

# Lake Lyell Geotechnical and Hydrogeological Drilling Program Flora and Fauna Assessment

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Prepared for EnergyAustralia Pty Ltd  
February 2023





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# Lake Lyell Geotechnical and Groundwater Drilling Program

## Flora and Fauna Assessment

### Report Number

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E211001 RP2

### Client

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EnergyAustralia Pty Ltd

### Date

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17 February 2023

### Version

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v4 Final

### Prepared by

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17 February 2023

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17 February 2023

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# 1 Introduction

## 1.1 Background of the development

EnergyAustralia Pty Ltd (EA) is investigating the feasibility of developing a 335 megawatt (MW) Pumped Hydro Energy Storage (PHES) at Lake Lyell approximately 15 km south of the existing Mount Piper Power Station, within the Lithgow Local Government Area (LGA). The PHES Project is currently in concept phase. To support the ongoing development of the Project, EA obtained development consent for a geotechnical drilling program, hereafter referred to as the 'development'. The development was assessed and approved by Lithgow City Council under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Following commencement of the geotechnical drilling program, EA determined that additional bores are required for the purpose of a groundwater monitoring network. Consistent with the need for geotechnical investigations, the groundwater monitoring network would obtain data to support and inform the feasibility and design of the PHES, by providing more robust information on the existing hydrogeological condition and informing how it may be affected by a future PHES. Inclusion of additional bores will be sought via modification of the development consent with regard to s4.55(1A) of the EP&A Act.

EMM Consulting Pty Ltd (EMM) has updated this Flora and Fauna Assessment on behalf of EA to support a development application (DA) modification to Lithgow City Council.

### 1.1.1 The modified development

The activity would provide a better understanding of the local geotechnical and hydrogeological conditions to support and inform the feasibility and design of the PHES.

The modified development is located approximately 3.5 kilometres (km) southwest of Lithgow on land owned and managed by EA (see Figure 1.1).

The modified development will consist of the following:

- Up to 13 geotechnical boreholes drilled from existing or new (groundwater monitoring) drill sites.
- Four groundwater monitoring bores drilled from existing drill sites.
- Three twinned groundwater monitoring bores (i.e. six bores) drilled from three new drill sites.
- Up to 2.6 km of low-impact seismic refraction and coincident resistivity surveying.
- Clearing and establishment of approximately 1.3 km of new vehicle tracks to enable access to geotechnical investigation locations.
- Repairing existing vehicle tracks and fire trails where necessary to ensure safe access.

The proposed modification would not exceed the previously approved disturbance area of 0.97 ha.

An overview of the activity is shown in Figure 1.2.

## 1.2 Legislative context

This modified development has been assessed against key biodiversity legislation and government policy, including:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- State Environmental Planning Policies;
- *Biodiversity Conservation Act 2016* (BC Act);
- *Fisheries Management Act 1994* (FM Act); and
- *Biosecurity Act 2015* (BS Act).

An assessment of the modified development against relevant legislation is provided in Section 5.

## 1.3 Biodiversity assessment pathway

The proposed development meets the criteria under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) Division 4.2 and the consenting authority is Lithgow City Council. As such, a biodiversity assessment must be submitted as part of the development application (DA) and must comply with the *Biodiversity Conservation Act 2016* (BC Act). In accordance with the BC Act, the Biodiversity Offset Scheme (BOS) is triggered by developments or activities that:

1. exceed the native vegetation clearing threshold for the lot size; and/or
2. include land on the biodiversity values map (areas with high biodiversity value that are particularly sensitive to impacts from development and clearing); and/or
3. are predicted to have a significant impact on threatened ecological communities, species or populations.

The proposed development does not trigger entry into the BOS for points 1 and 2 above for the following reasons:

1. native vegetation clearing extent will not exceed the clearing threshold of 1 ha (for minimum lot size 40 ha); and
2. there is no impact in areas mapped within the biodiversity values map.

As such, this biodiversity assessment has been prepared with a focus on quantifying impacts on threatened ecological communities, species or populations as a result of the proposed development.

## 1.4 Site description

The investigation envelope is located in Bowenfels in the City of Lithgow LGA. The natural setting of the site consists of Sclerophyll forests on ridgelines and moderate to very steep hillslopes above and to the north of the Farmers Creek arm of Lake Lyell, a dammed section of the Coxs River. Marrangaroo National Park is located outside of the investigation envelope, in contiguous vegetation to the north (Figure 1.1).

The vegetation of the site has, in part, been affected by historic and ongoing agricultural and forestry activity but is generally in good condition with relatively minor weed infestation.

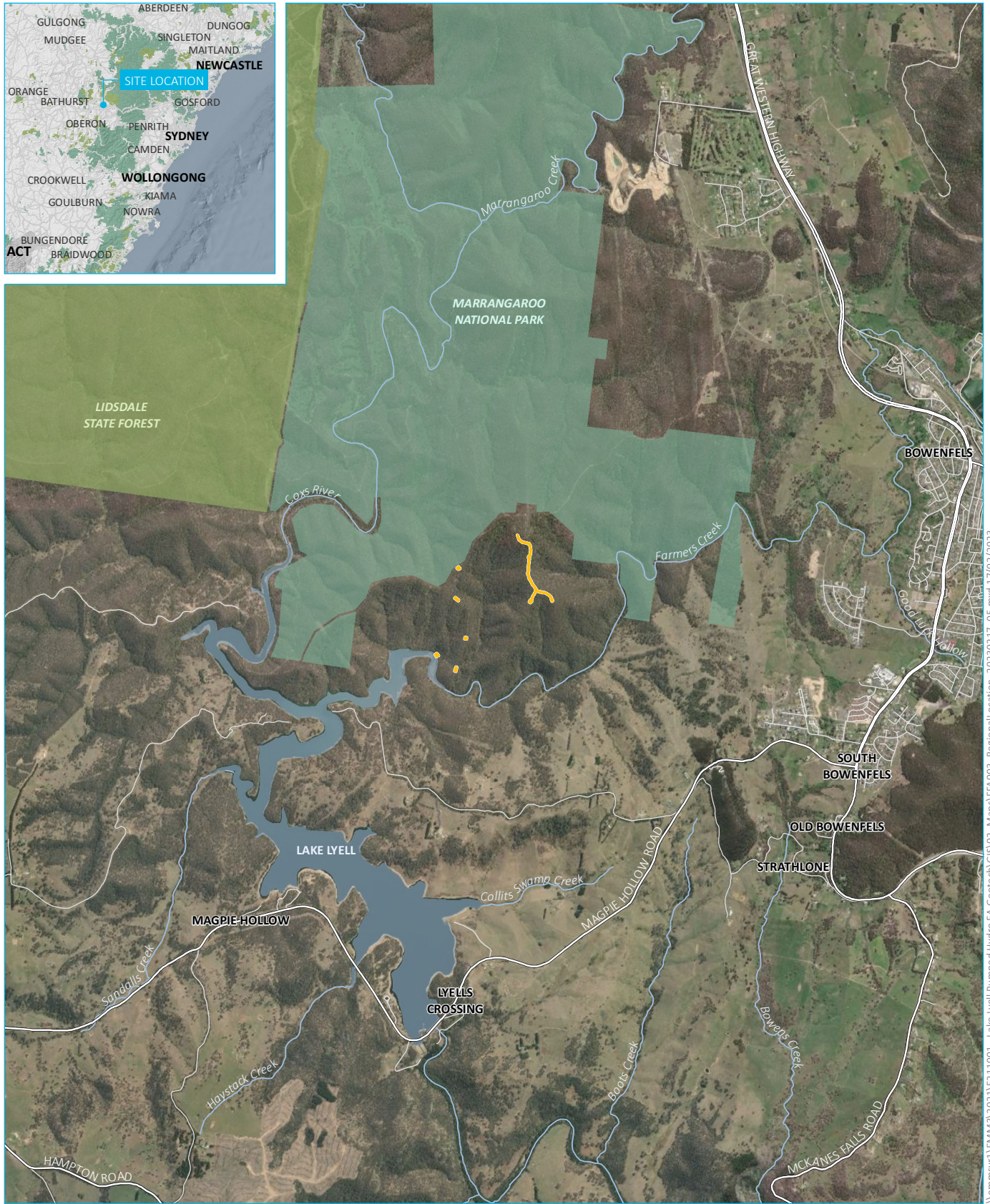


## 1.5 Terminology

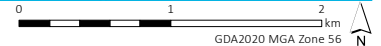
Terminology used in this report is listed in Table 1.1.

**Table 1.1** Terminology

<b>Term</b>	<b>Definition</b>
The modified development	Geotechnical and hydrogeological drilling investigations including boreholes, seismic survey and associated access tracks.
Investigation envelope (Figure 1.1)	The area assessed to allow refinement of geotechnical locations and/or access to further avoid or minimise environmental or engineering constraints that may be identified on site.
Disturbance footprint (Figure 1.2)	The area directly impacted by the modified development.
Locality	10 km radius centred on the development, in which threatened species records database searches were conducted.



Source: EMM (2023); EnergyAustralia (2022); ESRI (2022); DFSI (2017); GA (2011); ASGC (2006)



**KEY**

- Modified disturbance footprint
- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest

**INSET KEY**

- Major road
- NPWS reserve
- State forest

**Regional setting**

Lake Lyell Pumped Hydro  
Flora and fauna assessment  
Figure 1.1







Source: EMM (2023); EnergyAustralia (2022); ESRI (2022); DFSI (2017); GA (2011)

- KEY**
- Study area
  - Modified disturbance footprint
  - Vehicular track
  - Named watercourse
  - NPWS reserve

Site location

Lake Lyell Pumped Hydro  
Flora and fauna assessment  
Figure 1.2



## 2 Method

### 2.1 Desktop assessment

Threatened species and communities, and listed migratory species requiring assessment were identified through a review of the following combination of:

- known and predicted geographic distribution of the species based on its association with Interim Biogeographic Regionalisation for Australia (IBRA) subregions in the NSW Bionet Threatened Species Profile Database (TSPD);
- the modelled distribution of EPBC Act listed species which informs the Protected Matters Search Tool (PMST) (Appendix A) results and is accessible in the Atlas of Living Australia;
- NSW Department of Primary Industries (Fisheries) Freshwater threatened species distribution maps;
- associations between threatened species and Plant Community Types (PCTs) in the NSW Bionet TSPD;
- the presence and abundance of habitat features (eg waterways, large rock outcrops, caves, swamps etc) required by some species; and
- database records of threatened species occurrence in the locality and broader region including a review of:
  - NSW Biodiversity and Conservation Division (BCD) BioNet Atlas of NSW Wildlife, for species listed under the BC Act and EPBC Act;
  - Commonwealth Scientific and Industrial Research Organisation (CSIRO) Atlas of Living Australia for additional threatened specie records; and
  - Council of Heads of Australasian Herbaria (CHAH) Australasian Virtual Herbarium (AVH) for specimen-backed records of threatened plants.

### 2.2 Field investigation

Field investigations were conducted on 16 and 17 December 2021, and on 15 December 2022, by Paul Rossington, a highly experienced ecologist, and included:

- vegetation mapping and condition assessment; and
- habitat assessments for threatened species.

No targeted surveys were undertaken, however vegetation mapping and floristic plot surveys provided ample opportunity to detect conspicuous threatened plant species. The survey methods are outlined below.

#### 2.2.1 Vegetation site assessment

A site walk-over was undertaken to identify plant community types within the investigation envelope through observation and recording of dominant plant species, landscape and terrain and soil characteristics.

## 2.2.2 Habitat assessment

Concurrent with the vegetation mapping, a habitat assessment was undertaken seeking to identify the presence and abundance of the following fauna habitat features within the development site:

- habitat trees including large hollow-bearing trees and trees containing large stick nests;
- availability of flowering shrubs and feed tree species;
- waterway condition;
- ground litter and fallen logs; and
- rock outcrops, cliffs and caves.

## 2.3 Likelihood of occurrence assessment

The criteria for assessing likelihood of occurrence for threatened species, used to inform the impact assessment of the modified development (Section 4), is listed in Table 2.1.

**Table 2.1 Likelihood of occurrence criteria**

Likelihood	Description	Further assessment conducted?
Negligible	<ul style="list-style-type: none"><li>• The potential for the species to occur is considered so low as to not be worth considering.</li></ul>	No
Low	<ul style="list-style-type: none"><li>• Based on data collected during field investigations it was considered that the species was unlikely to occur in the investigation envelope or use habitats in the investigation envelope. A species may utilise the investigation envelope on rare occasions.</li><li>• Species is considered vagrant in the bioregion and is thus considered unlikely to occur in the investigation envelope.</li></ul>	No
Moderate	<ul style="list-style-type: none"><li>• The species is known to occur in the bioregion and the investigation envelope provides some habitat value for the species. Includes species for which optimal habitat is present that have not been recorded in the locality and species that have been recorded in the locality for which habitat on site is considered suboptimal.</li></ul>	Yes
High	<ul style="list-style-type: none"><li>• The species is known to occur in the bioregion, the investigation envelope supports optimal habitat features for the species and it has been recorded in the locality.</li></ul>	Yes
Recorded	<ul style="list-style-type: none"><li>• The species was recorded during site visit or reliable, recent and spatially accurate records of the species strongly indicate its presence in the investigation envelope.</li></ul>	Yes



### 2.3.1 Limitations

While the biodiversity assessments outlined above provide a robust assessment of the biodiversity values, the assessment is subject to a number of limitations outlined below. In both cases these limitations do not represent a significant limitation on this survey:

- The biodiversity assessment included a habitat assessment for threatened species. No targeted surveys have been undertaken although the field surveys provided some opportunity for the detection of threatened species. This is considered suitable given the limited nature of the impacts of the modified development and the conservative approach to assuming the presence of threatened species has been taken.
- While some species have been assessed as having a low likelihood of occurrence, it is acknowledged that this does not indicate the species will never occur. Rather, it means that based on data collected during desktop and field surveys it was considered that the species may only utilise the investigation envelope on rare occasions.

# 3 Results

## 3.1 Vegetation

### 3.1.1 Plant community types and other land uses

Likely due to substantial small-scale variation in slope, soils and aspect, the vegetation in the investigation envelope is difficult to easily allocate to described Plant Community Types (PCTs). With much of the vegetation sharing characteristics of multiple PCTs, the PCTs mapped were considered to be a best-fit despite some discrepancies between observed vegetation and PCT definitions.

Site investigations identified the presence of three plant community types (PCTs) and discrete areas of cleared or disturbed non-native vegetation within the disturbance as identified in Table 3.1 and shown in Figure 3.1.

**Table 3.1** Vegetation types recorded within the disturbance footprint.

Plant community type	Area (ha) in disturbance footprint	BC Act conservation status	EPBC Act conservation status
1197 – Snow Gum – Mountain Gum tussock grass-herb forest of the South Eastern Highlands Bioregion	0.47	Endangered Ecological Community	-
732 – Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion	0.09	-	-
1093 – Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest of the tablelands; South Eastern Highlands Bioregion	0.03	-	-
Cleared/disturbed and non-native vegetation	0.03	-	-
<b>Total native vegetation</b>	<b>0.59</b>	-	-
<b>Total</b>	<b>0.62</b>		

Descriptions of each of the identified PCTs within the investigation area are provided in Table 3.2, Table 3.3 and Table 3.4, respectively.

**Table 3.2 PCT 1197 description**

<b>Snow Gum – Mountain Gum tussock grass-herb forest of the South Eastern Highlands Bioregion (PCT 1197)</b>	
PCT ID	1197
Common name	Snow Gum – Mountain Gum tussock grass-herb forest of the South Eastern Highlands Bioregion
Vegetation condition zones and areas within modified development site	Vegetation zone 1 – 1197_high – 0.48 ha
Description	<p>The canopy is dominated by a mix of White Sally (<i>Eucalyptus pauciflora</i>), Silvertop Ash (<i>Eucalyptus sieberi</i>), Candlebark (<i>Eucalyptus rubida</i>), Mountain Gum (<i>Eucalyptus dalrympleana</i>), Broad-leaved Peppermint (<i>Eucalyptus dives</i>) with occasional Bundy (<i>Eucalyptus goniocalyx</i>) and Ribbon Gum (<i>Eucalyptus viminalis</i>).</p> <p>A sparse sub-canopy of small trees includes Black She-oak (<i>Allocasuarina littoralis</i>), Blackwood (<i>Acacia melanoxylon</i>) and Silver Wattle (<i>Acacia dealbata</i>).</p> <p>The shrub layer is sparse to moderately dense, containing species such as Narrow-leaved Geebung (<i>Persoonia linearis</i>), tea-trees (<i>Leptospermum</i> spp.), Blackthorn (<i>Bursaria spinosa</i>), Hoary Guinea Flower (<i>Hibbertia obtusifolia</i>), a beard-heath (<i>Leucopogon lanceolatus</i>), and a pea-bush (<i>Dillwynia retorta</i>).</p> <p>The ground layer is co-dominated by native forb, subshrub and grass species including Snowgrass (<i>Poa sieberiana</i>), Spiny-headed Mat-rush (<i>Lomandra longifolia</i>), Redanther Wallaby Grass (<i>Rytidosperma pallida</i>), Bracken (<i>Pteridium esculentum</i>), Kidney Weed (<i>Dichondra repens</i>), Sheep's Burr (<i>Acaena</i> spp.) and Stinking Pennywort (<i>Hydrocotyle laxiflora</i>).</p> <p>Weeds were recorded in the ground layer at moderate abundance and include species such as Sweet Vernal Grass (<i>Anthoxanthum odoratum</i>), Flaxleaf Fleabane (<i>Conyza bonariensis</i>), Blackberry (<i>Rubus</i> spp.), and Purpletop (<i>Verbena bonariensis</i>).</p>
Survey effort	Two BAM plot/transects and inspection of the extent of the PCT in the investigation envelope.
Condition description	The community is in medium to good condition, dominated by native species but with a low to moderate cover of introduced plant species, particularly in the ground layer.
Characteristic species used for identification of PCT	<p>According to the <i>NSW VIS Classification Version 2.1</i>, the dominant canopy layer species recorded within this community that align with the dominant species listed as characteristic of this PCT include White Sally, Mountain Gum, and Broad-leaved Peppermint. The presence and in places co-dominance of other canopy species in the site suggests that the vegetation here is transitional with other PCTs however no other PCTs appear to fit as closely in terms of canopy species composition as PCT 1197.</p> <p>The sub-canopy and shrub layers, together comprising the midstory of the community on site contain Blackwood, Silver Wattle and Hoary Guinea Flower; species that are consistent with PCT 1197.</p> <p>Dominant species in the ground stratum, consisted with PCT 1197 include Snowgrass and Sheep's Burr. Other characteristic species such as Weeping Grass (<i>Microlaena stipoides</i>) and Native Geranium (<i>Geranium solanderi</i>) were also observed at lower density.</p>
Justification of assignment of PCT	<p>Evidence that the vegetation comprises PCT 1197 includes:</p> <ul style="list-style-type: none"> <li>• geographic location in the Hill End subregion of the South Eastern Highland IBRA region;</li> <li>• landscape position on ridges with clay loam soil;</li> <li>• open forest structure with a spare shrub understorey with a grass and soft forb dominated ground layer;</li> <li>• presence and typically dominance of characteristic species of PCT 1197; and</li> <li>• State Vegetation Type Map (OEH 2018) maps PCT 1197 at the northern end of the investigation envelope.</li> </ul>

**Table 3.2 PCT 1197 description**

**Snow Gum – Mountain Gum tussock grass-herb forest of the South Eastern Highlands Bioregion (PCT 1197)**

Status The occurrence of PCT 1197 on the site is considered to be consistent with the BC Act listed Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions Endangered Ecological Community. The vegetation mapped as PCT 1197 is not entirely typical of the EEC as it does not occur on basalt, contains a higher diversity of canopy species and contains a number of shrub species more typically associated with lower soil fertility. It is therefore considered marginal for inclusion in the EEC. For the purposes of this assessment, taking a precautionary approach, all areas of PCT 1197 in the investigation envelope are nonetheless assumed to be consistent with the EEC.

Estimate of percent cleared value of PCT across its range 90%

Photograph



**Table 3.3 PCT 732 description**

<b>Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion (PCT 732)</b>	
PCT ID	732
Common name	Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion
Vegetation condition zones and areas within modified development site	Vegetation zone 1 – 732_high 0.12 ha
Description	<p>The canopy is co-dominated by Broad-leaved Peppermint (<i>Eucalyptus dives</i>) with occasional and Candlebark (<i>Eucalyptus rubida</i>).</p> <p>The midstory is sparse, containing species such as Narrow-leaved Geebung (<i>Persoonia linearis</i>) and Hoary Guinea Flower (<i>Hibbertia obtusifolia</i>).</p> <p>The ground layer is co-dominated by native and exotic species. Native forb, subshrub and grass species include Speargrass (<i>Austrostipa scabra</i>), PaleMatt-rush (<i>Lomandraglauca</i>), , Shorthair Plumegrass (<i>Dichelachne micrantha</i>) Red-anther Wallaby Grass (<i>Rytidosperma pallida</i>), and Blueberry Lily (<i>Dianella revoluta</i>).</p> <p>Weeds were recorded in the ground layer at moderate abundance and include Sweet Vernal-grass (<i>Anthoxanthum odoratum</i>), Catsear (<i>Hypochaeris radicata</i>) and Sheep Sorrel (<i>Rumex acetosella</i>).</p>
Survey effort	Inspection of the extent of the PCT in the investigation envelope.
Condition description	The community is in moderate condition with an intacta canopy and midstorey of but a ground layer with moderate levels of weed invasion
Characteristic species used for identification of PCT	<p>According to the <i>NSW VIS Classification Version 2.1</i>, the dominant canopy layer species recorded within this community that align with the dominant species listed as characteristic of this PCT include Broad-leaved Peppermint. The presence and in places co-dominance of other canopy species in the site and the lack of Ribbon Gum suggests that the vegetation here is transitional with other PCTs however no other PCTs appear to fit as closely in terms of species composition as PCT 732.</p> <p>The midstory of the community on site contains Hoary Guinea Flower; one of the four midstory species that are diagnostic of PCT 732.</p> <p>Dominant species in the ground stratum, consisted with PCT 732 include Wattle Matt-rush and Short-hair Plumegrass.</p>
Evidence used to identify the PCT	<p>Evidence that the vegetation comprises PCT 732 includes:</p> <ul style="list-style-type: none"> <li>• geographic location in the Hill End subregion of the South Eastern Highland IBRA region;</li> <li>• landscape position on ridges and slopes at moderate altitude on shallow, rocky soil;</li> <li>• low open forest structure with a spare understorey of sclerophyll shrubs, and sparse ground layer of grasses and forbs;</li> <li>• presence and typically dominance of characteristic species of PCT 732; and</li> <li>• the State Vegetation Type Map (OEH 2018) maps PCT 732 in the immediate area.</li> </ul>
Status	There are currently no TECs associated with this PCT. The vegetation mapped as PCT 732 does not resemble any TEC listed under the BM Act or EPBC Act.



