ATTACHMENT 5 HABITAT SURVEY AND ASSESSMENT OF SIGNIFICANCE

1. IMPACTS TO MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

An EPBC Act Protected Matters Search Tool (PMST) report was undertaken on 2 November 2021 for the Project area (including a 10 km buffer from the edge of the Project area) (the PMST search area). The PMST was used to identify Matters of National Environmental Significance (MNES) relevant to the Project. Another PMST report was undertaken on the 21 July 2022 to capture newly listed species, and changes in listed species status released in March 2022, and July 2022.

The PMST reports identified a total of 44 listed threatened species, two listed threatened ecological communities and nine migratory species, which have the potential to, are likely to, or are known to, occur within the PMST search area (i.e. MNES).

NGH was engaged to undertake a habitat evaluation of the Project area (Table 3) to ascertain the likelihood of occurrence of each of the identified species, as well as identify potential significant impacts to those species likely, or known to occur. The habitat evaluation drew on NGH's detailed understanding of the existing habitat values of the Project area, based on several flora and fauna field surveys over 2021 and 2022, elaborated in Sections 3 and 4 of the Biodiversity Development Assessment Report (BDAR).

Environment Protection and Biodiversity Conservation Act 1999 (EPBC) Assessments of Significance (AoS) were completed for nine fauna species and one threatened ecological community. These listed threatened species and communities (which constitute MNES) were determined to have a moderate to high likelihood of occurrence, or were recorded, in the Project area and therefore have a potential to be impacted by the proposed Project. An additional assessment was undertaken for the Booroolong Frog (identified as unlikely to occur) on a precautionary basis, due to potential impacts on downstream habitats from the extraction of water from Fish River.

An EPBC Act AoS was conducted for the following listed threatened ecological community:

- White Box-Yellow Box Blakley's Red Gum Grassy Woodland and Derived Native Grassland (EPBC - Critically Endangered Ecological Community)

EPBC Act AoS were also conducted for the following ten listed threatened species:

- Regent Honeyeater *Anthochaera phrygia* (EPBC – Critically Endangered)
- Painted Honeyeater *Grantiella picta* (EPBC – Vulnerable)
- Spotted-tailed Quoll *Dasyurus maculatus maculatus (SE mainland population)* (EPBC – Endangered)
- Greater Glider *Petauroides volans* (EPBC – Endangered)
- Grey-headed Flying Fox *Pteropus poliocephalus* (EPBC – Vulnerable)
- Booroolong Frog *Litoria booroolongensis* (EPBC – Endangered)
- Bathurst Copper Butterfly *Paralucia spinifera* (EPBC – Vulnerable)
- Gang-gang Cockatoo *Callocephalon fimbriatum* (EPBC – Endangered)

- Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) *Phascolarctos cinereus* (EPBC – Endangered)
- Pink-tailed Legless Lizard *Aprasia parapulchella* (EPBC – Vulnerable).

The EPBC Act AoS seeks to identify important, notable, or of consequence impacts related to the proposed Project. A proponent is required to undertake a self-assessment to determine if the proposed Project should be referred to DAWE for assessment. With regard to listed threatened species and ecological communities, the EPBC Significant Impact Guideline 1.1 prescribes 'significant impact criteria' which vary based on species listing status under the EPBC Act and are to be used as a guide for self-assessments.

Under the EPBC Act, impacts of a proposal are considered 'significant' if they meet one of the significant impact criteria. Accordingly, where a self-assessment determines that a significant impact to any of the criteria is likely, an overall significant impact outcome for the species is determined and a referral should take place.

Through completing the EPBC Act AoS, significant impact criteria were triggered for the following five listed threatened species, for which significant impacts as a result of the Project have the potential to occur:

- Regent Honeyeater *Anthochaera phrygia* (EPBC – Critically Endangered)
- Spotted-tailed Quoll *Dasyurus maculatus maculatus (SE mainland population)* (EPBC – Endangered)
- Greater Glider *Petauroides volans* (EPBC – Endangered)
- Bathurst Copper Butterfly *Paralucia spinifera* (EPBC – Vulnerable)
- Gang-gang Cockatoo *Callocephalon fimbriatum* (EPBC – Endangered).

