
<i>Eragrostis trachycarpa</i>	A Lovegrass					0.1	1								
<i>Eucalyptus aggregata</i>	Black Gum	5	7	10	10										
<i>Eucalyptus dives</i>	Broad-leaved Peppermint					15	30								
<i>Eucalyptus mannifera</i>	Brittle Gum					0.5	2								
<i>Eucalyptus pauciflora</i>	White Sally					5	1							5	5
<i>Eucalyptus stellulata</i>	Black Sally	0.1	2												
<i>Euchiton involucratus</i>	Star Cudweed	0.1	20	0.1	1	0.1	30			0.1	5				
<i>Gamochaeta purpurea</i>	Purple Cudweed	0.1	2												
<i>Geranium solanderi</i> var. <i>solanderi</i>		0.1	100	0.1	5										



Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
		Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
<i>Gonocarpus tetragynus</i>	Poverty Raspswort					0.5	1000								
<i>Goodenia bellidifolia</i> subsp. <i>bellidifolia</i>						0.1	1								
<i>Haloragis heterophylla</i>	Variable Raspswort			0.1	10			0.1	10			0.1	200	0.1	5
<i>Hemarthria uncinata</i>	Matgrass											0.2	10		
<i>Holcus lanatus</i>	Yorkshire Fog											0.1	1	0.3	20
<i>Hydrocotyle laxiflora</i>	Stinking Pennywort					0.1	10								
<i>Hypericum gramineum</i>	Small St John's Wort					0.1	50								
<i>Hypericum perforatum</i>	St. Johns Wort	0.4	1000	1	1000	0.5	1000			0.1	1	0.1	1	0.1	20
<i>Hypochaeris radicata</i>	Catsear	0.2	1000	0.5	1000	0.2	100	10	5000	10	5000	10	2000	0.2	30
<i>Juncus cognatus</i>								0.1	10						
<i>Juncus</i> spp.	A Rush							0.1	5						
<i>Juncus usitatus</i>												0.1	5		
<i>Lactuca serriola</i>	Prickly Lettuce			0.1	1										
<i>Leptospermum continentale</i>	Prickly Teatree					0.2	1								
<i>Ligustrum sinense</i>	Small-leaved Privet	0.1	1												
<i>Lolium perenne</i>	Perennial Ryegrass													0.2	40

Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
		Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
<i>Lomandra filiformis</i> subsp. <i>coriacea</i>	Wattle Matt-rush	0.1	10			10	1000								
<i>Lomandra longifolia</i>	Spiny-headed Mat	0.2	2												
<i>Lomandra multiflora</i> subsp. <i>multiflora</i>	Many					0.1	20								
<i>Lysimachia arvensis</i>	Scarlet Pimpernel	0.1	1			0.1	2							0.1	5
<i>Microlaena stipoides</i>	Weeping Grass	5	1000	10	2000	60	3000								
<i>Modiola caroliniana</i>	Red-flowered Mat			0.1	10										
<i>Nassella trichotoma</i>	Serrated Tussock	0.3	10	0.1	50										
<i>Oxalis corniculata</i>	Creeping Oxalis	0.1	10	0.1	20										
<i>Oxalis perennans</i>		0.1	10			0.1	10								
<i>Panicum effusum</i>	Hairy Panic									30	5000				
<i>Panicum gilvum</i>								30	5000	0.1	5				
<i>Panicum simile</i>	Two-colour Panic	0.4	100												
<i>Paspalum dilatatum</i>	Paspalum	0.5	100	5	1000	0.1	10	10	1000			0.5	50	20	2000
<i>Phalaris aquatica</i>	Phalaris	1	500	60	5000							0.2	20	0.5	30
<i>Plantago lanceolata</i>	Lamb's Tongues	0.2	100	0.5	500	0.1	10	2	1000	1	500	0.5	1000	45	5000
<i>Poa labillardierei</i> var. <i>labillardierei</i>	Tussock	5	200	0.5	500										



Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
		Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
<i>Poa sieberiana</i>	Snowgrass					0.3	500								
<i>Poranthera microphylla</i>	Small Poranthera					0.1	10								
<i>Pterostylis coccinea</i>						0.1	5								
<i>Rosa rubiginosa</i>	Sweet Briar			0.3	10	0.1	2								
<i>Rubus fruticosus</i> sp. agg.	Blackberry complex	0.1	10	10	50	4	10	0.1	1			15	5	15	100
<i>Rytidosperma caespitosum</i>	Ringed Wallaby Grass					3	200								
<i>Rytidosperma erianthum</i>	Wallaby Grass	2	1000	5	1000										
<i>Schoenus apogon</i>	Fluke Bogrush											0.1	10		
<i>Senecio madagascariensis</i>	Fireweed			0.1	1										
<i>Senecio prenanthoides</i>		0.1	10	0.1	10										
<i>Setaria pumila</i>	Pale Pigeon Grass							5	1000					0.2	100
<i>Solanum americanum</i>	Glossy Nightshade			0.1	5										
<i>Solanum nigrum</i>	Black-berry Nightshade	0.1	10	0.1	2										
<i>Sonchus oleraceus</i>	Common Sowthistle			0.1	1										
<i>Sorghum leiocladum</i>	Wild Sorghum	0.2	5	2	20										
<i>Sporobolus elongatus</i>	Slender Rat's Tail Grass	0.1	5												