**Table 3.3**      **PCT 732 description**

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

Estimate of percent cleared value of PCT      65%

Photograph



**Table 3.4 PCT 1093 description**

<b>Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest of the tablelands; South Eastern Highlands Bioregion (PCT 1093)</b>	
PCT ID	1093
Common name	Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest of the tablelands; South Eastern Highlands Bioregion
Vegetation condition zones and areas within proposed development site	Vegetation zone 1 – 1330_high 0.03 ha
Description	<p>The canopy is co-dominated by Inland Scribbly Gum (<i>Eucalyptus rossii</i>) and Broad-leaved Peppermint (<i>Eucalyptus dives</i>) with occasional and Candlebark (<i>Eucalyptus rubida</i>), Apple Box (<i>Eucalyptus bridgesiana</i>), and Bundy (<i>Eucalyptus goniocalyx</i>).</p> <p>The midstory is sparse, containing species such as Narrow-leaved Geebung (<i>Persoonia linearis</i>), Hoary Guinea Flower (<i>Hibbertia obtusifolia</i>), Finger Hakea (<i>Hakea dactyloides</i>), Daphne Heath (<i>Brachyloma daphnoides</i>) and Prickly Moses (<i>Acacia ulicifolia</i>).</p> <p>The ground layer is co-dominated by native forb, subshrub and grass species including Speargrass (<i>Austrostipa scabra</i>), Wattle Matt-rush (<i>Lomandra filiformis</i>), Spiny-headed Mat-rush (<i>Lomandra longifolia</i>), Wiry Panic (<i>Entolasia stricta</i>), Red-anther Wallaby Grass (<i>Rytidosperma pallida</i>), Thyme Spurge (<i>Phyllanthus hirtellus</i>, and Blueberry Lily (<i>Dianella revoluta</i>).</p> <p>Weeds were recorded in the ground layer at very low abundance and included: Catsear (<i>Hypochaeris radicata</i>) and Sheep Sorrel (<i>Rumex acetosella</i>).</p>
Survey effort	One BAM plot/transect and inspection of the extent of the PCT in the investigation envelope.
Condition description	The community is in good condition with a very low cover of introduced plant species.
Characteristic species used for identification of PCT	<p>According to the <i>NSW VIS Classification Version 2.1</i>, the dominant canopy layer species recorded within this community that align with the dominant species listed as characteristic of this PCT include Inland Scribbly Gum, Broad-leaved Peppermint and Bundy. The presence and in places co-dominance of other canopy species in the site and the lack of Red Stringybark suggests that the vegetation here is transitional with other PCTs however no other PCTs appear to fit as closely in terms of canopy species composition as PCT 1093.</p> <p>The midstory of the community on site contains Daphne Heath and Hoary Guinea Flower; two of the three midstory species that are diagnostic of PCT 1093.</p> <p>Dominant species in the ground stratum, consisted with PCT 1093 include Wattle Matt-rush and Red-anther Wallaby Grass.</p>
Evidence used to identify the PCT	<p>Evidence that the vegetation comprises PCT 1093 includes:</p> <ul style="list-style-type: none"> <li>• geographic location in the Hill End subregion of the South Eastern Highland IBRA region;</li> <li>• landscape position on ridges and slopes at moderate altitude on shallow, rocky soil;</li> <li>• low open forest structure with a spare understorey of sclerophyll shrubs, and sparse ground layer of grasses and forbs;</li> <li>• presence and typically dominance of characteristic species of PCT 1093; and</li> <li>• the State Vegetation Type Map (OEH 2018) maps PCT 1197 at the northern end of the investigation envelope.</li> </ul>
Status	There are currently no TECs associated with this PCT. The vegetation mapped as PCT 1093 does not resemble any TEC listed under the BM Act or EPBC Act.



**Table 3.4**      **PCT 1093 description**

**Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest of the tablelands; South Eastern Highlands Bioregion (PCT 1093)**

Estimate of percent cleared value of PCT      61%

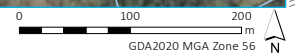
Photograph







Source: EMM (2023); EnergyAustralia (2022); ESRI (2022); DFSI (2017); GA (2011)



**KEY**

- Modified disturbance footprint
- Vehicular track
- Named watercourse
- Named waterbody
- NPWS reserve
- Minimal native vegetation

**Plant community type**

- 732 | Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion
- 1093 | Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands; South Eastern Highlands Bioregion
- 1197 | Snow Gum - Mountain Gum tussock grass-herb forest of the South Eastern Highlands Bioregion

**Vegetation present within the investigation envelope**

Lake Lyell Pumped Hydro  
Flora and fauna assessment  
Figure 3.1



\\emmsvr1\EMM\3\2021\E211001 - Lake Lyell Pumped Hydro EA Geotech\GIS\02\_Maps\FFA002\_PCT\_20230217\_06.mxd 17/02/2023

### 3.1.2 Threatened ecological communities

Snow Gum – Mountain Gum tussock grass-herb forest of the South Eastern Highlands Bioregion (PCT 1197) is listed in the NSW Bionet Vegetation Classification system as associated with the following BC Act listed TECs:

- Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions, endangered;
- Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions, critically endangered; and
- Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion, critically endangered.

The Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions endangered ecological community (EEC) is found on plateaus and tablelands with loam or clay soils, usually on undulating or hilly terrain (NSW TSSC 2011). The areas of PCT 1197 in the investigation envelope are found on moderately sloped hillsides and gently sloped ridgetops.

Despite its name, the EEC occurs not only on soils derived from basalt but also on similar loam or clay soils derived from mudstones, granites, alluvium and other substrates (NSW TSSC 2011). The occurrence of PCT 1197 on the site occurs on loam soil derived from sedimentary rock substrates.

The community typically has an open canopy of eucalypts with sparse shrubs and a dense groundcover of herbs and grass (NSW TSSC 2011). The occurrence of PCT 1197 on the site has a similar open eucalypt canopy, sparse shrub layer and grass and herb groundcover layer to that described in the EEC listing.

Characteristic eucalypts in the canopy of the EEC include Mountain Gum (*Eucalyptus dalrympleana*), White Sally (*Eucalyptus pauciflora*), Narrow-leaved Peppermint (*Eucalyptus radiata*), and Ribbon Gum (*Eucalyptus viminalis*) (NSW TSSC 2011). All of these species except Narrow-leaved Peppermint were observed in the areas of PCT 1197 in the investigation envelope however a number of other eucalypt species also comprise a significant proportion of the canopy. Characteristic subcanopy trees were recorded on the site including Blackwood (*Acacia melanoxylon*) and Silver Wattle (*Acacia dealbata*).

The occurrence of PCT 1197 on the site is not entirely typical of the EEC as it does not occur on basalt, contains a higher diversity of canopy species and contains a number of shrub species more typically associated with lower soil fertility. It is therefore, considered marginal for alignment with the EEC. For the purposes of this assessment, taking a precautionary approach, all areas of PCT 1197 in the investigation envelope are nonetheless assumed to be consistent with the EEC.

The Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions community is characterised by a sparse to very sparse (woodland to open woodland) tree layer dominated by White Sally (*Eucalyptus pauciflora*) either in single species stands or with Candlebark (*Eucalyptus rubida*) as a co-dominant, with other trees occurring very infrequently and only ever at low density. The co-dominance of eucalypt species other than White Sally and Candlebark in the areas of PCT 1197 in the investigation envelope precludes the presence of this community.

The Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion is restricted to an area between Captains Flat in the north and Bombala in the south and is therefore, highly unlikely to occur in the investigation envelope.



### 3.1.3 Habitat description

The vegetation and associated habitat present is generally in good condition though some exotic species of herbs, shrubs and grasses are present at relatively low densities. Large rocky outcrops, cliffs and crevices are absent from the investigation envelope, limiting its potential as habitat for some species. Mature eucalypt woodland and forest containing hollow-bearing trees in the investigation envelope provide ample potential breeding and den sites for birds, hollow-roosting bats and arboreal mammals. Patches of Blackthorn (*Bursaria spinosa*) in the investigation envelope represent potential habitat for the threatened Bathurst Copper Butterfly (*Paralucia spinifera*). The habitat present is unlikely, however, to contain any features of importance for animal species at risk of Serious and Irreversible Impacts (SAIL).

Potential habitat exists for multiple threatened species of plants, including several species listed as at risk of SAIL. No threatened plants were observed, however, no targeted searches have been undertaken for threatened species to date.

## 3.2 Threatened species

Desktop assessment and field-based habitat assessment were conducted as per Section 2.1 and Section 2.2. A likelihood of occurrence assessment was undertaken in accordance with Section 2.3. The results are presented in Appendix B. Of the species assessed, those detailed in Section 3.2.1 and Section 3.2.2 are considered likely to occur.

### 3.2.1 Flora

No threatened flora species were recorded in the investigation envelope during inspections conducted to date, however, no targeted surveys have been undertaken. The five species listed in Table 3.5 are considered likely to occur.

**Table 3.5 Threatened flora species likely to occur in the investigation envelope**

Scientific name	Common name	EPBC Act status	BC Act status	Habitat/potential habitat in investigation envelope
<i>Veronica blakelyi</i>	Veronica blakelyi	-	V	Associated with PCT 1197 and PCT 732. Recorded in many locations within 10-15 km NE of the investigation envelope. A low-growing plant that may be overlooked unless specifically targeted. Moderate likelihood of occurring in the investigation envelope.
<i>Thesium australe</i>	Austral Toadflax,	V	V	PMST; species or species habitat likely to occur within area. Not associated with IBRA subregion in TSPD but associated with PCT 1197 in other region/s. Nearest records are around 15 km away. An inconspicuous species; easily overlooked unless specifically targeted. Moderate likelihood of occurring in the investigation envelope.
<i>Acacia bynoeana</i>	Bynoe's Wattle			PMST; species or species habitat may occur within area. Not associated with IBRA subregion in TSPD but associated with PCT 732 in other region/s. Nearest records are around 14 km away. An inconspicuous species; easily overlooked unless specifically targeted. Moderate likelihood of occurring in the investigation envelope.

### 3.2.2 Fauna

No threatened fauna species were recorded in the investigation envelope during inspections conducted to date, however no targeted surveys have been undertaken. A likelihood of occurrence assessment was undertaken in accordance with Section 2.3, the detailed results are presented in Appendix B. Of the 84 species assessed, 36 species are considered likely to occur, as listed in Table 3.6.

**Table 3.6 Threatened fauna species likely to occur in the investigation envelope**

Scientific name	Common name	EPBC Act status	BC Act status	Habitat/potential habitat in investigation envelope
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	-	V	Associated PCT/s with hollow-bearing trees and potential food sources present. Nearest record is around 15 km from the investigation envelope. Moderate likelihood of occurring in the investigation envelope.
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	E	V	Associated PCT/s with hollow-bearing trees and potential food sources present. Nearest records are around 10 km from the investigation envelope. Moderate likelihood of occurring in the investigation envelope.
<i>Petauroides volans</i>	Greater Glider	V	-	Associated PCT/s with hollow-bearing trees and potential food sources present. PMST; species or species habitat likely to occur within area. Nearest records are within around 10 km of the investigation envelope. Moderate likelihood of intermittently occurring in the investigation envelope.
<i>Petaurus australis</i>	Yellow-bellied Glider	-	V	Associated PCT/s with hollow-bearing trees and potential food sources present. Nearest records are around 5 km away. Moderate likelihood of occurring in the investigation envelope.
<i>Petaurus norfolcensis</i>	Squirrel Glider	-	V	Associated PCT/s with hollow-bearing trees and potential food sources present. Nearest records are around 5 km away. High likelihood of occurring in the investigation envelope.
<i>Phascolarctos cinereus</i>	Koala	E	V	Associated PCT/s with potential food trees present. Nearest records are within around 10 km of the investigation envelope. Moderate likelihood of intermittently occurring in the investigation envelope.
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	Associated PCT/s with potential food trees present. PMST; species or species habitat likely to occur within area. Nearest records are within around 10 km of the investigation envelope. Moderate likelihood of intermittently occurring in the investigation envelope.
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	-	V	Associated PCT/s with potential food sources and nesting opportunities present. Nearest records are around 5 km away. High likelihood of occurring in the investigation envelope.
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	E	Associated PCT/s with potential food sources and nesting opportunities (hollow-bearing trees) present nearby. Nearest previous records are around 5 km away. Seen adjacent to investigation envelope. High likelihood of occurring in the investigation envelope.
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	E	V	Associated PCT/s with potential food sources ( <i>Allocasuarina</i> spp.) and nesting opportunities (hollow-bearing trees) present nearby. Nearest records are around 5 km away. High likelihood of occurring in the investigation envelope.
<i>Chthonicola sagittata</i>	Speckled Warbler	-	V	Associated PCT/s with potential food sources and nesting opportunities present. Nearest records are within 10 km. Moderate likelihood of occurring in the investigation envelope.

**Table 3.6 Threatened fauna species likely to occur in the investigation envelope**

Scientific name	Common name	EPBC Act status	BC Act status	Habitat/potential habitat in investigation envelope
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	-	V	Associated PCT/s with potential food sources and nesting opportunities present. Nearest records are around 5 km away. High likelihood of occurring in the investigation envelope.
<i>Daphoenositta a chrysoptera</i>	Varied Sittella	-	V	Associated PCT/s with potential food sources and nesting opportunities present. Nearest records are around 5 km away. High likelihood of occurring in the investigation envelope.
<i>Glossopsitta pusilla</i>	Little Lorikeet	-	V	Associated PCT/s with potential food sources and nesting opportunities (hollow-bearing trees) present. Nearest records are around 5 km away. High likelihood of occurring in the investigation envelope.
<i>Grantiella picta</i>	Painted Honeyeater	V	V	Associated PCT/s with potential food trees present though habitat likely to be marginal. Recorded within 10 km of the investigation envelope. Moderate likelihood of intermittently occurring in the investigation envelope.
<i>Haliaeetus leucogaster</i>	Whiter-bellied Sea-eagle.	-	V	No associated PCTs present but the species is associated with large artificial water bodies and has been recorded on several occasions at Lake Lyell. Nearest records are within 5 km. High likelihood of occurring in the investigation envelope. May forage and perch in the investigation envelope adjacent to Lake Lyell but the lack of any sticks nests in the investigation envelope indicates that it is not breeding there at present.
<i>Hieraaetus morphnoides</i>	Little Eagle	-	V	Associated PCT/s with potential food sources and nesting opportunities present though no large stick nests, that would be indicative of current breeding in the area, were observed. Nearest records are around 5 km away. High likelihood of occurring in the investigation envelope.
<i>Hirundapus caudacutus</i>	White-throated Needletail	V	-	Associated PCT/s with potential food sources present. Nearest records are around 5 km away. High likelihood of occurring in the investigation envelope.
<i>Lathamus discolor</i>	Swift Parrot	CE	E	Associated PCT/s with potential food sources present. PMST; species or species habitat likely to occur within area. Nearest records are within 5 km. Moderate likelihood of intermittently occurring in the investigation envelope.
<i>Lophoictinia isura</i>	Square-tailed Kite	-	V	Associated PCT/s with potential food sources and nesting opportunities present though no large stick nests, that would be indicative of current breeding in the area, were observed. Nearest records are around 5 km away. High likelihood of occurring in the investigation envelope.
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	-	V	Associated PCT/s with potential food sources and nesting opportunities present. Nearest records are within 10 km. Moderate likelihood of occurring in the investigation envelope.

**Table 3.6 Threatened fauna species likely to occur in the investigation envelope**

Scientific name	Common name	EPBC Act status	BC Act status	Habitat/potential habitat in investigation envelope
<i>Neophema pulchella</i>	Turquoise Parrot	-	V	Associated PCT/s with potential food sources and nesting opportunities (hollow-bearing trees) present. Nearest records are within 10 km. Moderate likelihood of occurring in the investigation envelope.
<i>Ninox connivens</i>	Barking Owl	-	V	Associated PCT/s with potential food sources and possible nesting opportunities (hollow-bearing trees) present nearby. Nearest records are within 10 km. Moderate likelihood of occurring in the investigation envelope.
<i>Ninox strenua</i>	Powerful Owl	-	V	Associated PCT/s with potential food sources and possible nesting opportunities (hollow-bearing trees) present nearby. Nearest records are within 5 km. High likelihood of occurring in the investigation envelope.
<i>Petroica boodang</i>	Scarlet Robin	-	V	Associated PCT/s with potential food sources and nesting opportunities present. Nearest records are around 5 km away. High likelihood of occurring in the investigation envelope.
<i>Petroica phoenicea</i>	Flame Robin	-	V	Associated PCT/s with potential food sources and nesting opportunities present. Nearest records are within 5 km. High likelihood of occurring in the investigation envelope.
<i>Polytelis swainsonii</i>	Superb Parrot	V	V	No associated PCTs in the investigation envelope. PMST; species or species habitat may occur within area. Local records likely to be of vagrant birds and aviary escapees. Low likelihood of occurring in the investigation envelope.
<i>Stagonopleura guttata</i>	Diamond Firetail	-	V	Associated PCT/s with potential food sources and nesting opportunities present. Nearest records are within 2 km. High likelihood of occurring in the investigation envelope.
<i>Tyto novaehollandiae</i>	Masked Owl	-	V	Associated PCT/s with potential food sources and possible nesting opportunities (hollow-bearing trees) present nearby. Nearest records are around 10 km away. High likelihood of occurring in the investigation envelope.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Associated PCT/s with potential food sources and roosting opportunities present. PMST; species or species habitat may occur within area. Recorded within 10 km of the site. High likelihood of occurring in the investigation envelope.
<i>Paralucia spinifera</i>	Purple Copper Butterfly, Bathurst Copper Butterfly	V	E	Associated PCT/s with potential food sources (Blackthorn – <i>Bursaria spinosa</i> ) present at low density. PMST; species or species habitat likely to occur within area. Moderate likelihood of occurring in the investigation envelope.



**Table 3.6 Threatened fauna species likely to occur in the investigation envelope**

Scientific name	Common name	EPBC Act status	BC Act status	Habitat/potential habitat in investigation envelope
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Associated PCT/s with potential food sources present but no potential roosting/breeding habitat (caves, cliffs and large crevices in rock outcrops) found in the investigation envelope or immediately adjacent. Recorded within 10 km of the site. Moderate likelihood of occurring in the investigation envelope.
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	-	V	Associated PCT/s with potential food sources and roosting/breeding opportunities (hollow-bearing trees) present. Recorded within 10 km of the site. High likelihood of occurring in the investigation envelope.
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	-	V	Associated PCT/s with potential food sources present but no potential roosting/breeding habitat (caves, cliffs and large crevices in rock outcrops) found in the investigation envelope or immediately adjacent. Recorded within 10 km of the site. High likelihood of occurring in the investigation envelope.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	-	V	Associated PCT/s with potential food sources and roosting/breeding opportunities (hollow-bearing trees) present. Recorded within 10 km of the site. High likelihood of occurring in the investigation envelope.
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	-	V	Associated PCT/s with potential food sources and roosting/breeding opportunities (hollow-bearing trees) present. Recorded within 10 km of the site. High likelihood of occurring in the investigation envelope.
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	-	V	Associated PCT/s with potential food sources likely present. Species recorded in multiple locations within 20 km from the site. A single large termite mound (potential breeding habitat) was observed in the investigation envelope. Moderate likelihood of occurring in the investigation envelope.

# 4 Impact assessment

## 4.1 Avoidance, minimisation and mitigation

### 4.1.1 Avoidance and minimisation

There is some flexibility in the precise locations of the access tracks and geotechnical investigation sites. During on-ground delineation of access track and geotechnical locations, particular features of higher habitat value may be largely avoided by shifting locations by a few metres within the investigation envelope. Features to be avoided wherever practicable include:

- hollow-bearing trees and mature trees;
- termite mounds;
- large rocks;
- large fallen trees; and
- mature blackthorn (*Bursaria spinosa*) plants ie potential habitat for the Bathurst Copper Butterfly.

By avoiding these features, loss of sheltering and breeding sites and the potential for the injury of individuals of threatened animal species would be largely avoided.

### 4.1.2 Mitigation

In order to further mitigate impacts on the ecological values of the site, the mitigation measures in Table 4.1 are proposed to be implemented.