Of note, four of the above MNES were recorded during targeted surveys within, or near to, the Project area, being the Greater Glider, Spotted-tailed Quoll, Bathurst Copper Butterfly and Gang-gang Cockatoo.

Section 2 below provides a description of the MNES likelihood of occurrence assessment undertaken for the Project. Section 3 provides assessments of significance (AoS) for those species determined likely to, or having the potential to, occur within the Project Area.

Where impact areas (in hectares [ha]) are reported, this relates to the maximum required disturbance for the Project, referred to as the Project Disturbance Footprint.

NOTE: all hectare areas of impact within the Project's Development Footprint have been calculated by Golder Associates Pty Ltd, and provided to NGH for inclusion into the Assessments of Significance. Mapping has also been completed by Golder Associates Pty Ltd, and the AoS for the Koala, Gang-Gang Cockatoo and Pink-tailed Legless Lizard were completed by Golder Associates Pty Ltd.

2. LIKELIHOOD OF OCCURRENCE ASSESSMENT FOR EPBC LISTED TECS AND SPECIES

Consistent with the *Significant Impact Guidelines Matters of National Environmental Significance* (DAWE, 2013), potential impacts to listed threatened species and ecological communities identified within the PMST search area (i.e. relevant to the Project) were initially evaluated through a likelihood of occurrence assessment.

The likelihood of occurrence assessment seeks to determine if impacts to a listed threatened species/ecological community are likely due to its potential presence within the within the Project area. The assessment considers the initial results of the PMST (i.e. PMST likelihood of occurrence) in combination with field survey results and site context (i.e. field verified likelihood of occurrence).

Whilst the PMST likelihood of occurrence is provided as part of the PMST search results, Table 1 below provides the adopted categories utilised for the field verified likelihood of occurrence. The field verified likelihood of occurrence considers the surveyed presence/absence of suitable habitat and habitat features, the proximity of nearest known and historic records to the Project (e.g. NSW BioNet Atlas and field surveys), and the mobility of the species (where relevant).

Table 1 Field-verified likelihood of occurrence categories

Field Verified Likelihood of Occurrence	Description
Unlikely	Species/community unlikely to occur within the Project area due to the lack of suitable habitat.
Potential	Species has the potential to occur within the Project area based on the presence of suitable habitat and/or historic species records in the broader area.
Recorded	Species was recorded within the Project area during general and/or targeted field surveys.

The results of the likelihood of occurrence assessment outcomes are summarised in *Table 3* below, including a description of the species/community and its EPBC Act listing status. Rows highlighted in yellow indicate that an AoS was undertaken for that species.

An overall potential for an impact to occur on a listed threatened species/community was determined through consideration of both the outcomes of the PMST likelihood of occurrence, and the field verified likelihood of occurrence assessment. This was completed through utilising the below assessment matrix (Table 2). Through using the matrix, listed threatened species/communities which score a moderate or high potential for impact were determined to require an AoS.

Table 2 Matrix for Potential Impact Calculation of Risk

		Field Verified Likelihood of Occurrence		
		Unlikely to occur	Potential to occur	Recorded
PMST Likelihood of Occurrence	May occur	Low	Medium	High
	Likely to occur	Low	Medium	High
	Known to occur	Medium	High	High

AoS for species determined to have a medium or high potential for impact consistent with the requirements of the *Significant Impact Guidelines Matters of National Environmental Significance* (DAWE, 2013) are provided in Section 3.

Table 3 Habitat evaluation of listed threatened species and ecological communities identified by the PMST as potentially occurring within the Protected Matters Search Tool (PMST) search area. . Rows highlighted in yellow indicate that an AoS was undertaken for that species.