Scientific name	Common name	Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7	
		Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
<i>Themeda triandra</i>		15	1000	0.2	50	0.2	1000								
<i>Trifolium repens</i>	White Clover											0.1	10	0.1	20
<i>Veronica plebeia</i>	Trailing Speedwell	0.1	2			0.1	10								
<i>Vulpia myuros</i>	Rat's Tail Fescue					0.1	2	0.5	100	0.2	500			10	500
<i>Wahlenbergia communis</i>	Tufted Bluebell	0.1	2			0.1	10							0.2	100
<i>Xerochrysum viscosum</i>	Sticky Everlasting					0.1	10								



## Appendix 4 Fauna

**Table A. 4 Fauna species recorded at the subject land**

Common name	Scientific name
<b>Mammals</b>	
Common Ringtail Possum	<i>Pseudocheirus peregrinus</i>
Common Brushtail Possum	<i>Trichosurus vulpecula</i>
Eastern Grey Kangaroo	<i>Macropus giganteus</i>
Rabbit	<i>Oryctolagus cuniculus</i>
Squirrel Glider	<i>Petaurus norfolcensis</i>
Sugar Glider	<i>Petaurus breviceps</i>
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>
Little Pied Bat	<i>Chalinolobus picatus</i>
Chocolate Wattled Bat	<i>Chalinolobus morio</i>
Vespadelus species (Little Forest Bat/ Southern Forest Bat/ Large Forest Bat/ Eastern Cave Bat).	<i>Vespadelus vulturnus/ regulus/ darlingtoni/ trougtoni*</i>
Little Broad-nosed Bat	<i>Scotorepens greyi</i>
Western Broad-nosed Bat	<i>Scotorepens balstonii</i>
South-eastern Free-tailed Bat	<i>Ozimops planiceps</i>
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>
White-striped Free-tailed Bat	<i>Austronomus australis</i>
Eastern Horseshoe Bat	<i>Rhinolophus megaphyllus</i>
<b>Large Bent-winged Bat*</b>	<b><i>Miniopterus orianae oceanensis</i></b>
<b>Birds</b>	
Australian Magpie	<i>Cracticus tibicen</i>
Australian Raven	<i>Corvus coronoides</i>
Black-eared Cuckoo	<i>Chalcites osculans</i>
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>
Brown Quail	<i>Coturnix ypsilophora</i>
Brown Thornbill	<i>Acanthiza pusilla</i>
Crested Pigeon	<i>Ocyphaps lophotes</i>
Crimson Rosella	<i>Platycercus elegans</i>
Dollarbird	<i>Eurystomus orientalis</i>

Common name	Scientific name
Double-barred Finch	<i>Taeniopygia bichenovii</i>
<b>Dusky Woodswallow*</b>	<b><i>Artamus cyanopterus cyanopterus</i></b>
Eastern Whipbird	<i>Psophodes olivaceus</i>
Eastern Yellow Robin	<i>Eopsaltria australis</i>
Fairy Martin	<i>Petrochelidon ariel</i>
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>
Grey Fantail	<i>Rhipidura albiscapa</i>
Grey Shrike-thrush	<i>Colluricincla harmonica</i>
<b>Little Eagle*</b>	<b><i>Hieraaetus morphnoides</i></b>
Little Pied Cormorant	<i>Microcarbo melanoleucos</i>
Magpie-lark	<i>Grallina cyanoleuca</i>
Noisy Miner	<i>Manorina melanocephala</i>
Pacific Black Duck	<i>Anas superciliosa</i>
Pale-flecked Garden Sunskink	<i>Lampropholis guichenoti</i>
Pied Butcherbird	<i>Cracticus nigrogularis</i>
Pied Currawong	<i>Strepera graculina</i>
Red Wattlebird	<i>Anthochaera carunculata</i>
Red-browed Finch	<i>Neochmia temporalis</i>
Red-rumped Parrot	<i>Psephotus haematonotus</i>
Restless Flycatcher	<i>Myiagra inquieta</i>
Sacred Kingfisher	<i>Todiramphus sanctus</i>
Silvereye	<i>Zosterops lateralis</i>
Superb Fairy-wren	<i>Malurus cyaneus</i>
Welcome Swallow	<i>Hirundo neoxena</i>
Whistling Kite	<i>Haliastur sphenurus</i>
White-browed Scrubwren	<i>Sericornis frontalis</i>
White-necked Heron	<i>Ardea pacifica</i>
White-plumed Honeyeater	<i>Ptilotula penicillatus</i>
White-throated Treecreeper	<i>Cormobates leucophaea</i>
Willie Wagtail	<i>Rhipidura leucophrys</i>
Yellow-faced Honeyeater	<i>Caligavis chrysops</i>
<b>Frogs</b>	
Bleating Tree Frog	<i>Litoria dentata</i>



Common name	Scientific name
Brown-striped Frog	<i>Limnodynastes peronii</i>
Common Eastern Froglet	<i>Crinia signifera</i>
Sign-bearing Froglet	<i>Crinia insignifera</i>
Spotted Grass Frog	<i>Limnodynastes tasmaniensis</i>
Brown Tree Frog	<i>Litoria ewingii</i>
Eastern Banjo Frog	<i>Limnodynastes dumerilii</i>

\*denotes Threatened species recorded on site