**Table 4.1 Proposed avoidance and mitigation measures**

<b>Prior to construction</b>
Site personnel should be adequately informed of environmental management procedures including, but not limited to, issues relating to flora and fauna management, weed control, erosion and sediment control and water quality management.
Preparation of a construction environmental management plan. The plan should incorporate the design, construction and post-construction environmental management measures proposed. This should include (but not be limited to) issues relating to vegetation management, weed control, and erosion and sediment control and should include plans clearly showing areas to be cleared, trees to be retained and any other 'no go zones'.
The locations of habitat features to be avoided within the investigation envelope, including hollow-bearing and potentially hollow-bearing trees, termite mounds; large rocks, large fallen trees; and Blackthorn ( <i>Bursaria spinosa</i> ) plants, should be physically marked by an ecologist prior to the finalisation of the location of the disturbance footprint to facilitate maximum avoidance of these features.
The removal of hollow-bearing trees, dead trees and large trees (>0.5 m diameter at 1.3 m above ground level), should be avoided wherever practicable by designing the precise location of access road and geotechnical investigation areas with consideration of the 'structural root zone' of trees as described in the relevant Australian Standards, <i>AS 4970-2009 - Protection of trees on development sites</i> (Standards Australia 2009). Trees to be removed and retained should also be physically marked to avoid confusion during clearing operations.
A weed control protocol should be developed. This would aim to stop the spread of environmental weeds, particularly those listed as High Threat Weeds. This protocol would include wash down procedures during the construction phase and weed suppression within the impact footprint.
The boundaries of areas to be cleared and trees to be retained are to be clearly defined on ground and 'no go zones' clearly signposted to prevent unauthorised clearing and vehicular and/or foot traffic. No go zones should include any trees to be retained and threatened plant species to be retained within the footprint.
<b>Construction</b>
Vehicles, machinery and equipment must be clear of soil and plant debris when they arrive on site and prior to movement between sites to minimise the potential for the introduction of weeds and pathogens.
Pre-clearance surveys for native animal species should be undertaken immediately prior to vegetation clearing and earthworks. Any fauna present should be translocated to adjacent habitat outside of the construction footprint.
An environment representative or ecologist should be present during the removal of any large (>50 cm DBH) trees, identified hollow-bearing trees, large fallen trees and rock outcrops to assist any fauna using these habitats to move into nearby habitat areas and seek veterinary assistance for any injured animals.
Where practicable, removal of hollow-bearing trees should be undertaken in Autumn (March to May), outside the main breeding period for hollow-dependent fauna likely to occupy the site and when bat species are likely to be active and able to flee (ie not in torpor). If hollow-bearing trees are to be removed during the breeding season of threatened hollow-dependent animals (September to February) or in winter (June to August) when bats are likely to be in a state of torpor, monitoring of breeding activity or the presence of bats should be carried out by an ecologist/s approximately one week prior to the proposed tree removal as a part of pre-clearing surveys. If nesting activity or the presence of bats is recorded, additional mitigation measures would be recommended, as necessary.
If safe to do without significant risk to plant operators, hollow-bearing trees should be knocked several times with an excavator on the day prior to removal to encourage animals to move away immediately or overnight. Knocking should also be repeated immediately prior to the removal of hollow-bearing trees.
Where safe for staff and practicable with regard to tree height and terrain, tree limbs containing hollows should be removed using tree-climbing techniques and/or an elevated work platform to allow hollows to be gently lowered to the ground, thus minimising the risk of injury to fauna.
During the construction phase, all works should be undertaken in accordance with general mitigation measures to be identified in the construction environmental management plan, including: sediment and erosion control, water quality management, air quality management, noise management, waste management, dangerous goods management etc.

**Table 4.1 Proposed avoidance and mitigation measures**

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When accessing construction sites, contractors should use only designated routes on existing tracks or through areas within minimal native vegetation.

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No materials, spoil or machinery should be stored or parked within the drip-line of any trees to be retained.

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**Post construction**

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Complete post construction weed control activities in accordance with the weed control protocol.

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## 4.2 Residual impacts

The residual impacts of the modified development, after application of the hierarchy of avoid, minimise and mitigate, are described here and were used to inform the assessments of impact significance for threatened biodiversity in Appendix C and Appendix D.

Clearing of native vegetation can result in a range of direct and indirect impacts including:

- reduction in the extent of vegetation communities;
- decline of local populations of species;
- fragmentation of remnants of vegetation communities or local populations of individual species;
- increased edge effects and habitat for invasive species;
- reduction in the viability of ecological communities resulting from loss or disruption of ecological functions (eg increased desiccation, light penetration, increased herbivore activity, weed invasion, increased predation, and loss of animals that are seed dispersers and pollinators);
- destruction of flora and fauna habitat and associated loss of biological diversity (habitat removal may include removal of hollow bearing trees, loss of leaf litter layer, and resultant changes to soil biota); and
- soil exposure and altered water flow patterns resulting in increased erosion and sedimentation.

These potential direct and indirect impacts are discussed below.

### 4.2.1 Contribution to key threatening processes

Key threatening processes are listed under the BC Act and under the EPBC Act. A process is defined as a key threatening process if it threatens or may threaten the survival, abundance, or evolutionary development of a native species or ecological community. A process can be listed as a key threatening process if it could cause a native species or ecological community to become eligible for adding to a threatened status category (other than conservation dependant) or cause an already listed threatened species or community to become more threatened, or if it adversely affects two or more listed threatened species or ecological communities.

The modified development has the potential to contribute to the following threatening processes:

- BC Act Key Threatening Processes:
  - invasion of native plant communities by exotic perennial grasses;
  - clearing of native vegetation; and
  - loss of hollow-bearing trees.
- EPBC Act Key Threatening Processes:
  - land clearance; and
  - loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.

Owing to the small extent of vegetation to be removed, the modified development will not significantly contribute to key threatening processes relating to native vegetation removal or land clearance. The loss of hollow-bearing trees will be minimised through micro-siting of investigation sites and access tracks to avoid where possible mature trees and hollow-bearing trees. The modified development is not likely to significantly increase the introduction or spread of exotic weed species, if undertaken in accordance with mitigation measures provided in Section 4.1.

#### 4.2.2 Direct impacts

Vegetation clearing for the modified development will result in direct impacts including a reduction in:

- native vegetation, including a threatened ecological community;
- habitat for flora and fauna; and
- populations of flora and fauna, possibly including threatened species. These impacts are discussed in more detail below.

##### i Loss of vegetation and associated habitat values

The main direct impact of the modified development on biodiversity is the clearing of 0.59 ha of native vegetation and associated habitat for the threatened species of plants and animals listed in Section 3.2. This impact is summarised in Table 4.2.

**Table 4.2 Potential loss of native vegetation and associated habitat**

Plant community type	Condition	Area (ha)
PCT 732 – Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion	High	0.09
PCT 1197 – Snow Gum – Mountain Gum tussock grass-herb forest of the South Eastern Highlands Bioregion	High	0.47
<b>Total</b>		<b>0.59</b>

## ii Impacts on threatened ecological communities

The modified development will result in the removal of 0.48 ha of Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions EEC (see Section 3.1.2). This community is listed as endangered under the BC Act, and accordingly an assessment of significance is provided at Appendix C. The assessment concluded that the modified development would not result in a significant impact on the EEC.

## iii Impacts on threatened species

Vegetation clearing inevitably results in the removal of individual plants. No threatened species of plant are known to occur in the vegetation that would be cleared for the modified development but there are several species that may occur there. It has been assumed that these species may occur within the disturbance footprint for the purposes of impact significance assessment.

Fauna injury or death, including that of some threatened species, could occur as a result of the proposed activities during the construction phase, particularly when vegetation and habitats are being cleared.

While some mobile species, such as birds, have the potential to move away from the path of clearing, other species that are less mobile, or those that are nocturnal and restricted to tree hollows, may have difficulty moving over relatively large distances. Threatened species that may be at risk of injury or death during vegetation clearing include small terrestrial and arboreal mammals, bats, larvae of the Purple Copper Butterfly and reptile such as Rosenberg's Goanna. Owing to the small extent of vegetation proposed to be removed, the planned avoidance of key habitat features and implementation of clearing mitigation measures, it is considered that the effect of this loss on local populations is unlikely to be significant.

Measures would be in place to minimise the likelihood of death or injury of wildlife, however, these cannot entirely prevent such potential losses. The impact of such losses in relation to threatened species was considered in the assessments of significance (refer Appendix C and Appendix D).

### 4.2.3 Indirect impacts

This section outlines the modified development's indirect impacts, following the implementation of avoidance, minimisation and mitigation measures (Section 4.1). Indirect impacts are related to vegetation clearing for modified development and comprise:

- habitat fragmentation, barrier and edge effects;
- weed proliferation;
- erosion and sedimentation; and
- increased noise, vibration and dust levels resulting in disturbance of fauna species, and consequent abandonment of habitat, or changes in behaviour (including breeding behaviour).

These potential indirect impacts are further discussed below.

#### i Habitat fragmentation, barrier and edge effects

Habitat fragmentation is the division of a single area of habitat into two or more smaller areas, with the occurrence of a new habitat type in the area between the fragments. This new dividing habitat type is often artificial and inhospitable to the species remaining within the fragments (Bennett 1990, 1993; Johnson *et al.* 2007).



In addition to the loss of total habitat area, the process of fragmentation can affect species within the newly created fragments in a number of ways, including barrier effects, genetic isolation, and edge effects. The degree to which these potential impacts affect the flora and fauna within the newly created fragments depends on a number of variables, including distance between the fragments, local environmental conditions, the species present and any proposed mitigation measures.

#### a Barrier effects

Barrier effects occur where particular species are either unable or are unwilling to move between suitable areas of fragmented habitat due to the imposition of a 'barrier' (eg a newly created inhospitable habitat type). This could result in either a complete halt to species movement or a reduced level of species movement between fragments. Species most vulnerable to barrier effects include rare species (where even a small reduction in movements can reduce genetic continuity within a population, hence reducing the effective population size), smaller ground-dwelling species and relatively sessile species with low mobility. Species least vulnerable to barrier effects tend to be those that are highly mobile (eg birds), although even these species can vary in their response to barriers.

Genetic isolation occurs where individuals from a population within one fragment are unable to interbreed with individuals from populations in adjoining fragments. Genetic isolation can lead to problems with inbreeding and genetic drift for populations isolated within a fragment. This may lead to reduced fitness (in the form of inbreeding depression resulting from expression of deleterious recessive genes in offspring) and consequently reduced viability of populations that are isolated in habitat fragments as a result of the modified development.

The modified development will result in the creation of vehicle tracks through habitat which could reduce the tendency of some species to move between different areas of habitat. As the tracks would be relatively narrow, they are unlikely to significantly reduce animal movement and they would not create a significant barrier effect.

#### b Edge effects

Edge effects are zones of changed environmental conditions (eg altered light levels, wind speed, temperature) occurring along the edges of habitat fragments. These new environmental conditions along the edges can promote the growth of different vegetation types (including weeds), promote invasion by pest animals specialising in edge habitats, or change the behaviour of resident animals (Moenting & Morris 2006). Edge zones can be subject to higher levels of predation by introduced mammalian and native avian predators. The distance of edge effects influence can vary, with edge effects in roads having been recorded greater than 1 km (Forman et al. 2000) and as little as 50 m away (Bali 2000; 2005).

Due to the very small scale of the proposed clearing and the proposed measures to prevent weed infestation, the modified development is unlikely to cause significant edge effects.

#### ii Weed proliferation

The modified development has the potential to disperse weeds into areas where weed species do not currently occur. The most likely causes of weed dispersal associated with the modified development would be introduction of weed seeds by vehicles and machinery. This may, in turn, reduce the habitat quality of the sites for threatened species, such as woodland species of bird (Robinson *et al.* 2001).

If vehicles, machinery and equipment are clean prior to arrival on site and prior to movement between sites, the potential for significant weed proliferation would be low.

### iii Erosion and sedimentation

Excavation and earthworks undertaken during the construction phase would expose soils that have the potential to enter surrounding areas of vegetation and waterways downslope, possibly resulting in erosion and sedimentation, if not properly managed. Erosion controls are recommended to be included within a construction environmental management plan.

## 5 Assessment against key legislation and policy

The current key legislation that is relevant to the modified development is discussed in Section 1.2, the assessment against each is set out below.

### 5.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

**Table 5.1 Assessment of the modified development against the EPBC Act**

MNES	Modified development specific	Potential for significant impact
Threatened species and status	<i>Thesium australe</i> (Austral Toadflax) – vulnerable <i>Acacia bynoeana</i> (Bynoe's Wattle) – vulnerable <i>Acacia meiantha</i> – endangered <i>Callocephalon fimbriatum</i> (Gang-gang cockatoo) - endangered <i>Calyptorhynchus lathami lathami</i> (South-eastern Glossy Black-Cockatoo) – vulnerable <i>Dasyurus maculatus</i> (Spotted-tailed Quoll) – endangered <i>Phascolarctos cinereus</i> (Koala) – vulnerable <i>Anthochaera phrygia</i> (Regent Honeyeater) – critically endangered <i>Grantiella picta</i> (Painted Honeyeater) – vulnerable <i>Hirundapus caudacutus</i> (White-throated Needletail) – vulnerable <i>Lathamus discolor</i> (Swift Parrot) – critically endangered <i>Pteropus poliocephalus</i> (Grey-headed Flying-fox) – vulnerable <i>Paralucia spinifera</i> (Bathurst Copper Butterfly) – vulnerable <i>Chalinolobus dwyeri</i> (Large-eared Pied Bat) – vulnerable	Low
Threatened ecological communities	None found in investigation envelope.	Negligible
Migratory species	Habitat for listed migratory species is marginal. Some species may be sporadic and infrequent visitors.	Negligible
Wetlands of international importance	None found in investigation envelope nor in the catchment of the investigation envelope.	Negligible

## 5.2 New South Wales Environmental Planning and Assessment Act 1979

### 5.2.1 State Environmental Planning Policy (Biodiversity and Conservation) 2021

*State Environmental Planning Policy (Biodiversity and Conservation) 2021* recently repealed the former *State Environmental Planning Policy (Koala Habitat Protection) 2020* (Koala SEPP 2020) and *State Environmental Planning Policy (Koala Habitat Protection) 2021* (Koala SEPP 2021). Chapter 3 and 4 of the SEPP aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline. In the context of this modified development, the SEPP requires consideration because the site is within the City of Lithgow LGA.

Chapter 4 of the SEPP applies to development applications on land which is >1 ha on its own, or together with adjoining land in the same ownership, whether or not the development application applies to only part of the land, and which is within council areas listed in Schedule 1 of the SEPP. It does not apply to assessments under Part 5 of the EP&A Act, or to State Significant Development or State Significant Infrastructure projects. There is also an exemption for clearing to create an asset protection zone to replace a dwelling house that has been damaged or destroyed by bushfire.

If a Comprehensive Koala Plan of Management is present for the land then the controls and assessment requirements within that document are to be applied. Should a Comprehensive Koala Plan of Management not be in force then there is a two-step process to assess whether the SEPP applies to a development application. This consists of first identify whether the land is potential koala habitat by identifying whether areas of vegetation which constitute at least 15% of the total number of trees in the upper or lower strata of the tree component as listed in Schedule 1. If potential koala habitat is present, then the land is assessed as to whether it contains core koala habitat, which means a resident population of Koalas. Should this apply then a Koala Plan of Management is required to be prepared.

The Biodiversity and Conservation SEPP does not apply to the modified development as:

- only a single tree species listed in Schedule 1 of the SEPP, Ribbon Gum (*Eucalyptus viminalis*) was recorded in the investigation envelope and the species comprises less than 15% of the canopy in terms of both foliage cover and abundance; and
- the land in the modified development does not constitute core koala habitat and no Koala Plan of Management is in force for the City of Lithgow LGA.

## 5.3 NSW Biodiversity Conservation Act 2016

The NSW BC Act is the key piece of legislation responsible for the conservation of biodiversity in NSW through the protection of threatened flora and fauna species, populations and ecological communities. The BC Act, together with the *NSW Biodiversity Conservation Regulation 2017* (the Regulation), establishes the Biodiversity Offsets Scheme (BOS), the Biodiversity Assessment Method (the BAM) and a method for determining whether development is considered likely to significantly affect threatened species, ecological communities or their habitats. A development is likely to result in a significant effect if:

- the development exceeds the biodiversity offsets scheme native vegetation clearing threshold;
- the development is carried out in a declared area of outstanding biodiversity value, as mapped on the Biodiversity Values Map; or
- the development is likely to significantly affect threatened species or ecological communities, or their habitats, according to the five-part test.

If any of these thresholds are exceeded, the BOS applies and a biodiversity development assessment report (BDAR) must be prepared in accordance with the BAM (OEH 2020).

Clearing thresholds are set out in Section 7.2 of the Regulation and are summarised below in Table 5.2. The minimum lot size is based on the minimum lot size in an environmental planning instrument.

**Table 5.2 Clearing thresholds**

Minimum lot size of land	Area of clearing (threshold)
Less than 1 hectare	0.25 hectare or more
Less than 40 hectares but not less than 1 hectare	0.5 hectare or more
Less than 1,000 hectares but not less than 40 hectares	1 hectare or more
1,000 hectares or more	2 hectares or more

EMM has assessed the modified development against these thresholds, as indicated in Table 5.3.

**Table 5.3 Biodiversity offset scheme thresholds**

BOS threshold	Assessment
Biodiversity offsets scheme native vegetation clearing threshold	For this site, the relevant lots, Lot 152 DP751651 (223.53 ha) and Lot 103 DP751651 (276.91 ha), do not have a minimum lot size in the <i>Lithgow Local Environmental Plan 2014</i> . As the lots are less than 1,000 hectares but not less than 40 hectares, the threshold for entry to the BOS is 1 hectare or more. The total clearing of native vegetation required for the development is 0.59 hectares. The modified development does not, therefore trigger the area of clearing threshold.
Declared area of outstanding biodiversity value, as mapped on the Biodiversity Values Map	The modified development would not impact on areas mapped on the Biodiversity Values Map.
Significant effect on threatened species or ecological communities, or their habitats, according to the five-part test	The modified development is unlikely to have a significant effect on threatened species or ecological communities, or their habitats (see Appendix C).

Based on the assessment in Table 5.3, the modified development does not require assessment under the BOS.

The test of significance, set out in Section 7.3 of the on BC Act, listed biodiversity is required to determine if a development is likely to significantly affect threatened species and hence if the application for development consent must be accompanied by a biodiversity development assessment report.

The test of significance was applied to all species and ecological communities likely to be impacted by the modified development (refer to Section 3.2) and is provided in Appendix C. The assessment concluded that no entities listed as threatened species under the BC Act are likely to be significantly impacted by the modified development.

### 5.3.1 Biosecurity Act 2015

The BS Act replaces the *Noxious Weeds Act 1993*, which is now been repealed.

The primary object of the BS Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

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

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

Weed species with specific biosecurity duties under the BS Act and the relevant duties are listed in Table 5.4. These species and the biosecurity security duties described should be the focus of weed management associated with the modified development.

**Table 5.4 Biodiversity duties for priority weeds**

Priority weed and location on site	Biosecurity duty for the Central Tablelands weed management area
Gorse ( <i>Ulex europaeus</i> )  Scattered at the southern end of the investigation area, immediately adjacent to the shore of Lake Lyell.	<u>Regional Recommended Measure*</u> (for Regional Priority - Containment)  Whole region: the plant should not be bought, sold, grown, carried or released into the environment.  Exclusion zone: the plant should be eradicated from the land and the land kept free of the plant. Land managers should mitigate the risk of the plant being introduced to their land.  Core infestation area: land managers should mitigate spread from their land. Land managers reduce impacts from the plant on priority assets.
Blackberry ( <i>Rubus fruticosus</i> species aggregate)  Scattered at the southern end of the investigation area, near the shore of Lake Lyell.	<u>Regional Recommended Measure*</u> (for Regional Priority - Asset Protection)  Land managers should mitigate the risk of new weeds being introduced to their land. Land managers should mitigate spread from their land. The plant should not be bought, sold, grown, carried or released into the environment.  Protect conservation areas, natural environments and primary production lands that are free of blackberry.

\* Central Tablelands Regional Strategic Weed Management Plan 2017-2022 - Local Land Services 2017



## 6 Conclusions

This biodiversity assessment has been completed to assess potential impacts of the modified development on species and communities listed under the BC Act and EPBC Act.

The modified development will clear one NSW listed EEC, *Snow Gum - Mountain Gum tussock grass-herb forest of the South Eastern Highlands Bioregion* and potential habitat for five threatened species of flora and 36 threatened species of fauna (refer Section 3.2).

Assessments of significance were completed in accordance with Section 7.2 of the BC Act and EPBC Act Policy Statement 1.1 (DoE 2013) for the listed communities and species. The assessments concluded that the modified development would not result in significant impacts on these listed communities and species, given the small magnitude of impact.

Impacts avoidance and mitigation measures described in Section 4.1 would be implemented to ensure that the modified development is undertaken with the least impact practicable.