Species	Description of habitat[1]	PMST Likelihood of Occurrence	Field Verified Likelihood of Occurrence	Potential for Impact
Ecological Communities				
Natural Temperate Grassland of the South Eastern Highlands EPBC - CE	The altitudinal range of the community is between 500 m and 1200 m above sea level (asl). The community is found on broad sweeping plains with poor drainage and cold air inversions that promote frosts which inhibit tree growth; on all topographical locations, including upper-slopes, crests and plateaux on basalt landscapes; and in frost hollows in areas otherwise dominated by woodlands or forests. The community may also occur in a landscape mosaic with several woodland communities.	Likely to occur	Unlikely to occur	Low
White Box-Yellow Box Blakley's Red Gum Grassy Woodland and Derived Native Grassland EPBC - CE	Remnants generally occur on fertile lower parts of the landscape where soil fertility is relatively high compared to the surrounding landscape.	Likely to occur	Recorded	High
Birds				
Anthochaera phrygia Regent Honeyeater EPBC - CE	Temperate woodlands and open forests of the inland slopes of south-east Australia, in particular dry open forest, woodland, Box-Ironbark woodland, and riparian forests of River Sheoak.	Known to occur	Potential to occur	High

Species	Description of habitat[1]	PMST Likelihood of Occurrence	Field Verified Likelihood of Occurrence	Potential for Impact
Botaurus poiciliptilus Australasian Bittern EPBC - E	Permanent freshwater wetlands with tall, dense vegetation.	May occur	Unlikely to occur	Low
Calidris ferruginea Curlew Sandpiper EPBC – CE; M	Intertidal mudflats in both fresh and brackish waters in sheltered coastal areas, such as estuaries, bays, inlets, and lagoons. Also recorded inland, including around ephemeral and permanent lakes, dams, and waterholes, usually with bare edges of mud or sand.	May occur	Unlikely to occur	Low
Callocephalon fimbriatum *Gang-gang Cockatoo* EPBC – E	Summer months - mature, wet sclerophyll forests, typically dominated by eucalypts (Frith 1969; NSW Scientific Committee 2008). Eucalypt dominated assemblages with dense, shrubby acacia, wattle and banksia understory support the highest density of birds (Higgins 1999). Winter months - woodland assemblages located at lower (drier) altitudes, commonly in open eucalypt assemblages (Shields & Crome 1992; Higgins 1999). Also observed in suburban areas during winter months including within parks, gardens, and roadside tree plantations (Morcombe 1986; Higgins 1999).	Known to occur	Recorded	High
Falco hypoleucos Grey Falcon EPBC - V	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey.	May occur	Unlikely to occur	Low

Species	Description of habitat[1]	PMST Likelihood of Occurrence	Field Verified Likelihood of Occurrence	Potential for Impact
Grantiella picta Painted Honeyeater EPBC - V	Boree/Weeping Myall, Brigalow, and Box-Gum Woodlands and Box-Ironbark Forests.	Likely to occur	Potential to occur	Medium
Hirundapus caudacutus White-throated Needletail EPBC – V; M	Migratory and usually seen in eastern Australia from October to April. More common in coastal areas, less so inland.	Known to occur	Unlikely to occur	Low
Lathamus discolor Swift Parrot EPBC - CE	On the coast and southwest slopes in areas with abundant flowering eucalypts or lerp. Feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Mugga Ironbark, and White Box.	Known to occur	Unlikely to occur	Low
Leipoa ocellata Malleefowl EPBC - V	Semi-arid to arid shrublands and low woodlands, especially those dominated by Mallee and/or Acacia which are tall, dense, and floristically rich. A sandy to sandy-loam substrate and abundance of leaf litter are required for breeding.	Likely to occur	Unlikely to occur	Low
Numenius madagascariensis Eastern Curlew EPBC – CE, M	It generally occupies coastal lakes, inlets, bays and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets.	May occur	Unlikely to occur	Low

Species	Description of habitat[1]	PMST Likelihood of Occurrence	Field Verified Likelihood of Occurrence	Potential for Impact
Polytelis swainsonii Superb Parrot EPBC - V	Box-Gum, Box-Cypress, and Boree Woodlands and River Red Gum Forests. They nest in hollows of large trees in tall open forest or woodland.	Likely to occur	Unlikely to occur	Low
Pycnoptilus floccosus Pilotbird EPBC - V	Pilotbirds are terrestrial, living on the ground in dense wet forests with heavy undergrowth. They forage on damp ground or among leaf litter, they are limited in flight to 1-2m from the ground. They are generally seen in pairs or family parties occupying small territories all year round.	May occur	Unlikely to occur	Low
Rostratula australis Australian Painted Snipe EPBC – E	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Likely to occur	Unlikely to occur	Low
Fish				
Maccullochella macquariensis Trout Cod EPBC - E	Trout Cod are often found in faster flowing water with rocky and gravel bottoms, but can also be found in some slower flowing, lowland rivers. Rivers with large in stream woody debris or snags.	May occur	Unlikely to occur	Low
Maccullochella peelii Murray Cod EPBC - V	Wide range of warm water habitat including clear rocky streams, slow flowing turbid rivers, and billabongs, most frequently in main river channel and larger tributaries but occasionally in floodplain channels during floods. Near complex structural cover such as large rocks, woody debris, and overhanging vegetation.	May occur	Unlikely to occur	Low

Species	Description of habitat[1]	PMST Likelihood of Occurrence	Field Verified Likelihood of Occurrence	Potential for Impact
Macquaria australasica Macquarie Perch EPBC - E	Both river and lake habitats; especially the upper reaches of rivers and their tributaries. Clear, deep, rocky holes with plenty of cover including aquatic vegetation, large boulders, large woody debris, and overhanging banks.	May occur	Unlikely to occur	Low
Frogs				
Litoria aurea Green and Golden Bell Frog EPBC - V	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha* spp.) or spikerushes (*Eleocharis* spp.), Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia holbrooki*), have a grassy area nearby and diurnal sheltering sites available.	Known to occur	Unlikely to occur	Low
Litoria booroolongensis Booroolong Frog EPBC - E	The Booroolong Frog is restricted to NSW and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range. Along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses with riffles, cobble banks and other rock structures within stream margins.	Known to occur	Potential to occur	Medium
Litoria castanea Yellow-spotted Tree Frog EPBC - CE	Require large permanent ponds or slow flowing 'chain-of-ponds' streams with abundant emergent vegetation such as bulrushes and aquatic vegetation.	Likely to occur	Unlikely to occur	Low
Insects				

Species	Description of habitat[1]	PMST Likelihood of Occurrence	Field Verified Likelihood of Occurrence	Potential for Impact
Paralucia spinifera Bathurst Copper Butterfly EPBC – V	Open woodland or open forest with a sparse understorey that is dominated by the shrub, Native Blackthorn *Bursaria spinosa subsp. lasiophylla.*	Known to occur	Recorded	High
Mammals				
Chalinolobus dwyeri Large-eared Pied Bat EPBC - V	Low to mid elevation dry open forest and woodland near roosts. Roosts in caves (near entrance), crevices in cliffs, old mine workings and in disused mud nests of Fairy Martins.	Known to occur	Recorded	Low
Dasyurus maculatus maculatus (SE mainland population) Spotted-tailed Quoll EPBC - E	Range of habitat types, including open forest, woodland, and inland riparian forest, using Hollow-bearing trees, fallen logs, small caves, rock outcrops, and rocky cliff faces as den sites. Females occupy home ranges of up to about 750ha and males up to 3500ha.	Likely to occur	Recorded	High
Petauroides volans Greater Glider (southern and central) EPBC - E	Largely restricted to eucalypt forests and woodlands. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. Favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.	Known to occur	Recorded	High
Petaurus australis australis Yellow-bellied glider (south-eastern) EPBC - V	Small social groups occupy large and exclusive home ranges. The Yellow-bellied glider occurs in eucalypt dominated woodlands and forests, including both wet and dry sclerophyll forests. However they are mostly found within large patches of mature old growth forest, with suitable sap trees and large hollow-bearing trees.	Likely to occur	Unlikely to occur	Low

Species	Description of habitat[1]	PMST Likelihood of Occurrence	Field Verified Likelihood of Occurrence	Potential for Impact
Petrogale penicillata Brush-tailed Rock-wallaby EPBC - V	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north.	Likely to occur	Unlikely to occur	Low
Phascolarctos cinereus Koala EPBC - E	Temperate, subtropical and tropical eucalypt woodlands and forests where suitable food trees grow, of which there are more than 70 eucalypt species and 30 non-eucalypt species that are particularly abundant on fertile clay soils.	Known to occur	Unlikely to occur	Medium
Pteropus poliocephalus Grey-headed Flying Fox EPBC - V	Range of vegetation communities including rainforest, open forest, and closed and open woodland. Roost sites usually near water, including lakes, rivers, and coastlines.	May occur	Potential to occur	Medium
Plants				
Dichanthium setosum Bluegrass EPBC - V	Associated with heavy basaltic black soils and red-brown loams with clay subsoil. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, extending to northern Queensland.	May occur	Unlikely to occur	Low