## 7 References

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# Appendix A

## Protected matters search tool





# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 19/10/21 14:35:59

## [Summary](#)

## [Details](#)

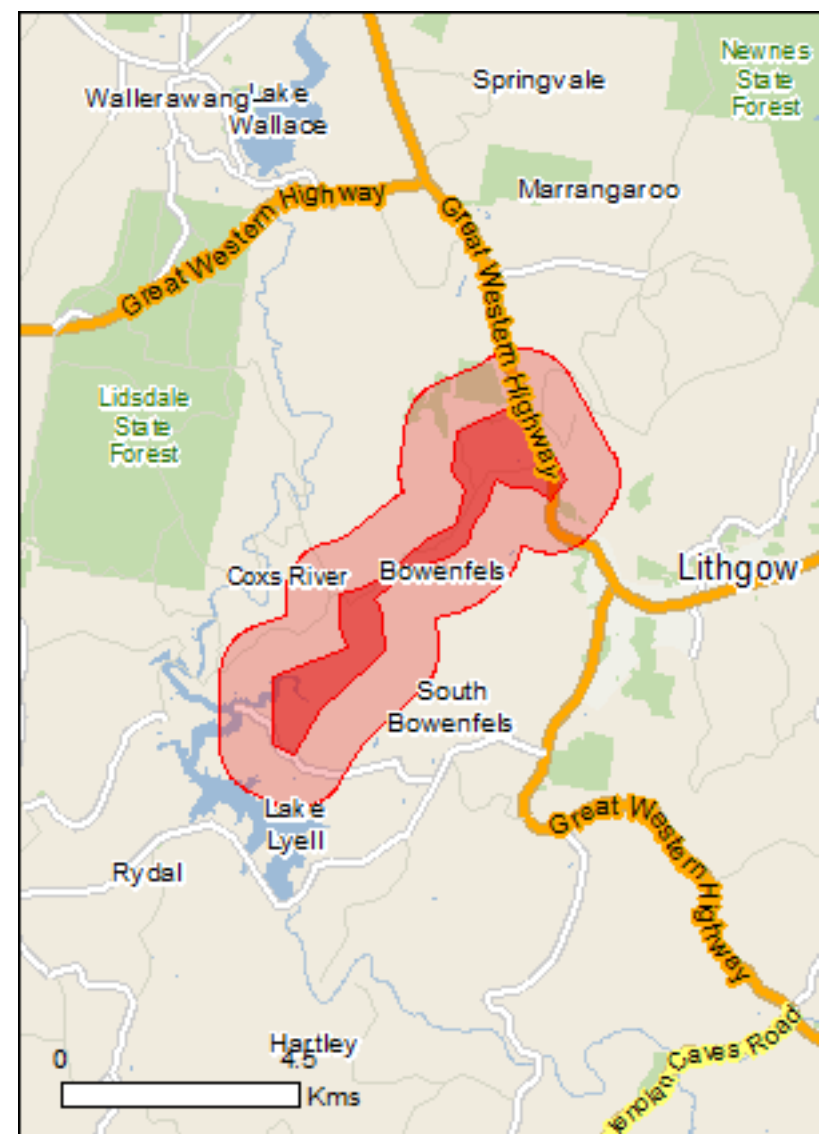
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

## [Caveat](#)

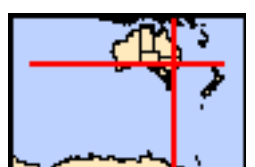
## [Acknowledgements](#)



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

[Coordinates](#)

[Buffer: 1.0Km](#)





# Summary

## Matters of National Environmental Significance

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

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	3
<a href="#">Listed Threatened Species:</a>	39
<a href="#">Listed Migratory Species:</a>	13

## Other Matters Protected by the EPBC Act

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

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

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

<a href="#">Commonwealth Land:</a>	1
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	19
<a href="#">Whales and Other Cetaceans:</a>	None
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None

## Extra Information

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

<a href="#">State and Territory Reserves:</a>	1
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	38
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">Key Ecological Features (Marine)</a>	None

# Details

## Matters of National Environmental Significance

### Listed Threatened Ecological Communities

[\[ Resource Information \]](#)

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

Name	Status	Type of Presence
<a href="#">Natural Temperate Grassland of the South Eastern Highlands</a>	Critically Endangered	Community may occur within area
<a href="#">Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion</a>	Endangered	Community may occur within area
<a href="#">White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland</a>	Critically Endangered	Community likely to occur within area

### Listed Threatened Species

[\[ Resource Information \]](#)

Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Anthochaera phrygia</a> Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Botaurus poiciloptilus</a> Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Falco hypoleucos</a> Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Grantiella picta</a> Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Polytelis swainsonii</a> Superb Parrot [738]	Vulnerable	Species or species habitat may occur within area
<a href="#">Rostratula australis</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur

Name	Status	Type of Presence within area
<b>Fish</b>		
<a href="#">Macquaria australasica</a> Macquarie Perch [66632]	Endangered	Species or species habitat known to occur within area
<a href="#">Prototroctes maraena</a> Australian Grayling [26179]	Vulnerable	Species or species habitat may occur within area
<b>Frogs</b>		
<a href="#">Heleioporus australiacus</a> Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat may occur within area
<a href="#">Litoria booroolongensis</a> Booroolong Frog [1844]	Endangered	Species or species habitat likely to occur within area
<b>Insects</b>		
<a href="#">Paralucia spinifera</a> Bathurst Copper Butterfly, Purple Copper Butterfly, Bathurst Copper, Bathurst Copper Wing, Bathurst-Lithgow Copper, Purple Copper [26335]	Vulnerable	Species or species habitat known to occur within area
<b>Mammals</b>		
<a href="#">Chalinolobus dwyeri</a> Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Dasyurus maculatus maculatus (SE mainland population)</a> Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
<a href="#">Petauroides volans</a> Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Petrogale penicillata</a> Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)</a> Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Pseudomys novaehollandiae</a> New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Pteropus poliocephalus</a> Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
<b>Plants</b>		
<a href="#">Acacia bynoeana</a> Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat may occur within area
<a href="#">Boronia deanei</a> Deane's Boronia [8397]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Cryptostylis hunteriana</a> Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
<a href="#">Eucalyptus aggregata</a> Black Gum [20890]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Eucalyptus pulverulenta</a> Silver-leaved Mountain Gum, Silver-leaved Gum	Vulnerable	Species or species

Name	Status	Type of Presence
[21537]		habitat known to occur within area
<a href="#">Euphrasia arguta</a> [4325]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Kunzea cabbagei</a> [11420]	Vulnerable	Species or species habitat may occur within area
<a href="#">Leucochrysum albicans subsp. tricolor</a> Hoary Sunray, Grassland Paper-daisy [89104]	Endangered	Species or species habitat may occur within area
<a href="#">Persoonia marginata</a> Clandulla Geebung [10852]	Vulnerable	Species or species habitat may occur within area
<a href="#">Pomaderris brunnea</a> Rufous Pomaderris, Brown Pomaderris [16845]	Vulnerable	Species or species habitat may occur within area
<a href="#">Pomaderris cotoneaster</a> Cotoneaster Pomaderris [2043]	Endangered	Species or species habitat may occur within area
<a href="#">Pultenaea glabra</a> Smooth Bush-pea, Swamp Bush-pea [11887]	Vulnerable	Species or species habitat may occur within area
<a href="#">Rhizanthella slateri</a> Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
<a href="#">Thesium australe</a> Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Xerochrysum palustre</a> Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat may occur within area
<b>Reptiles</b>		
<a href="#">Aprasia parapulchella</a> Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area
<a href="#">Hoplocephalus bungaroides</a> Broad-headed Snake [1182]	Vulnerable	Species or species habitat may occur within area
<b>Listed Migratory Species</b>		<b>[ <a href="#">Resource Information</a> ]</b>
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<b>Migratory Terrestrial Species</b>		
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Monarcha melanopsis</a> Black-faced Monarch [609]		Species or species habitat likely to occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area



Name	Threatened	Type of Presence
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat known to occur within area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat likely to occur within area
<b>Migratory Wetlands Species</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat may occur within area

## Other Matters Protected by the EPBC Act

### Commonwealth Land [\[ Resource Information \]](#)

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

Name
Commonwealth Land - Telstra Corporation Limited

### Listed Marine Species [\[ Resource Information \]](#)

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

Name	Threatened	Type of Presence
<b>Birds</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Chrysococcyx osculans</a> Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Monarcha melanopsis</a> Black-faced Monarch [609]		Species or species habitat likely to occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat known to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat may occur within area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat likely to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

## Extra Information

### State and Territory Reserves [\[ Resource Information \]](#)

Name	State
Marrangaroo	NSW

### Invasive Species [\[ Resource Information \]](#)

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

Name	Status	Type of Presence
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#### Birds

Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
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Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
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Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
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Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
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Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
--	--	--

Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
--	--	--

Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
--	--	--

Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
--	--	--

Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
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Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
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Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
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#### Mammals

Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
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Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
--	--	--

Capra hircus Goat [2]		Species or species habitat likely to occur
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Name	Status	Type of Presence
Equus caballus Horse [5]		within area  Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
<b>Plants</b>		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur



Name	Status	Type of Presence within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

# Caveat

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

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

## Coordinates

-33.457847 150.118982,-33.457829 150.118982,-33.457257 150.119583,-33.456899 150.120956,-33.467675 150.128295,-33.470754 150.125548,-33.469179 150.123446,-33.468928 150.121901,-33.468821 150.118897,-33.467961 150.116365,-33.469214 150.115592,-33.471505 150.114519,-33.474083 150.112502,-33.476982 150.111386,-33.478915 150.108511,-33.480526 150.101816,-33.484929 150.095765,-33.485573 150.096495,-33.486933 150.097138,-33.488902 150.097267,-33.490978 150.097653,-33.492087 150.097568,-33.493698 150.095379,-33.500282 150.086796,-33.506652 150.08229,-33.505149 150.078513,-33.495559 150.078642,-33.491658 150.091173,-33.488651 150.089757,-33.484052 150.089714,-33.483336 150.093491,-33.481689 150.09701,-33.476463 150.104391,-33.474745 150.108854,-33.474029 150.109713,-33.469232 150.111086,-33.466869 150.10894,-33.461213 150.109798,-33.457847 150.118982

# Acknowledgements

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

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
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- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
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- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
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- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

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

Please feel free to provide feedback via the [Contact Us](#) page.

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# Appendix B

## Likelihood of occurrence table



**Table B.1 Likelihood of occurrence table**

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	Regent Honeyeaters are semi-nomadic, occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests. They inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Birds are occasionally seen on the south coast. Nectar and fruit from mistletoes are also eaten. When nectar is scarce lerp and honeydew can comprise a large proportion of the diet. The species usually nest in tall mature eucalypts and she-oaks. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks, as well as in mistletoe haustoria. The species is a dual credit species, mapped important areas are a species credit, these areas do not require survey and any impact from development could be potentially serious and irreversible.	Moderate	Associated PCT/s with potential food trees present. PMST; species or species habitat likely to occur within area. Nearest records are within around 10 km of the investigation envelope. The investigation envelope is not in an area of mapped important habitat. Moderate likelihood of intermittently occurring in the investigation envelope.
<i>Aprasia parapulchella</i>	Pink-tailed Worm-lizard	V	V	Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass ( <i>Themeda australis</i> ). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks; the burrows have been constructed by and are often still inhabited by small black ants and termites.	Low	No associated PCTs in the subset site. PMST; species or species habitat may occur within area. The nearest record of the specie is around 40 km away. Low likelihood of occurring in the investigation envelope.
<i>Apus pacificus</i>	Fork-tailed Swift	-	Mi	The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea.	Moderate	Species may fly over investigation envelope on occasion however unlikely to land or forage within the investigation envelope.



**Table B.1 Likelihood of occurrence table**

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	CE	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> spp. and <i>Eleocharis</i> spp. 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.	Negligible	There are no records of the Australasian Bittern within the locality. The investigation envelope lacks suitable intertidal habitat.
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	-	Mi	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, salt pans and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgeland and other ephemeral wetlands, but leave when they dry.	Low	There are no records of this species within the locality. The investigation envelope lacks suitable habitat.
<i>Calidris ferruginea</i>	Curlew Sandpiper	E	CE	Occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland. It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed.	Low	There are no records of this species within the locality. The investigation envelope lacks suitable habitat.
<i>Callocephalon fimbriatum</i>	Gang-gang cockatoo	V	E	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. May also occur in sub-alpine Snow Gum woodland and occasionally in temperate rainforests. Favours old growth forest and woodland attributes for nesting and roosting.	Recorded	Recorded adjacent to the investigation envelope.

**Table B.1 Likelihood of occurrence table**

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Calyptorhynchus lathamii</i>	Glossy Black-Cockatoo	V	V	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak ( <i>Allocasuarina littoralis</i> ) and Forest Sheoak ( <i>A. torulosa</i> ) are important foods. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, <i>Allocasuarina diminuta</i> , and <i>A. gymnathera</i> . Belah is also utilised and may be a critical food source for some populations. Feeds almost exclusively on the seeds of several species of she-oak ( <i>Casuarina</i> and <i>Allocasuarina</i> species)	High	Recorded in the locality and some <i>Allocasuarina</i> species recorded nearby.
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Occurs from the Queensland border to Ulladulla, with largest numbers from the sandstone escarpment country in the Sydney Basin and Hunter Valley. 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 three 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 known existing maternity roost is in a sandstone cave near Coonabarabran.	Moderate	Associated PCT/s with potential food sources present but no potential roosting/breeding habitat (caves, cliffs and large crevices in rock outcrops) found in the investigation envelope or immediately adjacent. Recorded within 10 km of the site. Moderate likelihood of occurring in the investigation envelope.
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	Occurs along the east coast of Australia and the Great Dividing Range. Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests. Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas. Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage. Seventy per cent of the diet is medium-sized mammals, and also feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage. The home range of a female is between 180 and 1000 ha, while males have larger home ranges of between 2000 and 5000 ha. Breeding occurs from May to August.	Moderate	Associated PCT/s with hollow-bearing trees and potential food sources present. Nearest records are around 10 km from the investigation envelope. Moderate likelihood of occurring in the investigation envelope.

**Table B.1 Likelihood of occurrence table**

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Eulamprus leuraensis</i>	Blue Mountains Water Skink	E	E	The Blue Mountains Water Skink occurs at high elevations between 560 m and 1140 m. Genetic research indicates that individual populations are genetically distinct especially between Newnes Plateau and Blue Mountains populations. It is restricted to an isolated and naturally fragmented habitat of sedge and shrub swamps that have boggy soils and appear to be permanently wet. The vegetation in these swamps typically takes the form of a sedgeland interspersed with shrubs, but may occur as a dense shrub thicket.	Low	No associated PCTs are present. No suitable sedge swamp habitat is present in the investigation envelope. All records from locality are within Newnes State Forest. No records west of Lithgow.
<i>Falco hypoleucos</i>	Grey Falcon	E	V	Found over open country and wooded lands of tropical and temperate Australia. Mainly found on sandy and stony plains of inland drainage systems with lightly timbered acacia scrub. Restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions. Also occurs near wetlands.	Low	No associated PCTs present. PMST; species or species habitat may occur within area. An inland species, considered to be a sporadic, temporary visitor the region. The nearest record of the species ifs from > 90 km away. Low likelihood of occurring in the investigation envelope.
<i>Gallinago hardwickii</i>	Latham's Snipe	-	Mi	In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies)	Low	Investigation envelope lacks wetland habitats used by this species.
<i>Grantiella picta</i>	Painted Honeyeater	V	V	Inhabits Boree/ Weeping Myall ( <i>Acacia pendula</i> ), Brigalow ( <i>A. harpophylla</i> ) and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus <i>Amyema</i> . Insects and nectar from mistletoe or eucalypts are occasionally eaten. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches.	Moderate	Associated PCT/s with potential food trees present though habitat likely to be marginal. Recorded within 10 km of the investigation envelope. Moderate likelihood of intermittently occurring in the investigation envelope.

**Table B.1 Likelihood of occurrence table**

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	V	The Giant Burrowing Frog is found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. They spend more than 95% of their time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat, the Giant Burrowing Frog burrows below the soil surface or in the leaf litter.	Low	No associated PCTs present and species not known from locality. Low likelihood of occurring in the investigation envelope.
<i>Hirundapus caudacutus</i>	White-throated Needletail	-	V, Mi	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. Breeds in Asia. White-throated Needletails almost always forage aerially, at heights up to 'cloud level'.	High	Associated PCT/s with potential food sources present. Nearest records are around 5 km away. High likelihood of occurring in the investigation envelope. Breeds in Asia.
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E	V	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in cervices or hollows in large trees within 500m of escarpments in summer.	Low	Not predicted to occur in the area by the PMST. Associated PCT/s with potential food sources likely present but no potential autumn-spring shelter/breeding habitat (rock crevices or exfoliating sandstone rocks on exposed cliff edges) found in the investigation envelope or immediately adjacent. Low likelihood of occurring in the investigation envelope.
<i>Lathamus discolor</i>	Swift Parrot	E	CE	This species migrates in the autumn and winter months to south-eastern Australia. In NSW, it mostly occurs on the coast and south-west slopes in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations (OEH 2018). Favoured feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood ( <i>C. gummifera</i> ), Mugga Ironbark and White Box. Commonly used lerp infested trees include Inland Grey Box, Grey Box ( <i>E. moluccana</i> ) and Blackbutt ( <i>E. pilularis</i> ).	Moderate	Associated PCT/s with potential food sources present. PMST; species or species habitat likely to occur within area. Nearest records are within 5 km. Moderate likelihood of intermittently occurring in the investigation envelope.

**Table B.1 Likelihood of occurrence table**

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Litoria aurea</i>	Green and Golden Bell Frog	E	V	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes ( <i>Typha</i> spp.) or spikerushes ( <i>Eleocharis</i> spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow ( <i>Gambusia holbrooki</i> ), have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas. Formerly distributed from the NSW north coast near Brunswick Heads, southwards along the NSW coast to Victoria where it extends into east Gippsland. Records from west to Bathurst, Tumut and the ACT region. Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range, however they are widely separated and isolated. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). There is only one known population on the NSW Southern Tablelands.	Low	Not predicted to occur in the area by the PMST. Associated PCT/s with potential foraging habitat present. Nearest records are around 30 km away from the 1970s and 2003. Marginal potential breeding habitat present in adjacent water body. Low likelihood of occurring in the investigation envelope.
<i>Litoria booroolongensis</i>	Booroolong Frog	E	E	Lives along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock structures within stream margins. Shelter under rocks or amongst vegetation near the ground on the stream edge.	Low	Associated PCT/s present, however, no rocky stream habitat is found within or adjacent to the investigation envelope. PMST; Species or species habitat may occur within area. Recorded within 10 km of the site. Low likelihood of occurring in the investigation envelope.
<i>Litoria littlejohni</i>	Littlejohn's Tree Frog	V	V	This species breeds in the upper reaches of permanent streams and in perched swamps. Non-breeding habitat is heath based forests and woodlands where it shelters under leaf litter and low vegetation, and hunts for invertebrate prey either in shrubs or on the ground.	Low	No associated PCTs present. Not predicted to occur by the PMST. One record from locality. No permanent streams or perched water bodies within investigation envelope.



**Table B.1 Likelihood of occurrence table**

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Macquaria australasica</i>	Macquarie Perch	-	E	The Macquarie Perch is a riverine, schooling species. It prefers clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks.	Low	No permanent suitable water bodies within investigation envelope.
<i>Mixophyes balbus</i>	Stuttering Frog	E	V	The Stuttering Frog is restricted to the eastern slopes of the Great Divide, from the Cann River catchment in far East Gippsland, Victoria, to tributaries of the Timbarra River near Drake, New South Wales. They are found in association with permanent streams through temperate and sub-tropical rainforest and wet sclerophyll forest, rarely in dry open tableland riparian vegetation.	Low	No associated PCTs in investigation envelope nor any permanent streams. One record within Newnes State Forest. High likelihood of occurring in the investigation envelope.
<i>Monarcha melanopsis</i>	Black-faced Monarch	-	Mi	A migratory species found during the breeding season in damp gullies in temperate rainforests. Disperses after breeding into more open woodland.	Low	There are no records from the locality and habitat is marginal for the species.
<i>Motacilla flava</i>	Yellow Wagtail	-	Mi	Migrants from the Northern Hemisphere to Australia. There are few sightings in southern Australia although in recent years, the wetlands of the Hunter River estuary in NSW have proved to be a reliable area to see them. In the north they are regularly seen in the summer months, especially around Broome and Darwin.	Low	There are no records from the locality and habitat is marginal for the species.
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	-	Mi	The Satin Flycatcher inhabits heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests. The species can occur at elevations of up to 1,400 m ASL. The Satin Flycatcher breeds in heavily vegetated gullies.	Low	There are no records from the locality and habitat is marginal for the species.
<i>Numenius madagascariensis</i>	Eastern Curlew	-	CE	Occurs in sheltered coasts, especially estuaries, embayment's, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats often with beds of seagrass.	Negligible	There are no records of the Eastern Curlew within the locality. The investigation envelope lacks intertidal habitat.

**Table B.1 Likelihood of occurrence table**

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Paralucia spinifera</i>	Purple Copper Butterfly, Bathurst Copper Butterfly	E	V	Occurs above 850 m elevation. Geology, soils, topographic position and dominant vegetation canopy species vary between habitat locations. However, vegetation structure is consistent, commonly open woodland or open forest with a sparse understorey that is dominated by the shrub, Native Blackthorn <i>Bursaria spinosa</i> subsp. <i>lasiophylla</i> .	Moderate	Associated PCT/s with potential food sources ( <i>Blackthorn – Bursaria spinosa</i> ) present at low density. PMST; species or species habitat likely to occur within area. Moderate likelihood of occurring in the investigation envelope.
<i>Petauroides volans</i>	Greater Glider	-	V	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 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.	Moderate	852 Records from locality, mostly from Newnes State Forest. Suitable habitat within investigation envelope.
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E	V	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Shelter or bask during the day in rock crevices, caves and overhangs and are most active at night when foraging. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. Highly territorial and have strong site fidelity with an average home range size of about 15 ha. Males tend to have larger home ranges than females.	Low	No associated PCTs are present. Nearest records with reliable location details records are within around 15 km of the investigation envelope. No cliffs or steep areas with large rock outcrops are found within or adjacent to the investigation envelope. No recent records within locality. Low likelihood of occurring in the investigation envelope.

**Table B.1 Likelihood of occurrence table**

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Phascolarctos cinereus</i>	Koala	V	V	In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region. 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. haemastoma</i> and <i>E. signata</i> . They are solitary with varying home ranges. The Koala is a tree-dwelling, medium-sized marsupial, distributed from Cairns to South Australia, however, the listed population does not include Victoria or South Australia. Koalas inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by species from the genus <i>Eucalyptus</i> . The distribution of Koalas is also affected by altitude, with the species limited to below 800 m ASL.	Moderate	Associated PCT/s with potential food trees present. Nearest records are within around 10 km of the investigation envelope. No recent reliable records within the locality. Moderate likelihood of intermittently occurring in the investigation envelope.
<i>Polytelis swainsonii</i>	Superb Parrot	V	V	Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box.	Low	No associated PCTs in the investigation envelope. PMST; species or species habitat may occur within area. Local records likely to be of vagrant birds and aviary escapees. Low likelihood of occurring in the investigation envelope.
<i>Prototroctes maraena</i>	Australian Grayling	-	V	Australian Grayling is diadromous, spending part of its lifecycle in freshwater and at least part of the larval and/or juvenile stages in coastal seas.	Low	No permanent suitable water bodies within investigation envelope.