Species	Description of habitat[1]	PMST Likelihood of Occurrence	Field Verified Likelihood of Occurrence	Potential for Impact
Eucalyptus aggregata Black Gum EPBC - V	In NSW it occurs in the South Eastern Highlands Bioregion and on the western fringe of the Sydney Basin Bioregion. Black Gum has a moderately narrow distribution, occurring mainly in the wetter, cooler and higher parts of the tablelands. Grows in the lowest parts of the landscape. Grows on alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers.	Known to occur	Unlikely to occur	Low
Eucalyptus pulverulenta Silver-leafed Gum EPBC - V	Grows in shallow soils as an understorey plant in open forest, typically dominated by Brittle Gum (*Eucalyptus mannifera*), Red Stringybark (*E. macrorhynca*), Broad-leafed Peppermint (*E. dives*), Silvertop Ash (*E. sieberi*) and Apple Box (*E. bridgesiana*). The Silver-leafed Gum is found in two quite separate areas, the Lithgow to Bathurst area and the Monaro (Bredbo to Bombala).	Known to occur	Unlikely to occur	Low
Eucalyptus robertsonii subsp. hemisphaerica Robertson's Peppermint EPBC - 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 Burraga."	Likely to occur	Unlikely to occur	Low
Euphrasia arguta EPBC - CE	Plants from the Nundle area have been reported from eucalypt forest with a mixed grass and shrub understorey; here, plants were most dense in an open disturbed area and along the roadside, indicating the species had regenerated following disturbance.	May occur	Unlikely to occur	Low

Species	Description of habitat[1]	PMST Likelihood of Occurrence	Field Verified Likelihood of Occurrence	Potential for Impact
Lepidium aschersonii Spiny Pepper-cress EPBC - V	Spiny Pepper-cress is a perennial herb that occurs in the marginal central-western slopes and north-wester plains region of NSW. Found on ridges of gilgai clays dominated by Brigalow (*Acacia harpophylla*), Belah (*Casuarina cristata*), Buloke (*Allocasuarina luehmanii*) and Grey Box (*Eucalyptus microcarpa*). In the south has been recorded growing in Bull Mallee (*Eucalyptus behriana*).	May occur	Unlikely to occur	Low
Lepidium hyssopifolium Basalt Pepper-cress EPBC - E	In NSW, there is a small population near Bathurst, one population at Bungendore, and one near Crookwell. Known to have occurred in both woodland with a grassy understorey and in grassland.	Likely to occur	Unlikely to occur	Low
Leucochrysum albicans var. tricolor Hoary Sunray EPBC - E	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. Occurs in a wide variety of grassland, woodland and forest habitats, generally on relatively heavy soils.	May occur	Unlikely to occur	Low
Rhizanthella slateri Eastern Underground Orchid EPBC - E	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. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Therefore usually located only when the soil is disturbed. 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.	May occur	Unlikely to occur	Low

Species	Description of habitat[1]	PMST Likelihood of Occurrence	Field Verified Likelihood of Occurrence	Potential for Impact
Swainsona recta Small Purple-pea EPBC - E	Populations still exist in the Queanbeyan and Wellington-Mudgee areas. Over 80% of the southern population grows on a railway easement. It is also known from the ACT and a single population of four plants near Chiltern in Victoria. Before European settlement Small Purple-pea occurred in the grassy understorey of woodlands and open-forests dominated by Blakely's Red Gum *Eucalyptus blakelyi*, Yellow Box *E. melliodora*, Candlebark Gum *E. rubida* and Long-leaf Box *E. goniocalyx*.	May occur	Unlikely to occur	Low
Thesium australe Austral Toadflax EPBC - V	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*).	Likely to occur	Unlikely to occur	Low
Xerochrysum palustre Swamp Everlasting EPBC - V	Found in Kosciuszko National Park and the eastern escarpment south of Badja. Also found in eastern Victoria. Grows in swamps and bogs which are often dominated by heaths. Also grows at the edges of bog margins on peaty soils with a cover of shrubs or grasses.	Likely to occur	Unlikely to occur	Low