**Table B.1 Likelihood of occurrence table**

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	P	V	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. 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, and is therefore likely to play an important role in seed dispersal and fungal spore dispersal. It is likely that the species spends considerable time foraging above-ground for food, predisposing it to predation by native predators and introduced species. Breeding typically occurs between August and January, but can extend into autumn.	Low	No associated PCTs are present. Nearest records are around 8 km from the investigation envelope. No heathland or heathy forest is found in the investigation envelope. Unsuitable habitat within investigation envelope. One record from 2008 in Newnes State Forest. Low likelihood of occurring in the investigation envelope.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Site fidelity to camps is high; some camps have been used for over a century. Can travel up to 50 km from the camp to forage; commuting distances are more often <20 km.	High	Associated PCT/s with potential food sources and roosting opportunities present. PMST; Species or species habitat may occur within area. Recorded within 10 km of the site. Species may forage within the investigation envelope as part of a much larger home range. No Grey-headed Flying-fox camps occur within the investigation envelope. High likelihood of intermittently occurring in the investigation envelope.
<i>Rhipidura rufifrons</i>	Rufous Fantail	-	Mi	Mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as Tallow-wood ( <i>Eucalyptus microcorys</i> ), Mountain Grey Gum ( <i>E. cypellocarpa</i> ), Narrow-leaved Peppermint ( <i>E. radiata</i> ), Mountain Ash ( <i>E. regnans</i> ), Alpine Ash ( <i>E. delegatensis</i> ), Blackbutt ( <i>E. pilularis</i> ) or Red Mahogany ( <i>E. resinifera</i> ); usually with a dense shrubby understorey often including ferns.	Low	No preferred habitat within investigation envelope.

**Table B.1 Likelihood of occurrence table**

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Rostratula australis</i>	Australian Painted Snipe	E	E	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 preferred habitat within investigation envelope.
<i>Acacia bynoeana</i>	Bynoe's Wattle	E	V	Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple.	Moderate	Not associated with IBRA subregion in TSPD but associated with PCT 732 in other region/s. PMST; species or species habitat may occur within area. Nearest records are around 14 km away. An inconspicuous species; easily overlooked unless specifically targeted. Moderate likelihood of occurring in the investigation envelope.
<i>Acacia flocktoniae</i>	Flockton Wattle	V	V	Grows in dry sclerophyll forest on sandstone. The Flockton Wattle is found only in the Southern Blue Mountains (at Mt Victoria, Megalong Valley and Yerranderie).	Low	No associated PCTs present. Investigation envelope outside of known geographic distribution. Low likelihood of occurring in the investigation envelope.
<i>Boronia deanei</i>	Deane's Boronia	V	V	Grows in wet heath, often at the margins of open forest adjoining swamps or along streams. There are scattered populations of Deane's Boronia between the far south-east of NSW and the Blue Mountains with the species found on Newnes Plateau (Newnes State Forest), Nalbaugh Plateau (South East National Park), Kanangra-Boyd National Park, Budderoo National Park and Morton National Park. The species mainly occurs in conservation reserves and once grew profusely in Morton National Park near Bundanoon but has rarely been seen in that area since being impacted by devastating bushfires of the 1960s. The 2019/20 black summer bushfires impacted populations at Newnes Plateau, Nalbaugh Plateau and Kanangra-Boyd National Park.	Low	No associated PCTs present. Records of species within locality are confined to the Newnes State Forest. Low likelihood of occurring in the investigation envelope.



**Table B.1 Likelihood of occurrence table**

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	V	V	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum ( <i>Eucalyptus sclerophylla</i> ), Silvertop Ash ( <i>E. sieberi</i> ), Red Bloodwood ( <i>Corymbia gummifera</i> ) and Black Sheoak ( <i>Allocasuarina littoralis</i> ); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid ( <i>C. subulata</i> ) and the Tartan Tongue Orchid ( <i>C. erecta</i> ). This species has been recorded from as far north as Gibraltar Range National Park south into Victoria around the coast as far as Orbost. It is known historically from a number of localities on the NSW south coast and has been observed in recent years at many sites between Batemans Bay and Nowra (although it is uncommon at all sites). Also recorded at Munmorah State Conservation Area, Nelson Bay, Wye, Washpool National Park, Nowendoc State Forest, Ku-Ring-Gai Chase National Park and Ben Boyd National Park.	Low	No associated PCTs present. Records of species within locality are confined to the Newnes State Forest. Low likelihood of occurring in the investigation envelope.
<i>Eucalyptus cannonii</i>	Capertee Stringybark	-	V	Capertee Stringybark has a broad altitudinal range, from around 450m to 1,050m. Within this range, the species appears to tolerate most situations except the valley floors. Associated eucalypt species are diverse: <i>Eucalyptus viminalis</i> , <i>Eucalyptus mannifera</i> , <i>Eucalyptus polyanthemus</i> , <i>Eucalyptus rossii</i> , <i>Eucalyptus blakelyi</i> , <i>Eucalyptus oblonga</i> , <i>Eucalyptus sparsifolia</i> , <i>Eucalyptus bridgesiana</i> , <i>Eucalyptus dalrympleana</i> , <i>Eucalyptus melliodora</i> , <i>Eucalyptus dives</i> and <i>Angophora floribunda</i> .	Low	PCT 732 may be potential habitat. The site is outside of the known range of the species and no stringybark eucalypts are found in the subject site.

**Table B.1 Likelihood of occurrence table**

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Eucalyptus aggregata</i>	Black Gum	V	V	In western Sydney, may be locally abundant particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland.	Moderate	Associated with PCT 1197. PMST; Species or species habitat likely to occur within area. Nearest records are within 10 km of the site. Black Gum grows in the lowest parts of the landscape on alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers. No such low-lying flats or hollows are found in the investigation envelope. It is a conspicuous species that would have been detected during the site inspection if mature plants were present. Low likelihood of occurring in the investigation envelope.
<i>Eucalyptus pulverulenta</i>	Silver-leafed Gum	V	V	Grows in shallow soils as an understorey plant in open forest, typically dominated by Brittle Gum ( <i>Eucalyptus mannifera</i> ), Red Stringybark ( <i>E. macrorhynca</i> ), Broad-leafed Peppermint ( <i>E. dives</i> ), Silvertop Ash ( <i>E. sieberi</i> ) and Apple Box ( <i>E. bridgesiana</i> ). The Silver-leafed Gum is found in two quite separate areas, the Lithgow to Bathurst area and the Monaro (Bredbo to Bombala).	Low	Associated with PCT 732. PMST; Species or species habitat likely to occur within area. Multiple records of the species exist in the locality however it is a very conspicuous species that would have been detected during the site inspection if mature plants were present. Low likelihood of occurring in the investigation envelope.

**Table B.1 Likelihood of occurrence table**

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Eucalyptus robertsonii</i> subsp. <i>Hemisphaerica</i>	Robertson's Peppermint	V	V	Locally frequent in grassy or dry sclerophyll woodland or forest, on lighter soils and often on granite. Usually found in closed grassy woodlands in locally sheltered sites. Habitats include quartzite ridges, upper slopes and a slight rise of shallow clay over volcanics. Known only from the central tablelands of NSW, at small disjunct localities from north of Orange to Burruga.	Low	Associated with PCT 1197 and potentially suitable habitat present. Not predicted to occur in the area by the PMST. The nearest unconfirmed (observational) records of the species are from around 20 km away to the ENE. The only confirmed (specimen-backed) records of the species since the 1951 are from around 100 km away to the ENE, north of Orange. It is a conspicuous species that would have been detected during the site inspection if mature plants were present. Low likelihood of occurring in the investigation envelope.
<i>Euphrasia arguta</i>	-	CE	CE	Historic records of the species noted the following habitats: 'in the open forest country around Bathurst in sub humid places', 'on the grassy country near Bathurst', and 'in meadows near rivers'. <i>Euphrasia arguta</i> was rediscovered in the Nundle area of the NSW north western slopes and tablelands in 2008. Prior to this, it had not been collected for 100 years. Historically, <i>Euphrasia arguta</i> has only been recorded from relatively few places within an area extending from Sydney to Bathurst and north to Walcha. The Royal Botanic Gardens Specimen Register records an additional location reported and vouchered in 2002 from near the Hastings River; and <i>Euphrasia arguta</i> was also recorded from the Barrington Tops in 2012.	Low	PMST; species or species habitat may occur within area. Not associated with IBRA subregion in TSPD nor with any of the PCTs recorded. The nearest records of the species are around 80 km to the north and date from the 1890s. Low likelihood of occurring in the investigation envelope.

**Table B.1 Likelihood of occurrence table**

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Kunzea cabbagei</i>	-	V	V	<p><i>Cabbage Kunzea</i> is restricted to damp, sandy soils in wet heath or mallee open scrub at higher altitudes on sandstone outcrops or Silurian group sediments.</p> <p><i>Kunzea cabbagei</i> mainly occurs in the western and southern parts of the Blue Mountains, NSW, mainly the Yerranderie/Mt Werong area, with four main populations with 20 to 150 individuals. Populations are also located west of Berrima, along the Wingecarribee River; Loombah Plateau east of Mount Werong; the Oberon-Colong Stock Route within Kanangra-Boyd National Park (NP); and Wanganderry Plateau within the Nattai NP.</p>	Low	<p>PMST; Species or species habitat may occur within area.</p> <p>Not associated with IBRA subregion in TSPD nor with any of the PCTs recorded. The nearest record of the species is around 17 km to the north. The species habitat (damp, sandy soils in wet heath or mallee open scrub at higher altitudes on sandstone outcrops or Silurian group sediments) is not found on the site.</p> <p>Negligible likelihood of occurring in the investigation envelope.</p>
<i>Leucochrysum albicans subsp. Tricolor</i>	Hoary Sunray	-	E	<p>Occurs in a wide variety of grassland, woodland and forest habitats, generally on relatively heavy soils. Can occur in modified habitats such as semi-urban areas and roadsides.</p> <p>Endemic to south-eastern Australia, where it is currently known from three geographically separate areas in Tasmania, Victoria and south-eastern NSW and ACT. In NSW it currently occurs on the Southern Tablelands adjacent areas in an area roughly bounded by Albury, Bega and Goulburn, with a few scattered localities know from beyond this region.</p>	Low	<p>Associated with PCT 1093.</p> <p>PMST; species or species habitat may occur within area.</p> <p>The nearest records of the species are from around 80 km away. It is a conspicuous species that would have been detected during the site inspection if plants were present as the seasonal timing was appropriate.</p> <p>Low likelihood of occurring in the investigation envelope.</p>
<i>Persoonia acerosa</i>	Needle Geebung	V	V	<p>The Needle Geebung occurs in dry sclerophyll forest, scrubby low-woodland and heath on low fertility soils.</p> <p>The Needle Geebung has been recorded only on the central coast and in the Blue Mountains, from Mt Tomah in the north to as far south as Hill Top where it is now believed to be extinct. Mainly in the Katoomba/Wentworth Falls/Springwood area.</p>	Low	<p>Not associated with PCT's within investigation envelope. Species mostly known from Katoomba/ Wentworth Falls/ Springwood area.</p> <p>Low likelihood of occurring in the investigation envelope.</p>

**Table B.1 Likelihood of occurrence table**

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Pomaderris brunnea</i>	Brown Pomaderris	E	V	Brown Pomaderris grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines. Brown Pomaderris is a shrub to 3 m tall that has distinctively hairy stems. The stem-hairs comprise long brownish hairs above a thick white hairy under-coat. The leaves are up to 4 cm long and 1.5 cm wide and have toothed margins. The upper leaf surface is hairless; the lower surface is densely hairy like the stem. The leaf veins extend to the margins. The small, yellowish flowers have no petals and form dense clusters at the ends of the branches.	Low	Not associated with IBRA subregion in TSPD nor with any of the PCTs recorded. Investigation envelope outside of known geographic distribution. Low likelihood of occurring in the investigation envelope.
<i>Pomaderris cotoneaster</i>	Cotoneaster Pomaderris	E	E	<i>Cotoneaster Pomaderris</i> has been recorded in a range of habitats in predominantly forested country. The habitats include forest with deep, friable soil, amongst rock beside a creek, on rocky forested slopes and in steep gullies between sandstone cliffs. Cotoneaster Pomaderris has a very disjunct distribution, being known from the Nungatta area, northern Kosciuszko National Park (near Tumut), the Tantawangalo area in South-East Forests National Park and adjoining freehold land, Badgery's Lookout near Tallong, Bungonia State Conservation Area, the Yerranderie area, Kanangra-Boyd National Park, the Canyonleigh area and Ettrema Gorge in Morton National Park. The species has also been recorded along the Genoa River in Victoria.	Low	PMST; species or species habitat may occur within area. Not associated with IBRA subregion in TSPD nor with any of the PCTs recorded. Investigation envelope outside of known geographic distribution. Low likelihood of occurring in the investigation envelope.
<i>Prostanthera cryptandroides</i> subsp. <i>cryptandroides</i>	Wollemi Mint-bush	V	V	At Glen Davis, occurs in open forest dominated by <i>Eucalyptus fibrosa</i> . Other eucalypt species may be present as sub-dominants. In the Denman-Gungal and Widden-Baerami Valley areas, occurs on rocky ridgelines on Narrabeen Group Sandstones in association with a range of communities. Associated communities include: Narrabeen Rocky Heath, Narrabeen Acacia Woodland, Narrabeen Exposed Woodland; Open Heath of <i>Calytrix tetragona</i> , <i>Leptospermum parviflorum</i> and <i>Isopogon dawsonii</i> ; and Open Scrubland of <i>Eucalyptus dwyeri</i> , <i>Baeckea densifolia</i> , <i>Dillwynia floribunda</i> , <i>Aotus ericoides</i> and <i>Hemigenia cuneifolia</i> . Distributed between Lithgow and Sandy Hollow on the NSW central west slopes, central tablelands and western parts of the central coast botanical regions. Populations occur in Wollemi National Park and Gardens of Stone National Park. A voucher specimen exists for the far northern tablelands near Tenterfield; however, this may represent subsp. <i>euphrasioides</i> .	Low	Not associated with IBRA subregion in TSPD nor with any of the PCTs recorded. Investigation envelope outside of known geographic distribution. Low likelihood of occurring in the investigation envelope.



**Table B.1 Likelihood of occurrence table**

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Pultenaea glabra</i>	Smooth Bush-Pea	V	V	<p>This species is primarily associated with riparian or swamp habitat areas in the mid to upper altitudes of the central Blue Mountains on sandstone derived soils. Grows in swamp margins, hillslopes, gullies and creekbanks and occurs within dry sclerophyll forest and tall damp heath on sandstone.</p> <p>An erect shrub to 1.5 m tall with smooth hairless stems and leaves. Leaves are alternate, narrow, concave, to 20mm x 2mm, with a pointed tip. The yellow/orange pea-like flowers are borne in dense subterminal or apparently terminal inflorescences. Fruit is a swollen pod to 5 mm long. The <i>Pultenaea glabra</i> species complex is the subject of ongoing research.</p>	Low	<p>Not associated with IBRA subregion in TSPD nor with any of the PCTs recorded.</p> <p>Investigation envelope outside of known geographic distribution.</p> <p>Low likelihood of occurring in the investigation envelope.</p>
<i>Rhizanthella slateri</i>	Eastern Underground Orchid	-	E	<p>Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest.</p> <p>Occurs from south-east Queensland to south-east NSW. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra.</p>	Low	<p>Not associated with IBRA subregion in TSPD nor with any of the PCTs recorded.</p> <p>Investigation envelope outside of known geographic distribution.</p> <p>Low likelihood of occurring in the investigation envelope.</p>
<i>Thesium australe</i>	Austral Toadflax	V	V	<p>Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (<i>Themeda australis</i>). A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass.</p> <p>Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Although originally described from material collected in the SW Sydney area, populations have not been seen in a long time. It may persist in some areas in the broader region.</p>	Moderate	<p>PMST; species or species habitat likely to occur within area.</p> <p>Not associated with IBRA subregion in TSPD but associated with PCT 1197 and PCT 732 in other region/s.</p> <p>Nearest records are around 15 km away.</p> <p>An inconspicuous species; easily overlooked unless specifically targeted.</p> <p>Moderate likelihood of occurring in the investigation envelope.</p>

**Table B.1** Likelihood of occurrence table

Scientific Name	Common Name	BC Act status	EPBC Act status	Typical habitat and range	Likelihood of occurrence	Justification
<i>Velleia perfoliata</i>	-	V	V	Found in shallow depressions on Hawkesbury sandstone shelves, on rocky hill sides, under cliffs or on rocky/sandy soils along tracks and trails. Occurs on fairly shallow soils of sandy loam texture. Often found growing on moss and lichen mats formed on rock. Only known from the Hawkesbury district and upper Hunter Valley.	Low	Not associated with IBRA subregion in TSPD nor with any of the PCTs recorded. Investigation envelope outside of known geographic distribution. Low likelihood of occurring in the investigation envelope.
<i>Xerochrysum palustre</i>	Swamp Everlasting	-	V	Grows in swamps and bogs which are often dominated by heaths. Found in Kosciuszko National Park and the eastern escarpment south of Badja. Also found in eastern Victoria.	Low	Not associated with IBRA subregion in TSPD nor with any of the PCTs recorded. Investigation envelope outside of known geographic distribution. Low likelihood of occurring in the investigation envelope.



# Appendix C

## BC Act Assessment of Significance



## C.1 Threatened ecological communities: *Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions*

Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions is listed under the BC Act. PCT 1197 within the investigation has been considered as possibly conforming to this Endangered Ecological Community (EEC) (see discussion in Section 3.1.2 in body of report).

An assessment of impact criteria has been completed under Section 1.7 of the EP&A Act to assess potential impacts of the proposed modification on Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions is below.

**Table C.1** Five-part test of significance - *Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions EEC*

Test	Discussion
<i>a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,</i>	Not applicable to EECs.
<i>c. in relation to the habitat of a threatened species or ecological community:</i>	At most 0.47 ha of Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions EEC occurs at the investigation envelope and would be directly impacted. This is considered a small area of the EEC within the locality.
<i>i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i>	
<i>ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i>	Direct impacts to the Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions EEC will be at most 0.9 ha of vegetation removal. This is unlikely to cause significant fragmentation or isolation of this EEC.
<i>iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</i>	The occurrence of PCT 1197 on the site is not entirely typical of the EEC as it does not occur on basalt, contains a higher diversity of canopy species and contains a number of shrub species more typically associated with lower soil fertility. It is therefore considered marginal for inclusion in the EEC and is only considered habitat of moderate importance to the EEC.
<i>d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</i>	No areas of outstanding biodiversity value are present in the disturbance footprint or broader region. The proposed activity is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.
<i>e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</i>	<p>The modified development may exacerbate existing impacts on the EECs, namely:</p> <ul style="list-style-type: none"> <li>• clearing of native vegetation; and</li> <li>• invasion of native plant communities by exotic perennial grasses.</li> </ul> <p>These will be managed through the implementation of mitigating measures during the clearing and works phases of the proposed activity.</p>
<b>Conclusion</b>	<p>The modified development is unlikely to significantly impact Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions as:</p> <ul style="list-style-type: none"> <li>• vegetation clearing is minimised and avoided, and the local occurrence maintained;</li> <li>• the modified development will not further isolate or fragment the local occurrence; and</li> </ul> <p>Mitigation measures will be implemented to manage indirect impacts on the EECs during of the clearing and works phases of the proposed activity.</p>



## C.2 Flora (trees and shrubs): Austral Toadflax (*Thesium australe*), Bynoe's Wattle (*Acacia bynoeana*)

**Table C.2** Five-part test of significance - Austral Toadflax, Bynoe's Wattle

Test	Discussion
<i>a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,</i>	<p>These species were not identified during field surveys. However, the modified development will reduce the extent of potential habitat for these species by up to 0.59 ha. This habitat may be utilised infrequently by these species as part of their lifecycle within the broader landscape.</p> <p>While it is possible that the proposed activity may have an adverse impact on the life cycle of these species, it is considered that this impact is negligible and inconsequential and therefore not of an extent and/ or intensity that is likely to place a local viable population of the species at risk of extinction.</p>
<i>c. in relation to the habitat of a threatened species or ecological community:</i>	The modified development will result in a reduction of the species habitat extent by an estimated <0.1% relative to similar habitat within the region. This is a negligible impact on the extent of these species' habitat.
<i>i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i>	
<i>ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i>	The modified development will remove 0.59 ha of potential habitat for these species and will not fragment or isolate the habitat in the broader environment from other areas of habitat.
<i>iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</i>	The type of habitat within the modified development is similar to the broader environment therefore, removal of 0.59 ha will not impede the long-term survival of Austral Toadflax, and Bynoe's Wattle in the locality.
<i>d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</i>	No areas of outstanding biodiversity value are present in the disturbance footprint or broader region. The proposed activity is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.
<i>e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</i>	<p>The modified development may exacerbate existing impacts on these species, namely:</p> <ul style="list-style-type: none"> <li>clearing of native vegetation; and</li> <li>invasion of exotic flora species.</li> </ul> <p>Mitigation measures will be implemented to manage indirect impacts on the EECs during of the clearing and works phases of the proposed activity.</p>
<b>Conclusion</b>	The modified development will result in a reduction of the species habitat extent by an estimated <0.1% relative to similar habitat within the region and therefore, is unlikely to cause a significant impact on Austral Toadflax or Bynoe's Wattle within the local area.

C.3 Woodland birds; not hollow-dependent: Diamond Firetail (*Stagonopleura guttata*), Dusky Woodswallow (*Artamus cyanopterus cyanopterus*), Flame Robin (*Petroica phoenicea*), Hooded Robin (*Melanodryas cucullata cucullata*), Painted Honeyeater (*Grantiella picta*), Regent Honeyeater (*Anthochaera phrygia*), Scarlet Robin (*Petroica boodang*), Speckled Warbler (*Chthonicola sagittata*) and Varied Sittella (*Daphoenositta chrysoptera*).

**Table C.3 Five-part test of significance – Woodland birds; not hollow-dependent: Diamond Firetail, Dusky Woodswallow, Flame Robin, Hooded Robin, Painted Honeyeater, Regent Honeyeater, Scarlet Robin, Speckled Warbler and Varied Sittella.**

Test	Discussion
<i>a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,</i>	At most 0.59 ha of potential habitat for the species comprising structurally intact woodland will be cleared. This constitutes less than 1% of the local occurrence of potential habitat for this suite of woodland birds. Potential foraging habitat for these species is relatively abundant in the locality therefore, none of these species are likely to have their life cycles significantly affected by the proposed activity.
<i>c. in relation to the habitat of a threatened species or ecological community:</i>	At most 0.59 ha of structurally intact woodland would be cleared which may be habitat for these species.
<i>i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i>	
<i>ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i>	The modified development will use existing tracks where possible and will only require a small area of clearing. Due to the small disturbance footprint needed for drilling the exact location of the drilling can be located to avoid habitat features such as mature trees and hollow bearing trees. The minor additional fragmentation as a result of the proposed activity is unlikely to alter the value of the remaining habitat for these species in the investigation envelope.
<i>iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</i>	The modified development will remove less than 1% of the local occurrence of potential habitat for this suite of woodland birds therefore, none of these species are likely to have their life cycles significantly affected by the proposed activity.
<i>d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</i>	No areas of outstanding biodiversity value are present in the modified development or broader region therefore, no impacts are likely.

**Table C.3**      **Five-part test of significance – Woodland birds; not hollow-dependent: Diamond Firetail, Dusky Woodswallow, Flame Robin, Hooded Robin, Painted Honeyeater, Regent Honeyeater, Scarlet Robin, Speckled Warbler and Varied Sittella.**

Test	Discussion
<i>e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</i>	<p>The main key threatening process of relevance to the species in the locality of the modified development is clearing of native vegetation. Native vegetation would be cleared for the modified development however the impact of this clearing on woodland bird species (see Section C above) is not likely to have a significant impact on the local occurrence of the species.</p> <p>The modified development is not likely to contribute significantly to any other threatening processes.</p>
<b>Conclusion</b>	<p>The modified development is unlikely to have a significant impact on Diamond Firetail, Dusky Woodswallow, Flame Robin, Hooded Robin, Painted Honeyeater, Regent Honeyeater, Scarlet Robin, Speckled Warbler and Varied Sittella.</p>

C.4 Woodland birds; hollow-dependent: Brown Treecreeper (*Climacteris picumnus victoriae*), Gang-gang Cockatoo (*Callocephalon fimbriatum*), Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Little Lorikeet (*Glossopsitta pusilla*), Swift Parrot (*Lathamus discolor*) and Turquoise Parrot (*Neophema pulchella*).

**Table C.4 Five-part test of significance - Woodland birds; hollow-dependent: Brown Treecreeper, Gang-gang Cockatoo, Glossy Black-Cockatoo, Little Lorikeet, Swift Parrot and Turquoise Parrot.**

Test	Discussion
<i>a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,</i>	<p>At most 0.59 ha of potential habitat for the species comprising structurally intact woodland will be cleared. This constitutes less than 1% of the local occurrence of potential habitat for this suite of hollow-dependent woodland birds. Potential foraging habitat for these species is relatively abundant in the locality and habitat in the investigation envelope is considered to be of only moderate importance to the possible local occurrence of these species.</p> <p>The modified development will remove less than 1% of the local occurrence of potential habitat for this suite of woodland birds therefore, none of these species are likely to have their life cycles significantly affected by the proposed activity. is likely be able to avoid the removal of hollow-bearing trees; and therefore is unlikely to cause a significant reduction in the availability of tree hollows in the locality.</p> <p>None of these species are likely to have their life cycles significantly affected by the modified development.</p>
<i>c. in relation to the habitat of a threatened species or ecological community:</i>	At most 0.59 ha of woodland would be cleared which may be used as a foraging habitat by these species.
<i>i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i>	Large, potentially hollow-bearing trees within the investigation envelope may provide breeding habitat for hollow-dependent woodland birds (except for Swift Parrot which breeds in Tasmania). The modified development will avoid any large hollow bearing trees where practicable to reduce impacts to these hollow-dependent species.
<i>ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i>	The modified development will use existing tracks where possible and will only require a small area of clearing. Due to the small disturbance footprint needed for drilling the exact location of the drilling can be located to avoid habitat features such as mature trees and hollow bearing trees. The minor additional fragmentation as a result of the proposed activity is unlikely to alter the value of the remaining habitat for these species in the investigation envelope.
<i>iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</i>	The modified development will remove less than 1% of the local occurrence of potential habitat for this suite of woodland birds therefore, none of these species are likely to have their life cycles significantly affected by the proposed activity.
<i>d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</i>	No areas of outstanding biodiversity value are present in the disturbance footprint or broader region. The proposed activity is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.

**Table C.4 Five-part test of significance - Woodland birds; hollow-dependent: Brown Treecreeper, Gang-gang Cockatoo, Glossy Black-Cockatoo, Little Lorikeet, Swift Parrot and Turquoise Parrot.**

Test	Discussion
<p><i>e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</i></p>	<p>Key threatening processes which are of relevance to the species in the locality of the modified development include the following:</p> <ul style="list-style-type: none"> <li>• competition from feral honeybees;</li> <li>• clearing of native vegetation;</li> <li>• loss of hollow-bearing trees; and</li> <li>• infection by Psittacine beak and feather disease (Pbfd) is also known as psittacine circovirus (PCV) or Psittacine Circoviral Disease (PCD). It is the most common and highly infectious viral disease among parrots.</li> </ul> <p>The modified development are not likely to lead to an increase in the abundance of feral honeybees within bushland areas adjacent to the proposed activity or otherwise affect habitat such that feral honeybees would be likely to increase their impact on native species.</p> <p>Native vegetation would be cleared for the proposed activity however the impact of this clearing on woodland birds (see Section C above) is not likely to have a significant impact on the local occurrence of those species.</p> <p>Machinery will be cleaned between sites to reduce the chance of spreading weeds or any diseases.</p> <p>The modified development are not considered likely to contribute to any other threatening processes.</p>
<b>Conclusion</b>	<p>The modified development is unlikely to cause a significant impact on the Brown Treecreeper, Gang-gang Cockatoo, Glossy Black-Cockatoo, Little Lorikeet, Swift Parrot and Turquoise Parrot.</p>



## C.5 Raptors: Little Eagle (*Hieraetus morphnoides*), Square-tailed Kite (*Lophoictinia isura*) and White-bellied Sea-Eagle (*Haliaeetus leucogaster*)

**Table C.5 Five-part test of significance – Little Eagle, Square-tailed Kite and White-bellied Sea-Eagle**

Test	Discussion
<i>a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,</i>	<p>No nests of birds of prey were observed in the investigation envelope. It is likely that any trees of suitable size for nesting by birds of prey within disturbance footprint will be able to be avoided during any clearing works.</p> <p>The approximately 0.59 ha of woodland affected may be used as a foraging habitat by these species on an occasional basis as part of a large home range. Large remnants of woodland within the wider area are likely to provide suitable nesting habitat for these species.</p> <p>None of these species are considered likely to breed in the investigation envelope.</p>
<i>c. in relation to the habitat of a threatened species or ecological community:</i>	<p>The 0.59 ha of woodland habitat would be cleared may be used as a foraging habitat would form only part of the home range of a single individual or breeding pair of these species. For example, the Little Eagle is likely to have large home ranges of at least several hundred hectares, often including sparsely wooded habitats including grasslands.</p>
<i>i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i>	
<i>ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i>	
<i>iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</i>	<p>The 0.59 ha of woodland affected may be used as a foraging habitat by these species on an occasional basis as part of a large home range. Large remnants of woodland within the wider area are likely to provide suitable nesting habitat for these species. Given this, the modified development is unlikely to impede the long-term survival of Little Eagle, Square-tailed Kite and White-bellied Sea-Eagle within the locality.</p>
<i>d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</i>	<p>No areas of outstanding biodiversity value are present in the disturbance footprint or broader region. The proposed activity is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.</p>
<i>e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</i>	<p>The key threatening process that may affect raptors in the modified development area is clearing of native vegetation.</p> <p>Given the small area to be cleared in comparison with the area retained, the modified development is not considered to significantly contribute to any key threatening processes.</p>
<b>Conclusion</b>	<p>The modified development is unlikely to cause a significant impact on the Little Eagle, Square-tailed Kite and White-bellied Sea-Eagle.</p>

## C.6 Owls: Barking Owl (*Ninox connivens*), Masked Owl (*Tyto novaehollandiae*) and Powerful Owl (*Ninox strenua*)

**Table C.6** Five-part test of significance - Owls: Barking Owl, Masked Owl and Powerful Owl.

Test	Discussion
<p><i>a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,</i></p>	<p>The modified development is not considered likely to adversely affect potential breeding habitat of owl species as the vegetation clearance is of a small extent when compared to the relatively large home range of these species. Large hollow-bearing trees will be avoided during clearing works.</p> <p>The likely ability of the owls to disperse over tens of kilometres through a mosaic of forested and cleared land suggests that there are unlikely to be any barriers to gene flow within NSW.</p> <p>Given the relatively small amount of potential habitat that would be affected, the modified development is not considered likely to significantly disrupt the breeding cycle of owls. No other element of relevance to the lifecycle of the species is considered likely to be affected such that a viable local population of these species would be placed at significantly elevated risk of extinction.</p>
<p><i>c. in relation to the habitat of a threatened species or ecological community:</i></p> <p><i>i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i></p>	<p>The modified development will result in removal of up to 0.59 ha of potential roosting and foraging habitat for the species.</p>
<p><i>ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i></p>	<p>Owls are able to disperse over tens of kilometres through a mosaic of forested and cleared land. The removal of a small proportion of the available habitat due to clearing is considered unlikely to significantly impact on the ability of the species to move between potential habitats in the locality and further afield.</p>
<p><i>iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</i></p>	<p>The 0.59 ha of woodland affected may be used as a foraging habitat by these species on an occasional basis as part of a large home range. Large remnants of woodland within the wider area are likely to provide suitable nesting habitat for these species. Given this, the modified development is unlikely to impede the long-term survival of Barking Owl, Masked Owl and Powerful Owl.</p>
<p><i>d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</i></p>	<p>No areas of outstanding biodiversity value are present in the modified development or broader region. The modified development is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.</p>

**Table C.6**      **Five-part test of significance - Owls: Barking Owl, Masked Owl and Powerful Owl.**

Test	Discussion
<p><i>e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</i></p>	<p>Key threatening processes which are of relevance to the species in the locality of the modified development include the following:</p> <ul style="list-style-type: none"> <li>• competition from feral honeybees for hollows;</li> <li>• clearing of native vegetation; and</li> <li>• loss of hollow-bearing trees through clearing of habitat.</li> </ul> <p>The modified development is not likely to lead to an increase in the abundance of feral honeybees within bushland areas adjacent to the proposed activity or otherwise affect habitat such that feral honeybees would be likely to increase their impact on native species.</p> <p>Native vegetation would be cleared for the modified development however, the impact of this clearing on owls (see Section C above) is not likely to have a significant impact on the local occurrence or survival of the species.</p> <p>The modified development are not considered likely to contribute to any other threatening processes.</p>
<p><b>Conclusion</b></p>	<p>The modified development is unlikely to cause a significant impact on the Barking Owl, Masked Owl and Powerful Owl.</p>

C.7 Arboreal and semi-arboreal mammals: Koala (*Phascolarctos cinereus*), Eastern Pygmy-possum (*Cercartetus nanus*), Spotted-tailed Quoll (*Dasyurus maculatus*), Squirrel Glider (*Petaurus norfolcensis*) and Yellow-bellied Glider (*Petaurus australis*).

**Table C.7 Five-part test of significance – Koala, Eastern Pygmy possum, Spotted-tailed Quoll, Squirrel Glider and Yellow-bellied Glider.**

Test	Discussion
<i>a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,</i>	<p>Potential habitat for Koala, Eastern Pygmy-possum, Spotted-tailed Quoll, Squirrel Glider and Yellow-bellied Glider exists within the modified development. The investigation envelope may form part of the large home ranges of the Koala, Spotted-tailed Quoll, Squirrel Glider and Yellow-bellied Glider.</p> <p>The modified development is unlikely to significantly affect potential breeding habitat for these species as the vegetation clearance is of a small extent (0.59 ha) when compared to the relatively large home range of these species. The Eastern Pygmy-possum has a much smaller home range (&gt;1 ha) however, given the narrow, elongated shape of the disturbance footprint a home-range of the Eastern Pygmy-possum is unlikely to be situated entirely within this area.</p> <p>The modified development is thus unlikely to place these species at risk of extinction.</p>
<i>c. in relation to the habitat of a threatened species or ecological community:</i>	<p>The modified development will result in removal of up to 0.59 ha of potential roosting, denning and foraging habitat for these species. It is likely that these species would only use that habitat on a sporadic basis as part of larger home ranges. As a result, the modified development is not considered likely to significantly disrupt the breeding cycle of arboreal species.</p>
<i>i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i>	
<i>ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i>	
<i>iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</i>	<p>The proposed works will result in the removal of up to 0.59 ha of potential habitat for these species and will not fragment or isolate any available habitat. As these species are mobile they are considered unlikely to be significantly affected by the modified development.</p> <p>Given the relatively small amount of potential habitat that would be affected, the proposed activity is not considered likely to fragment or isolate areas of habitat for arboreal species.</p>
<i>c. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</i>	<p>No areas of outstanding biodiversity value are present in the disturbance footprint or broader region. The proposed activity is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.</p>

**Table C.7** Five-part test of significance – Koala, Eastern Pygmy possum, Spotted-tailed Quoll, Squirrel Glider and Yellow-bellied Glider.

Test	Discussion
<p><i>e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</i></p>	<p>The modified development would contribute to the following key threatening processes that may affect these species:</p> <ul style="list-style-type: none"> <li>• clearing of native vegetation; and</li> <li>• removal of dead wood and trees.</li> </ul> <p>The modified development is not likely to lead to an increase in the abundance of feral honeybees within bushland areas adjacent to the proposed activity or otherwise affect habitat such that feral honeybees would be likely to increase their impact on native species.</p> <p>Native vegetation would be cleared for the modified development however the impact of this clearing (see Section C above) is not likely to have a significant impact on the local occurrence of the species.</p> <p>The modified development are not considered likely to contribute to any other threatening processes.</p>
<p><b>Conclusion</b></p>	<p>The modified development is unlikely to cause a significant impact on the Koala, Eastern Pygmy possum, Spotted-tailed Quoll, Squirrel Glider and Yellow-bellied Glider.</p>



## C.8 Bats; caving-roosting: Large Bent-winged Bat (*Miniopterus orianae oceanensis*), Large-eared Pied Bat (*Chalinolobus dwyeri*).

**Table C.8 Five-part test of significance - Large Bent-winged Bat, Large-eared Pied Bat.**

Test	Discussion
<i>a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,</i>	<p>Large Bent-winged Bat and Large-eared Pied Bat populations are most at risk of extinction if their breeding habitat (maternity and hibernation caves) is impacted. These species may utilise a variety of natural caves and artificial structures for roosting, none of which are present in the investigation envelope. These species are unlikely to breed in the investigation envelope.</p> <p>The removal of up to 0.59 ha of potential habitat is unlikely to significantly impact the life cycle of either species such that a local population is placed at risk of extinction.</p>
<i>c. in relation to the habitat of a threatened species or ecological community:</i>	<p>The proposed activity will remove up to 0.59 ha of woodland, potential Large Bent-winged Bat and Large-eared Pied Bat foraging habitat. However, as these species are highly mobile and there is foraging habitat available in the wider area the modified development is unlikely to significantly impact upon these species.</p>
<i>i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i>	
<i>ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i>	
<i>iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</i>	<p>The small-scale clearing of habitat associated with the activity is unlikely cause a barrier to movement of these species that are capable of traversing fragmented landscapes. As these species are highly mobile, they are considered unlikely to be significantly affected by the minor habitat fragmentation that would occur as a result of the modified development.</p> <p>The approximately 0.59 ha of potential habitat impacted by the modified development is only likely to be used by the species on a sporadic basis, particularly by dispersing juveniles, as the habitat available is of marginal quality compared to larger, better connected remnants elsewhere in the locality.</p>
<i>d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</i>	<p>No areas of outstanding biodiversity value are present in the modified development or broader region. The modified development is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.</p>

**Table C.8**      **Five-part test of significance - Large Bent-winged Bat, Large-eared Pied Bat.**

Test	Discussion
<p><i>e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</i></p>	<p>Key threatening processes relevant to the Large Bent-winged Bat and Large-eared Pied Bat are:</p> <ul style="list-style-type: none"> <li>• clearing of native vegetation;</li> <li>• invasion and establishment of exotic vines and scramblers;</li> <li>• invasion and establishment of Scotch Broom (<i>Cytisus scoparius</i>);</li> <li>• invasion of native plant communities by <i>Chrysanthemoides monilifera</i>;</li> <li>• invasion of native plant communities by exotic perennial grasses;</li> <li>• invasion, establishment and spread of Lantana (<i>Lantana camara</i> L. sens. Lat);</li> <li>• loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants; and</li> <li>• Novel biota and their impact on biodiversity.</li> </ul> <p>Site hygiene measures would be in place to minimise the risk of introducing weeds and pathogens and with these measures in place, the risk of the activity contributing substantially to any of these key threatening processes is low.</p> <p>The extent of clearing of vegetation that would occur is very small in relation to the area of habitat for local populations of these species and is unlikely to significantly contribute to the effect of that process on the species.</p> <p>The modified development is therefore unlikely to have a significant long-term contribution to any of these threatening processes.</p>
<p><b>Conclusion</b></p>	<p>The modified development is unlikely to cause a significant impact on the Large Bent-winged Bat and Large-eared Pied Bat.</p>

## C.9 Bats; hollow-dependent: Eastern False Pipistrelle (*Falsistrellus tasmaniensis*),

**Table C.9 Five-part test of significance - Eastern False Pipistrelle**

Test	Discussion
<i>a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,</i>	Hollow-dependent bat populations are most at risk of extinction if their breeding habitat is impacted. Potential breeding habitat in the modified development for Eastern False Pipistrelle constitutes hollow-bearing trees in large intact woodland areas. The modified development will clear up to 0.59 ha of potential breeding habitat however, where practicable removal of hollow-bearing trees will be avoided and therefore, the lifecycle of this species is considered unlikely to be affected such that a viable local population would be placed at risk of extinction.
<i>c. in relation to the habitat of a threatened species or ecological community:</i>	The proposed activity will remove up to 0.59 ha of potential habitat for hollow-dependent bat species.
<i>i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i>	
<i>ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i>	The small-scale clearing of habitat associated with the modified development is unlikely cause a barrier to movement of Eastern False Pipistrelle as it can traverse fragmented landscapes. Therefore, the Eastern False Pipistrelle is unlikely to be significantly affected by the minor habitat fragmentation that would occur as a result of the modified development.
<i>iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</i>	The modified development will clear up to 0.59 ha of potential breeding habitat however, where practicable removal of hollow-bearing trees will be avoided and therefore, the lifecycles of these species are considered unlikely to be affected such that a viable local population of any of these species is likely to be placed at risk of extinction.
<i>c. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</i>	No areas of outstanding biodiversity value are present in the disturbance footprint or broader region. The modified development is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.

**Table C.9**      **Five-part test of significance - Eastern False Pipistrelle**

Test	Discussion
<p><i>e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</i></p>	<p>Key threatening processes relevant to hollow-dependent bat species in the locality are:</p> <ul style="list-style-type: none"> <li>• clearing of native vegetation;</li> <li>• competition from feral honeybees;</li> <li>• invasion and establishment of exotic vines and scramblers;</li> <li>• invasion and establishment of Scotch Broom (<i>Cytisus scoparius</i>);</li> <li>• invasion of native plant communities by exotic perennial grasses;</li> <li>• invasion, establishment and spread of Lantana (<i>Lantana camara</i> L. sens. Lat);</li> <li>• loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants;</li> <li>• loss of hollow-bearing trees; and</li> <li>• Novel biota and their impact on biodiversity.</li> </ul> <p>Site hygiene measures would be in place to minimise the risk of introducing weeds and pathogens and with these measures in place, the risk of the modified development contributing substantially to associated key threatening processes is low.</p> <p>The extent of clearing of vegetation is small in relation to the area of available habitat for local populations of this species and is unlikely to have a significant impact.</p> <p>The modified development is unlikely to lead to an increase in the abundance of feral honeybees within bushland areas adjacent to the modified development or otherwise affect habitat such that feral honeybees would be likely to increase their impact on native species.</p> <p>The modified development may result in the loss of a small number of hollow-bearing trees, constituting only a small proportion of tree-hollow habitat in the locality.</p> <p>The modified development is unlikely to contribute substantially to any threatening processes affecting the species.</p>
<p><b>Conclusion</b></p>	<p>The modified development is unlikely to cause a significant impact on the Eastern False Pipistrelle.</p>

## C.10 Rosenberg’s goanna (*Varanus rosenbergi*) – Vulnerable

**Table C.10** Five-part test of significance – Rosenberg’s goanna

Test	Discussion
<i>a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,</i>	Potential habitat for the Rosenberg’s goanna habitat in the investigation envelope comprises intact woodland areas rocky outcrops and potential breeding habitat within termite mounds. Rocky outcrops are common in the landscape and the activity would only impact a small proportion of such habitat in the areas within the disturbance footprint. Given the small proportion of impact, the proposed activity is not considered likely to significantly affect the life cycle of these species.
<i>c. in relation to the habitat of a threatened species or ecological community:</i>	At most 0.59 ha of potential habitat – consisting of woodland, rocky outcrops and a termite mound – will be removed from the disturbance footprint.
<i>i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i>	
<i>ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i>	The removal of 0.59 ha is a small area compared to the available habitat in the broader locality. In addition, the species is highly mobile therefore, the loss of the habitat would not isolate any populations or individuals of this species.
<i>iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</i>	The removal of 0.59 ha is a small area compared to the available habitat in the broader locality. In addition, the species is highly mobile therefore, the loss of the habitat is unlikely to significantly impact habitat important to the long-term survival of this species.
<i>d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</i>	No areas of outstanding biodiversity value are present in the modified development or broader region. The modified development is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.
<i>e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</i>	<p>The modified development would contribute to the following key threatening processes that may affect these species:</p> <ul style="list-style-type: none"> <li>• habitat loss and fragmentation as land is cleared for residential, agricultural and industrial developments; and</li> <li>• removal of habitat elements, such as termite mounds and fallen timber.</li> </ul> <p>With the implementation of the mitigation measures proposed, however, the proposed activity is unlikely to have a significant long-term contribution to these threatening processes.</p>
<b>Conclusion</b>	The modified development is unlikely to have a significant impact on the Rosenberg’s goanna.

## C.11 Purple Copper Butterfly, Bathurst Copper Butterfly (*Paralucia spinifera*) – Endangered

**Table C.11** Five-part test of significance – Purple Copper Butterfly, Bathurst Copper Butterfly

Test	Discussion
<i>a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,</i>	Potential habitat for the Purple Copper Butterfly habitat in the investigation envelope comprises open forest with a sparse understorey that is dominated by the shrub, Native Blackthorn ( <i>Bursaria spinosa</i> subsp. <i>Lasiophylla</i> ). The modified development comprises up to 0.59 ha of potential habitat for this species. Given the small proportion of impact, the proposed activity is not considered likely to significantly affect the life cycle of these species. In addition, areas of Native Blackthorn will be avoided where practicable to further reduce impacts.
<i>c. in relation to the habitat of a threatened species or ecological community:</i>	At most 0.59 ha of potential habitat – consisting of stands of Native Blackthorn will be removed from the investigation envelope. These areas will be avoided where practicable to reduce the impacts of clearing habitat.
<i>i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i>	
<i>ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i>	The removal of up to 0.59 ha of potential habitat for this species will make a minor contribution to the fragmentation of the species' habitat within the locality. However, due to the mobile nature of this species, this minor fragmentation of habitat will not cause the species to become isolated.
<i>iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</i>	The removal of 0.59 ha is a small area compared to the available habitat in the broader locality. In addition, the species is mobile therefore, the loss of the habitat is unlikely to significantly impact habitat important to the long-term survival of this species.
<i>d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</i>	No areas of outstanding biodiversity value are present in the disturbance footprint or broader region. The proposed activity is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.
<i>e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</i>	<p>The proposed activity would or has the potential to contribute to the following key threatening processes that may affect these species:</p> <ul style="list-style-type: none"> <li>• clearing of <i>Bursaria</i> in open woodland habitat;</li> <li>• habitat fragmentation; and</li> <li>• weed competition with <i>Bursaria</i>, restricting the extent/condition of suitable habitat.</li> </ul> <p>With the implementation of weed hygiene measures and wash down protocols, the modified development is unlikely to have a significant long-term contribution to these threatening processes.</p>
<b>Conclusion</b>	The modified development is unlikely to cause a significant impact on the Purple Copper Butterfly



## C.12 Grey-headed Flying-fox (*Pteropus poliocephalus*)

**Table C.12** Five-part test of significance - Grey-headed Flying-fox

Test	Discussion
<p><i>a. in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,</i></p>	<p>Grey-headed Flying-fox populations are most at risk of extinction if their breeding and roosting habitat (camp sites) is impacted. Camp sites are readily detectable due to their size, and the loudness of their occupants. No camp sites for the Grey-headed Flying-fox are located within or adjacent to the investigation envelope.</p> <p>Potential summer foraging habitat for this species is considered to be relatively abundant in the locality and is considered to be of only moderate importance to the local occurrence of this species. No winter foraging habitat (Alluvial Woodland) is likely to be removed. Therefore, the removal of up to 0.59 ha of potential foraging habitat is unlikely to significantly impact the Grey-headed Flying-fox given the availability of habitat in the broader locality.</p> <p>Therefore, the proposed activity is unlikely to affect the life cycle such that a local population of the Grey-headed Flying-fox is placed at risk of extinction.</p>
<p><i>c. in relation to the habitat of a threatened species or ecological community:</i></p> <p><i>i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i></p>	<p>The proposed activity will remove up to 0.59 ha of potential Grey-headed Flying-fox habitat. This is considered a relatively minor amount of vegetation removal in comparison the available habitat that will remain within the locality.</p>
<p><i>ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i></p>	<p>The removal of up to 0.59 ha of potential habitat for this species will make a minor contribution to the fragmentation of the species' habitat within the locality. However, due to the mobile nature of this species, this minor fragmentation of habitat will not cause the species to become isolated.</p>
<p><i>iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,</i></p>	<p>The removal of 0.59 ha is a small area compared to the available habitat in the broader locality. In addition, the species is highly mobile therefore, the loss of the habitat is unlikely to significantly impact habitat important to the long-term survival of this species.</p>
<p><i>d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),</i></p>	<p>No areas of outstanding biodiversity value are present in the disturbance footprint or broader region. The proposed activity is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.</p>
<p><i>e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.</i></p>	<p>The modified development would contribute to the clearing of native vegetation, a key threatening process that may affect this species. The increased impact of this key threatening process as a result of the proposed activity is however, unlikely to significantly impact the local population of this species.</p>
<p><b>Conclusion</b></p>	<p>The modified development is unlikely to cause a significant impact on the Grey-headed Flying-fox.</p>



# Appendix D

## EPBC Act assessments of significance



## D.1 Flora (herbs and sub-shrubs): Austral Toadflax (*Thesium australe*), Bynoe's Wattle (*Acacia bynoeana*)

**Table D.1 Significant impact assessment –Austral Toadflax. Bynoe's Wattle**

Criteria	Discussion
<b>Lead to a long-term decrease in size of an important population</b>	The modified development is not within an area deemed as an important population for these species. The removal of 0.59 ha of potential habitat is unlikely to have a significant impact and unlikely to place a local viable population of these species at risk of extinction.
<b>Reduce the area of occupancy of an important population</b>	The modified development is not within an area deemed as an important population for these species. The removal of 0.59 ha of potential habitat is unlikely to have a significant impact and unlikely to place a local viable population of these species at risk of extinction.
<b>Fragment an existing important population into two or more populations</b>	The modified development is not within an area deemed as an important population for these species. The removal of 0.59 ha of potential habitat is unlikely significantly fragment or isolate the habitat for these species.
<b>Adversely affect habitat critical to the survival of a species</b>	No habitat critical to the survival of the species has been identified in the species SPRAT profile or the Conservation Advice. It is unlikely the proposed activity will adversely affect habitat critical to the survival of these species.
<b>Disrupt the breeding cycle of an important population</b>	Substantial areas of vegetation will be retained across the locality and will maintain connectivity between different vegetation communities for pollination to occur. It is unlikely there will be any disruption to the breeding cycle of a population due to the modified development as any identified individuals will be avoided.
<b>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</b>	The modified development will result in a reduction of the species habitat extent by an estimated <0.1% relative to similar habitat within the region. This is a negligible impact on the extent of these species' habitat.
<b>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</b>	Clearing vegetation may result in the spread of exotic species. This will be mitigated by weed hygiene measures and wash down protocols. Therefore, the proposed activity is unlikely to result in an increase in invasive species into the adjacent remnant vegetation.
<b>Introduce disease that may cause the species to decline</b>	Mitigation measures such as hygiene protocols and sediment controls will reduce the potential risk of these diseases being indirectly introduced to potential habitat of these species. As a result, the proposed activity is unlikely to introduce disease to these species or potential habitat.
<b>Interfere substantially with the recovery of the species</b>	The modified development may exacerbate existing impacts on these species, namely: <ul style="list-style-type: none"> <li>clearing of native vegetation; and</li> <li>invasion of exotic flora species.</li> </ul> Mitigation measures will be implemented to manage indirect impacts on the EECs during of the clearing and works phases of the proposed activity.
<b>Conclusion</b>	The activity is unlikely to cause a significant impact on Austral Toadflax or Bynoe's Wattle within the local area.

## D.2 Bats: Large-eared Pied Bat (*Chalinolobus dwyeri*)

**Table D.2 Significant impact assessment – Large-eared Pied Bat**

Criteria	Discussion
<b>Lead to a long-term decrease in size of an important population</b>	<p>The <i>National Recovery Plan for the Large-eared Pied Bat</i> (DERM 2011) identifies that important populations for the Large-eared Pied Bat in NSW occur in the sandstone escarpments of the Sydney basin and northwest slopes of NSW. The sandstone escarpments of Morton National Park may also harbour important populations of the species. The site is within 10 km of sandstone escarpments in the Sydney Basin. There are 60 records of the species within the locality. The vegetation within the investigation envelope contains foraging habitat for the species. No caves or rocky overhangs were recorded within the investigation envelope.</p> <p>Although the vegetation may provide potential foraging habitat for the species, the proposed activity is unlikely to lead to the long-term decrease of an important population of the species due to the small disturbance footprint.</p>
<b>Reduce the area of occupancy of an important population</b>	<p>The removal of up to 0.59 ha of potential habitat is unlikely to reduce the area of occupancy for this species as areas of potential habitat outside of the investigation envelope will be unaffected by the proposed activity.</p>
<b>Fragment an existing important population into two or more populations</b>	<p>The removal of 0.59 ha of potential habitat will cause a negligible increase on the fragmentation and isolation of the locally available habitat. This species is highly mobile thus the population will not be fragmented due to the removal of this habitat.</p>
<b>Adversely affect habitat critical to the survival of a species</b>	<p>Habitat critical to the survival of the species has been defined by the National Recovery Plan (DERM 2011) as roosting habitat comprising disused mine shafts, caves, overhangs and abandoned fairy martin (<i>Hirundo ariel</i>) nests. Sandstone cliffs and fertile wooded valley habitat within close proximity of each other are also considered habitat critical to the species.</p> <p>As the investigation envelope does not contain any of these structures, the proposed activity is not considered to have an adverse effect on habitat critical to the survival of the species.</p>
<b>Disrupt the breeding cycle of an important population</b>	<p>No caves, karsts, overhangs or human structures were recorded within the investigation envelope. Therefore, the proposed activity will not disrupt the breeding cycle of a population.</p>
<b>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</b>	<p>Prior to vegetation clearing, pre-clearance surveys will be undertaken within the investigation envelope to identify any threatened animal species present. The likelihood of finding the species within the investigation envelope is low however, there is potential for indirect impacts on the species (if present) through the modification of vegetation near to the potential habitat including increased noise and spread of weeds that degrade habitat.</p> <p>Mitigation measures including hygiene protocols to suppress weed spread will be implemented.</p> <p>The removal of 0.59 ha of suitable habitat is considered unlikely to lead to the species decline. The species is only likely to forage over the study site and may only land within the investigation envelope on a very rare occasion, therefore the species are not likely to experience a decline from modification, destruction, removal, isolation or decrease in the availability or quality of habitat.</p>
<b>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</b>	<p>The clearing of up to 0.59 ha of vegetation may result in the spread of exotic species. This will be mitigated by hygiene protocols. Therefore, the proposed activity is unlikely to result in an increase in invasive species into the adjacent remnant vegetation.</p>
<b>Introduce disease that may cause the species to decline</b>	<p>The recovery plan for the species does not identify any diseases associated with the species.</p>

**Table D.2 Significant impact assessment – Large-eared Pied Bat**

Criteria	Discussion
<b>Interfere substantially with the recovery of the species</b>	<p>Recovery actions for the Large-eared Pied Bat are to review existing information, develop habitat models, identify priority colonies and sites, identify unsurveyed roost structures, undertake targeted surveys, revise the distribution, manage threats, educate the community, conduct research on the species, and determine meta-population dynamics (DERM 2011).</p> <p>The proposed activity will not interfere with the recovery actions specified, and therefore is unlikely to interfere with the recovery of the species.</p>
<b>Conclusion</b>	<p>The Modified development will not have a significant residual impact on Large-eared Pied Bat as:</p> <ul style="list-style-type: none"> <li>• while records exist within the locality, suitable roosting sites were recorded within the investigation envelope during field surveys; and</li> <li>• the investigation envelope does not represent habitat critical to the survival of the species and the proposed activity will not interfere with recovery.</li> </ul>

### D.3 Woodland birds: Swift Parrot (*Lathamus discolor*), Regent Honeyeater (*Anthochaera phrygia*), Painted Honeyeater (*Grantiella picta*)

**Table D.3 Significant impact assessment – Swift Parrot, Regent Honeyeater, Painted Honeyeater**

Criteria	Discussion
<b>Lead to a long-term decrease in size of an important population</b>	<p>There is one record of the Swift Parrot, one record of Regent Honeyeater and one record of Painted Honeyeater within the locality. These species were not observed during the field investigation. The investigation envelope contains potential foraging habitat for these species.</p> <p>No breeding habitat for Swift Parrot occurs within the study site as they breed in Tasmania and migrate to mainland Australia during the winter non-breeding months.</p> <p>Regent Honeyeaters breed at only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. The modified development is not within these regions, however the Capertee Valley lies approximately 50 km north.</p> <p>Painted Honeyeaters are nomadic and occur at low densities. The investigation envelope may form only a very small portion of an individual’s home-range. Being a highly mobile species the removal of 0.59 ha of potential foraging habitat is unlikely to significantly impact this species.</p> <p>Although potential habitat occurs within the investigation envelope, the modified development is unlikely to lead to the long-term decrease of any population of these species.</p>
<b>Reduce the area of occupancy of an important population</b>	<p>The removal of up to 0.59 ha of potential habitat is unlikely to reduce the area of occupancy for this species as substantial areas of habitat outside of the investigation envelope will be unaffected by the modified development.</p>
<b>Fragment an existing important population into two or more populations</b>	<p>The modified development will remove up to 0.59 ha of habitat and will not fragment existing important populations into two or more populations.</p>
<b>Adversely affect habitat critical to the survival of a species</b>	<p>Habitat critical to the survival of the Swift Parrot includes those areas of priority habitat for which the Swift Parrot has a level of site fidelity or possess phenological characteristics likely to be of importance to the Swift Parrot. Due to the low number of records of this species in the locality (one record) it is unlikely that the site represents habitat critical to the survival</p> <p>Habitat critical to the survival of the Regent Honeyeater includes any breeding or foraging habitat in areas where the species is likely to occur; and any newly discovered breeding or foraging locations. Key areas include the Bundarra-Barraba, Pilliga Woodlands, Mudgee-Wollar and the Capertee Valley and Hunter Valley areas in New South Wales, and the Chiltern and Lurg-Benalla regions of north east Victoria.</p> <p>Habitat critical to the survival of the Painted Honeyeater includes known or likely breeding habitat in Boree/Weeping Myall (<i>Acacia pendula</i>), Brigalow (<i>A. harpophylla</i>) woodlands, box-gum woodlands and box-ironbark forests on the inland slopes of the Great Dividing Range in New South Wales, Victoria and southern Queensland. Critical habitat also includes all preferred foraging species within known and likely foraging habitat particularly mistletoes of the genus <i>Amyema</i> growing on forest and woodland eucalypts and acacias.</p> <p>Sub-optimal potential habitat occurs in the investigation envelope for these species. Therefore, the proposed activity is unlikely to adversely affect habitat critical to the survival of this species.</p>



**Table D.3 Significant impact assessment – Swift Parrot, Regent Honeyeater, Painted Honeyeater**

Criteria	Discussion
<b>Disrupt the breeding cycle of an important population</b>	<p>Swift Parrots breed in Tasmania over summer. Therefore, the proposed activity will not disrupt the breeding cycle of a population of this species.</p> <p>Regent Honeyeaters are known to breed in three locations. The investigation envelope is outside of these areas and therefore unlikely to have any impact on the breeding cycle of this species.</p> <p>The Painted Honeyeater is known to breed on the inland slopes of the Great Dividing Range. As the vegetation to be impacted in the investigation envelope only represent 0.59 ha of potential habitat it is unlikely that this area is important to this species given its large home-range and large area of occupancy.</p> <p>The removal of up to 0.59 ha of potential habitat will cause a negligible impact on the breeding cycle of these species.</p>
<b>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</b>	<p>The likelihood of finding the species within the investigation envelope is low however, there is potential for indirect impacts on the species (if present) through the modification of vegetation near to the potential habitat including increased noise and spread of weeds that degrade habitat.</p> <p>Mitigation measures for the indirect impacts will be accounted for through hygiene protocols to suppress weed spread.</p> <p>The removal of up to 0.59 ha of potential habitat is considered unlikely to lead to the species decline. These species are not likely to experience a decline from modification, destruction, removal, isolation or decrease in the availability or quality of habitat as a result of the proposed activity.</p>
<b>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</b>	<p>Clearing vegetation may result in the spread of exotic species. This will be mitigated by weed hygiene measures and wash down protocols. Therefore, the proposed activity is unlikely to result in an increase in invasive species into the adjacent remnant vegetation.</p>
<b>Introduce disease that may cause the species to decline</b>	<p>The Swift Parrot may be susceptible to Psittacine Beak and Feather disease. Disease outbreaks usually occur in wild animal populations where significant stresses arise. The clearance of potential foraging habitat is unlikely to cause significant stress such that a disease outbreak would occur.</p>
<b>Interfere substantially with the recovery of the species</b>	<p>National recovery plans have been developed for the Swift Parrot, Regent Honeyeater and Painted Honeyeater. Generally, these plans aim to minimise habitat loss, review and update management prescriptions, raise public awareness, encourage conservation efforts and manage disease risk.</p> <p>Given the small size of the proposed impact (up to 0.59 ha), the proposed activity is unlikely to interfere with the recovery of these species.</p>
<b>Conclusion</b>	<p>The Modified development is unlikely to have a significant residual impact on Swift Parrot, Regent Honeyeater and Painted Honeyeater as:</p> <ul style="list-style-type: none"> <li>• these species are not frequently recorded within 10 km of the investigation envelope;</li> <li>• the area of clearing is considered small (up to 0.59 ha) in relation to these species' home-range; and</li> <li>• the investigation envelope does not represent habitat critical to the survival of the species and the proposed activity will not interfere with recovery.</li> </ul>

## D.4 Mammals: Koala (*Phascolarctos cinereus*) and Greater Glider (*Petauroides volans*).

**Table D.4 Significant impact assessment – Koala and Greater Glider**

Criteria	Discussion
<b>Lead to a long-term decrease in size of a population</b>	There are records of these species within 10 km of the study site however it is not known whether or not the species occurs in the land within and surrounding the investigation envelope. The removal of up to 0.59 ha is unlikely to reduce the carrying capacity of the area for the species or decrease the size of a population of either species.
<b>Reduce the area of occupancy of the species</b>	The proposed activity will remove up to 0.59 ha of habitat for the Koala and Greater Glider, however is unlikely to reduce the area of occupancy of any population of these species.
<b>Fragment an existing population into two or more populations</b>	The loss of up to 0.59 ha will cause a negligible increase on the fragmentation of any population of Koala and Greater Glider due to the species' ability to traverse distances.
<b>Adversely affect habitat critical to the survival of a species</b>	Only a single tree species listed in Schedule 2 of the Koala SEPP, Ribbon Gum ( <i>Eucalyptus viminalis</i> ) was recorded in the investigation envelope and the species comprises much less than 15% of the canopy in terms of both foliage cover and abundance. Therefore, the habitat within the investigation envelope is only likely to be considered of moderate importance to the species. The area of potential habitat in the investigation envelope is part of a much larger area of habitat that will not be affected by the proposed activity and therefore the local area of critical habitat is unlikely to be adversely affected by the proposed activity.  The conservation advice for the Greater Glider does not define habitat critical to the survival of the species. Due to the lack of previous records in within the same woodland remnant as the investigation envelope and the species range, the investigation envelope is unlikely to support critical habitat for the Greater Glider.
<b>Disrupt the breeding cycle of a population</b>	The loss of up to 0.59 ha of marginal habitat is unlikely to disrupt the breeding cycle of any Koala or Greater Glider populations present.
<b>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</b>	The removal of up to 0.59 ha of potential habitat is considered unlikely to lead to these species decline.
<b>Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat</b>	The clearing of up to 0.59 ha of vegetation may result in the spread of exotic species. This will be mitigated by weed hygiene measures and wash down protocols. Therefore, the proposed activity is unlikely to result in an increase in invasive species into the adjacent remnant vegetation.
<b>Introduce disease that may cause the species to decline</b>	The proposed activity is unlikely to introduce disease such as Chlamydia or Koala Retrovirus to the site. The Greater Glider is not known to be significantly affected by disease outbreaks.
<b>Interfere with the recovery of the species</b>	Recovery actions for the Koala aim to determine population trends, increase knowledge of the species ecological requirements, develop and implement threat abatement strategies and increase community involvement and awareness of the recovery program. As recovery actions are focused on increasing knowledge of the species, the proposed activity will not interfere with recovery.  Recovery actions for the Greater Glider include actions to reduce the frequency and intensity of prescribed burns, identify appropriate levels of patch retention, habitat tree retention, and logging rotation in hardwood production. Protect and retain hollow-bearing trees, suitable habitat and habitat connectivity. The proposed activity is likely to interfere with these recovery actions by impacting on potential habitat, however 0.59 ha is unlikely to be substantial and any large hollow-bearing trees will be avoided.

**Table D.4**      **Significant impact assessment – Koala and Greater Glider**

Criteria	Discussion
<b>Conclusion</b>	The proposed activity is unlikely to adversely affect the Koala or Greater Glider such that it will lead to the decline of either species within the broader locality. This is because the investigation envelope is part of a much larger area of habitat and the proposed activity will clear a very small proportion of this habitat (up to 0.59 ha of potential habitat).

## D.5 Mammals: Spotted-tailed Quoll (*Dasyurus maculatus*).

**Table D.5 Significant impact assessment – Spotted-tailed Quoll**

Criteria	Discussion
<b>Lead to a long-term decrease in size of a population</b>	<p>There are records of the Spotted-tailed Quoll within 10 km from the investigation envelope. The species was not observed during the field investigation. The vegetation within the investigation envelope contains sub-optimal foraging habitat for the species. No den sites were recorded on site, including suitable hollow logs, rock crevices or caves.</p> <p>Although the investigation envelope may provide potential foraging habitat for the species, the proposed activity is unlikely to lead to the long-term decrease of any populations of the species.</p>
<b>Reduce the area of occupancy of the species</b>	<p>Although the presence of this species within the investigation envelope has been assessed as moderate, individuals were not identified within the investigation envelope.</p> <p>The removal of up to 0.59 ha of potential habitat is unlikely to reduce the area of occupancy for this species as areas of potential habitat outside of the investigation envelope will be unaffected by the proposed activity.</p>
<b>Fragment an existing population into two or more populations</b>	<p>The removal of 0.59 ha of potential habitat will cause a negligible increase on the fragmentation and isolation of the locally available habitat.</p>
<b>Adversely affect habitat critical to the survival of a species</b>	<p>Habitat critical to the survival of the species has been defined by the National Recovery Plan (DELWP 2016) as large patches of forest with adequate denning resources and relatively high densities of medium-sized mammalian prey.</p> <p>As the investigation envelope does not contain any of these structures, the proposed activity is not considered to have an adverse effect on habitat critical to the survival of the species.</p>
<b>Disrupt the breeding cycle of a population</b>	<p>No potential den sites such as hollow logs, rock crevices or caves were recorded within the investigation envelope. Therefore, the proposed activity is unlikely to disrupt the breeding cycle of any populations of the species.</p>
<b>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</b>	<p>Prior to vegetation clearing, pre-clearance surveys will be undertaken within the investigation envelope to identify any threatened species. The likelihood of finding the species within the investigation envelope is low however, there is potential for indirect impacts on the species (if present) through the modification of vegetation near to the potential habitat including increased noise and spread of weeds that degrade habitat.</p> <p>Mitigation measures for the indirect impacts will be accounted for through hygiene protocols to suppress weed spread.</p> <p>The removal of 0.59 ha of suitable habitat is considered unlikely to lead to the species decline. The species was not identified in the investigation envelope therefore the species are not likely to experience a decline from modification, destruction, removal, isolation or decrease in the availability or quality of habitat.</p>
<b>Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat</b>	<p>The clearing of up to 0.59 ha of vegetation may result in the spread of exotic species. This will be mitigated by weed hygiene measures and wash down procedures. Therefore, the proposed activity is unlikely to result in an increase in invasive species into the adjacent remnant vegetation.</p>
<b>Introduce disease that may cause the species to decline</b>	<p>The recovery plan for the Spotted-tailed Quoll does not identify any diseases associated with the species.</p>

**Table D.5 Significant impact assessment – Spotted-tailed Quoll**

Criteria	Discussion
<b>Interfere with the recovery of the species</b>	<p>Recovery actions for the Spotted-tailed Quoll aim to determine the species distribution, manage key threats, better understand habitat requirements, reduce habitat loss and fragmentation, evaluate the risk posed by silvicultural practices, determine appropriate fire regimes, reduce deliberate killings of the species, reduce road mortality of the species, determine the impact of climate change, and raise community awareness.</p> <p>The proposed activity will not interfere with the recovery actions specified, and therefore is unlikely to interfere with the recovery of the species.</p>
<b>Conclusion</b>	<p>The modified development is unlikely to have a significant residual impact on Spotted-tail Quoll as:</p> <ul style="list-style-type: none"> <li>• while records exist within the locality, no individuals or denning sites were recorded within the investigation envelope during field surveys; and</li> <li>• the investigation envelope does not represent habitat critical to the survival of the species and the proposed activity will not interfere with recovery.</li> </ul>

## D.6 Mammals: Grey-headed Flying-fox (*Pteropus poliocephalus*)

**Table D.6 Significant impact assessment – Grey-headed Flying-fox**

Criteria	Discussion
<b>Lead to a long-term decrease in size of an important population</b>	<p>Grey-headed Flying-fox populations are most at risk of extinction if their breeding and roosting habitat (camp sites) is impacted. Camp sites are readily detectable due to their size, and the loudness of their occupants. No camp sites for the Grey-headed Flying-fox are located within or adjacent to the investigation envelope.</p> <p>Potential summer foraging habitat for this species is considered to be abundant in the locality and is considered to be of only moderate importance to the local occurrence of this species. No winter foraging habitat (Alluvial Woodland) is likely to be removed. Therefore, the removal of up to 0.59 ha of potential foraging habitat is unlikely to impact the Grey-headed Flying-fox given the larger, higher quality habitat being retained in the broader locality.</p> <p>Through pre-clearance surveys, the risk of direct mortality to individuals of the species is low. Therefore, the proposed activity is unlikely to lead to a long-term decrease in size of an important population</p>
<b>Reduce the area of occupancy of an important population</b>	<p>The proposed activity will remove up to 0.59 ha of potential Grey-headed Flying-fox habitat. This is considered a relatively minor amount of vegetation removal in comparison the available habitat that will remain within the locality. Therefore, the proposed activity is unlikely to reduce the area of occupancy of an important population</p>
<b>Fragment an existing important population into two or more populations</b>	<p>The modified development will contribute to the fragmentation of habitat by removing up to 0.59 ha of potential Grey-headed Flying-fox habitat.</p> <p>As the Grey-headed Flying-fox is highly mobile, the species is considered unlikely to be significantly affected by the minor additional habitat fragmentation that would occur as a result of the proposed activity.</p>
<b>Adversely affect habitat critical to the survival of a species</b>	<p>The draft <i>National Recovery Plan</i> for the Grey-headed Flying-fox (DoEE 2017) states that all foraging habitat has potential to be productive during general food shortages and therefore provide a critical resource. On this basis, the removal of foraging habitat for the species could be considered to be an adverse impact on habitat critical to the species; however, the removal of 0.59 ha of potential foraging habitat is unlikely to significantly affect resource supply as it is part of a larger and more substantial foraging area within the locality that will not be affected by the proposed activity.</p>
<b>Disrupt the breeding cycle of an important population</b>	<p>No breeding camps were recorded within the investigation envelope. Therefore, the proposed activity will not disrupt the breeding cycle of a population.</p>
<b>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</b>	<p>Prior to vegetation clearing, pre-clearance surveys will be undertaken within the investigation envelope to identify any threatened species. The likelihood of finding the species within the investigation envelope is low however, there is potential for indirect impacts on the species (if present) through the modification of vegetation near to the potential habitat including increased noise and spread of weeds that degrade habitat. Works will be conducted during daylight hours, and are unlikely to impact on foraging behaviours.</p> <p>The removal of 0.59 ha of suitable habitat is considered unlikely to lead to the species decline. The species was not identified in the investigation envelope therefore the species are not likely to experience a decline from modification, destruction, removal, isolation or decrease in the availability or quality of habitat.</p>
<b>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</b>	<p>The clearing of up to 0.59 ha of vegetation may result in the spread of exotic species. This will be mitigated by weed hygiene measures and wash down protocols. Therefore, the proposed activity is unlikely to result in an increase in invasive species into the adjacent remnant vegetation.</p>



**Table D.6 Significant impact assessment – Grey-headed Flying-fox**

Criteria	Discussion
<b>Introduce disease that may cause the species to decline</b>	The proposed activity is unlikely to introduce disease including Australian Bat Lyssavirus, Menangle virus or Hendra virus.
<b>Interfere substantially with the recovery of the species</b>	<p>Recovery actions for the Grey-headed Flying-fox aim to identify, protect and enhance native foraging and roosting habitat, determine population trends, build community capacity to coexist with the species in urban environments, develop and implement threat abatement strategies and increase community involvement and awareness of the recovery program, and improve camp management in sensitive areas.</p> <p>The proposed activity will interfere with recovery objectives to protect and enhance native foraging and roosting habitat. However, the proposed activity will affect a small area of potential foraging habitat and not interfere with known camps.</p>
<b>Conclusion</b>	<p>The Modified development is unlikely to have a significant residual impact on Grey-headed Flying Fox as:</p> <ul style="list-style-type: none"> <li>• while records exist within the locality, no individuals or suitable roosting sites were recorded within the investigation envelope during field surveys; and</li> <li>• while the habitat may be considered to be critical foraging habitat, the investigation envelope is part of a much larger area of potential foraging habitat and the proposed activity will clear a very small proportion of this habitat (up to 0.59 ha of potential habitat).</li> </ul>

## D.7 Migratory birds: White-throated Needletail (*Hirundapus caudacutus*), Fork-tailed Swift (*Apus pacificus*).

**Table D.7 Significant impact assessment – White-throated Needletail and Fork-tailed Swift**

Criteria	Discussion
<b>Lead to a long-term decrease in size of an important population</b>	The White-throated Needletail and Fork-tailed Swift are high elevation aerial foragers that have very large home ranges. Although potential foraging habitat occurs within the investigation envelope, the proposed activity is unlikely to lead to the long-term decrease of any population of these species.
<b>Reduce the area of occupancy of an important population</b>	Although the presence of this species within the investigation envelope has been assessed as moderate, individuals were not identified within the investigation envelope. There are records these species from within the locality.  The removal of up to 0.59 ha of woodland is unlikely to reduce the area of occupancy for this species as substantial areas of habitat outside of the investigation envelope will be unaffected by the proposed activity.
<b>Fragment an existing important population into two or more populations</b>	The proposed activity to impact potential habitat by up to 0.59 ha, is unlikely to further fragment habitat for this species.  The removal of 0.59 ha of potential habitat will cause a negligible increase on the fragmentation and isolation of the locally available habitat.
<b>Adversely affect habitat critical to the survival of a species</b>	No habitat critical to the survival of these species is within the disturbance footprint. Sub-optimal potential habitat occurs in the investigation envelope for the species. Therefore, the proposed activity is unlikely to adversely affect habitat critical to the survival of this species.
<b>Disrupt the breeding cycle of an important population</b>	These species do not breed within the locality. Therefore, the proposed activity will not disrupt the breeding cycle of a population.
<b>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</b>	The removal of 0.59 ha of woodland is considered unlikely to lead to these species decline. These species may forage aerially above the investigation envelope therefore the species are not likely to experience a decline from modification, destruction, removal, isolation or decrease in the availability or quality of habitat.
<b>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</b>	Clearing vegetation may result in the spread of exotic species. This will be mitigated by weed hygiene measures and wash down protocols. Therefore, the proposed activity is unlikely to result in an increase in invasive species into the adjacent remnant vegetation.
<b>Introduce disease that may cause the species to decline</b>	No diseases are known from within these species' populations The removal of 0.59 ha of woodland is unlikely to cause significant stress to the species such that a disease outbreak would occur.
<b>Interfere substantially with the recovery of the species</b>	Conservation advice for these species list the following threats: <ul style="list-style-type: none"> <li>• habitat loss and fragmentation;</li> <li>• wind turbines and overhead wires; and</li> <li>• poisoning.</li> </ul> <p>The proposed activity will make a minor contribution to habitat loss for these species. However, the impact is likely negligible on any population of these species.</p>

**Table D.7**      **Significant impact assessment – White-throated Needletail and Fork-tailed Swift**

Criteria	Discussion
<b>Conclusion</b>	<p>The proposed activity will not have a significant residual impact on White-throated Needletail or Fork-tailed Swift as:</p> <ul style="list-style-type: none"><li>• while records exist within the locality, no individuals were recorded within the investigation envelope during field surveys; and</li><li>• the investigation envelope does not represent habitat critical to the survival of the species and the proposed activity will not significantly interfere with the life-cycle of these species.</li></ul>

## D.8 Insects: Purple Copper Butterfly, Bathurst Copper Butterfly (*Paralucia spinifera*)

**Table D.8 Significant impact assessment – Purple Copper Butterfly, Bathurst Copper Butterfly**

Criteria	Discussion
<b>Lead to a long-term decrease in size of an important population</b>	Potential habitat for the Purple Copper Butterfly habitat in the investigation envelope comprises open forest with a sparse understorey that is dominated by the shrub, Native Blackthorn ( <i>Bursaria spinosa</i> subsp. <i>Lasiophylla</i> ). The disturbance footprint comprises up to 0.59 ha of potential habitat for this species. Given the small proportion of impact, the proposed activity is not considered likely to significantly lead to a long-term decrease in the size of any population of this species. Areas of Native Blackthorn will be avoided where practicable.
<b>Reduce the area of occupancy of an important population</b>	At most 0.59 ha of potential habitat – consisting of stands of Native Blackthorn will be removed from the investigation envelope. These areas will be avoided where practicable. This small area of habitat is unlikely to reduce the area of occupancy of this species.
<b>Fragment an existing important population into two or more populations</b>	The removal of up to 0.59 ha of potential habitat for this species will make a minor contribution to the fragmentation of the species' habitat within the locality. However, due to the mobile nature of this species, this minor fragmentation of habitat will not cause the species to become isolated.
<b>Adversely affect habitat critical to the survival of a species</b>	No areas critical to the survival of this species are mapped within the investigation envelope. Therefore, the proposed activity is unlikely to disturbance footprints of critical habitat for this species.
<b>Disrupt the breeding cycle of an important population</b>	Currently there are five management sites for this species, none of which are in the investigation envelope. The removal of 0.59 ha of potential habitat is unlikely to significantly disrupt the breeding cycle of this species due to the large amount of potential and higher quality habitat within the locality.
<b>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</b>	As this species is relatively mobile the removal of 0.59 ha of potential habitat is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
<b>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</b>	The clearing of up to 0.59 ha of vegetation may result in the spread of exotic species. This will be mitigated by weed hygiene measures and wash down procedures. Therefore, the proposed activity is unlikely to result in an increase in invasive species into the adjacent remnant vegetation.
<b>Introduce disease that may cause the species to decline</b>	No diseases are known to affect the Purple Copper Butterfly.
<b>Interfere substantially with the recovery of the species</b>	The proposed activity would or has the potential to contribute to the following key threatening processes that may affect these species: <ul style="list-style-type: none"> <li>clearing of <i>Bursaria</i> in open woodland habitat;</li> <li>habitat fragmentation; and</li> <li>weed competition with <i>Bursaria</i>, restricting the extent/condition of suitable habitat.</li> </ul> <p>With the implementation of weed hygiene measures and wash down protocols, the proposed activity is unlikely to have a significant long-term contribution to these threatening processes.</p>
<b>Conclusion</b>	The activity is unlikely to cause a significant impact on the Purple Copper Butterfly

## D.9 Gang-Gang Cockatoo (*Callocephalon fimbriatum*)

**Table D.9 Significant impact assessment – Gang-Gang Cockatoo**

Criteria	Discussion
<b>Lead to a long-term decrease in size of a population</b>	There are records of the Gang-Gang Cockatoo within 5 km from the investigation envelope and the species was sighted adjacent to the investigation envelope during inspections. The vegetation within the investigation envelope contains sub-optimal foraging habitat for the species. No trees containing hollows of suitable dimensions for nesting were recorded on site. Although the investigation envelope may provide potential foraging habitat for the species, the proposed activity is unlikely to lead to the long-term decrease of any populations of the species.
<b>Reduce the area of occupancy of the species</b>	The removal of up to 0.59 ha of potential habitat is unlikely to reduce the area of occupancy for this species as areas of potential habitat outside of the investigation envelope will be unaffected by the proposed activity.
<b>Fragment an existing population into two or more populations</b>	The removal of 0.59 ha of potential habitat will cause a negligible increase on the fragmentation and isolation of the locally available habitat.
<b>Adversely affect habitat critical to the survival of a species</b>	<p>According to the EPBC conservation advice, habitat critical to the survival of the Gang-gang Cockatoo includes:</p> <ul style="list-style-type: none"> <li>• all foraging habitat during both the breeding and non-breeding season, excluding exotic feeding grounds such as ornamental trees, shrubs, and hedges within urban and suburban areas.</li> <li>• hollow bearing trees with known or potential Gang-gang Cockatoo hollow chambers that are generally around 20 cm in floor diameter, around 50.5 cm deep (range 22–90 cm) and occur around 7.5 m (range 5–9.4 m) above the ground.</li> </ul> <p>The investigation envelope contains potential foraging habitat in small trees but does not contain any potential breeding sites. The proposed activity would have a very minor adverse effect on habitat critical to the survival of the species.</p>
<b>Disrupt the breeding cycle of a population</b>	No potential nest sites were recorded within the investigation envelope. Breeding sites may occur nearby however the activity would not occur during the breeding season (October to January) for the species. Therefore, the proposed activity is unlikely to disrupt the breeding cycle of any populations of the species.
<b>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</b>	<p>Prior to vegetation clearing, pre-clearance surveys will be undertaken within the investigation envelope to identify any threatened animal species. The likelihood of finding the species within the investigation envelope is low however, there is potential for indirect impacts on the species (if present) through the modification of vegetation near to the potential habitat including increased noise and spread of weeds that degrade habitat.</p> <p>Mitigation measures for the indirect impacts will be accounted for through hygiene protocols to suppress weed spread.</p> <p>The removal of 0.59 ha of suitable habitat is considered unlikely to lead to the species decline. Therefore the species are not likely to experience a decline from modification, destruction, removal, isolation or decrease in the availability or quality of habitat.</p>
<b>Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat</b>	The clearing of up to 0.59 ha of vegetation may result in the spread of exotic species. This will be mitigated by weed hygiene measures and wash down procedures. Therefore, the proposed activity is unlikely to result in an increase in invasive species into the adjacent remnant vegetation.
<b>Introduce disease that may cause the species to decline</b>	The species may be susceptible to Psittacine Beak and Feather disease. Disease outbreaks usually occur in wild animal populations where significant stresses arise. The clearance of potential foraging habitat is unlikely to cause significant stress such that a disease outbreak would occur.

**Table D.9 Significant impact assessment – Gang-Gang Cockatoo**

Criteria	Discussion
<b>Interfere with the recovery of the species</b>	<p>There is no adopted or made Recovery Plan for this species.</p> <p>Recovery actions for the species aim to reduce the impact of threatening processes, particularly habitat loss.</p> <p>Due to its very small scale, the proposed activity will not interfere substantially with the recovery of the species.</p>
<b>Conclusion</b>	<p>The modified development is unlikely to have a significant impact on the Gang-gang Cockatoo as:</p> <ul style="list-style-type: none"> <li>• while the species is known to occur within the locality, no likely breeding hollows would be affected; and</li> <li>• disturbance or loss of the very small area (~0.6 ha) of potential foraging habitat affected will not interfere with the species' recovery.</li> </ul>



## D.10 Glossy Black Cockatoo (South-eastern subspecies) (*Calyptorhynchus lathami lathami*)

**Table D.10 Significant impact assessment – Glossy Black Cockatoo (South-eastern subspecies)**

Criteria	Discussion
<p><b>Lead to a long-term decrease in size of an important population</b></p> <p>Associated PCT/s with potential food sources (<i>Allocasuarina</i> spp.) and nesting opportunities (hollow-bearing trees) present nearby.</p> <p>Nearest records are around 5 km away.</p> <p>High likelihood of occurring in the investigation envelope.</p>	<p>There are records of the Glossy Black Cockatoo within 5 km from the investigation envelope but the species has not been recorded in the vicinity of the investigation envelope. The vegetation within the investigation envelope contains sub-optimal foraging habitat for the species as there is only a low abundance of <i>Allocasuarina</i> species. No trees containing hollows of suitable dimensions for nesting were recorded on site. Although the investigation envelope may provide potential foraging habitat for the species, the proposed activity is unlikely to lead to the long-term decrease of any populations of the species.</p>
<p><b>Reduce the area of occupancy of an important population</b></p>	<p>The removal of up to 0.59 ha of potential habitat is unlikely to reduce the area of occupancy for this species as areas of potential habitat outside of the investigation envelope will be unaffected by the proposed activity.</p>
<p><b>Fragment an existing important population into two or more populations</b></p>	<p>The removal of 0.59 ha of potential habitat will cause a negligible increase on the fragmentation and isolation of the locally available habitat.</p>
<p><b>Adversely affect habitat critical to the survival of a species</b></p>	<p>According to the EPBC conservation advice, habitat critical to the survival of the Glossy Black Cockatoo includes:</p> <ul style="list-style-type: none"> <li>• all foraging habitat consisting of areas containing <i>Allocasuarina</i> and <i>Casuarina</i> feed tree species.</li> <li>• hollow bearing trees with the following traits; &gt;8 m above ground, located in branches &gt;30 cm in diameter no more than 45 degrees from vertical; and with a minimum entrance diameter of &gt;15 cm.</li> </ul> <p>The investigation envelope is adjacent to areas of potential foraging and breeding habitat but does not contain any potential breeding sites. The proposed activity would have a very minor, if any, adverse effect on habitat critical to the survival of the species.</p>
<p><b>Disrupt the breeding cycle of an important population</b></p>	<p>No potential nest sites were recorded within the investigation envelope. Breeding sites may occur nearby however the activity would not occur during the breeding season (April – August) for the species. Therefore, the proposed activity is unlikely to disrupt the breeding cycle of any populations of the species.</p>
<p><b>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</b></p>	<p>Prior to vegetation clearing, pre-clearance surveys will be undertaken within the investigation envelope to identify any threatened animal species. The likelihood of finding the species within the investigation envelope is low however, there is potential for indirect impacts on the species (if present) through the modification of vegetation near to the potential habitat including increased noise and spread of weeds that degrade habitat.</p> <p>Mitigation measures for the indirect impacts will be accounted for through hygiene protocols to suppress weed spread.</p> <p>The removal of 0.59 ha of suitable habitat is considered unlikely to lead to the species decline. Therefore the species are not likely to experience a decline from modification, destruction, removal, isolation or decrease in the availability or quality of habitat.</p>

**Table D.10 Significant impact assessment – Glossy Black Cockatoo (South-eastern subspecies)**

Criteria	Discussion
<b>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</b>	The clearing of up to 0.59 ha of vegetation may result in the spread of exotic species. This will be mitigated by weed hygiene measures and wash down procedures. Therefore, the proposed activity is unlikely to result in an increase in invasive species into the adjacent remnant vegetation.
<b>Introduce disease that may cause the species to decline</b>	The species may be susceptible to Psittacine Beak and Feather disease. Disease outbreaks usually occur in wild animal populations where significant stresses arise. The clearance of potential foraging habitat is unlikely to cause significant stress such that a disease outbreak would occur.
<b>Interfere substantially with the recovery of the species</b>	<p>There is no adopted or made Recovery Plan for this species.</p> <p>Recovery actions for the species aim to reduce the impact of threatening processes, particularly habitat loss.</p> <p>Due to its very small scale, the proposed activity will not interfere substantially with the recovery of the species.</p>
<b>Conclusion</b>	<p>The modified development is unlikely to have a significant impact on the Gang-gang Cockatoo as:</p> <ul style="list-style-type: none"> <li>• while the species is known to occur within the locality, no likely breeding hollows would be affected; and</li> <li>• disturbance or loss of the very small area (~0.6 ha) of potential foraging habitat affected will not interfere with the species' recovery.</li> </ul>







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