Species	Description of habitat[1]	PMST Likelihood of Occurrence	Field Verified Likelihood of Occurrence	Potential for Impact
Zieria obcordata Granite Zieria EPBC - E	Grows in eucalypt woodland or shrubland dominated by species of Acacia on rocky hillsides. Also occurs in *Eucalyptus* and *Callitris* dominated woodland with an open, low shrub understorey, on moderately steep, mainly west to north-facing slopes in sandy loam amongst granite boulders. The altitude range of sites is 500 to 830 metres. Occurs at two sites with a geographic range of 105 km. These are in the Wuuluman area near Wellington, comprising of a single subpopulation over 3 sites comprising 209 plants and Crackerjack Rock/Rock Forests area NW of Bathurst, with a subpopulation comprising of 14 sites, totalling to approximately 700 adult plants.	May occur	Unlikely to occur	Low
Reptiles				
Aprasia parapulchella Pink-tailed Legless Lizard EPBC - V	Inhabits open woodland areas with predominantly native grassy ground layers. Commonly found beneath small, partially-embedded rock.	Likely to occur	Potential to occur	Medium
Delma impar Striped Legless Lizard EPBC - V	Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component. Habitat is where grassland is dominated by perennial, tussock-forming grasses and sometimes present in modified grasslands with a significant content of exotic grasses.	May occur	Unlikely to occur	Low

Species	Description of habitat[1]	PMST Likelihood of Occurrence	Field Verified Likelihood of Occurrence	Potential for Impact
Hoplocephalus bungaroides Broad-headed Snake EPBC – V	Typically found on exposed rocky sites on sandstone outcrops and benching. Habitat is woodland, open woodland and/or heath, or forest.	Absent	Unlikely to occur	Low
Tympanocryptis pinguicolla – Grassland Earless Dragon EPBC - E	The Grassland Earless Dragon is restricted to a small number of Natural Temperate Grassland sites dominated by wallaby grasses (*Nothodanthonia* spp.), spear grasses (*Austrostipa* spp.), Poa Tussock (*Poa sieberiana*), Red Grass (*Bothriochloa macra*), and occasionally Kangaroo Grass (*Themeda australis*). The only populations known are in the ACT and adjacent NSW at Queanbeyan, and on the Monaro Basalt Plains between Cooma and south-west of Nimmitabel.	Absent	Unlikely to occur	Low
Migratory Marine Species				

Species	Description of habitat[1]	PMST Likelihood of Occurrence	Field Verified Likelihood of Occurrence	Potential for Impact
Apus pacificus Fork-tailed Swift EPBC - M	The Fork-tailed Swift is almost exclusively aerial, flying from less then 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. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. The sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines (Higgins 1999).	Likely to occur	Unlikely to occur	Low
Migratory Terrestrial Species				
Monarcha melanopsis Black-faced Monarch EPBC- M	The Black-faced Monarch is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating. The Black-faced Monarch builds a deep cup nest of casuarina needles, bark, roots, moss and spider web in the fork of a tree, about 3 m to 6 m above the ground.	May occur	Unlikely to occur	Low
Motacilla flava Yellow Wagtail EPBC- M	Limited information available for this species but some evidence suggests this species occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra.	May occur	Unlikely to occur	Low

Species	Description of habitat[1]	PMST Likelihood of Occurrence	Field Verified Likelihood of Occurrence	Potential for Impact
Myiagra cyanoleuca Satin Flycatcher EPBC- M	The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	Known to occur	Unlikely to occur	Low
Rhipidura rufifrons Rufous Fantail EPBC- M	The Rufous Fantail is found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground. During migration, it may be found in more open habitats or urban areas.	Known to occur	Unlikely to occur	Low
Migratory Wetland Species				
Actitis hypoleucos Common Sandpiper EPBC - M	In Australia, the Common Sandpiper is found in coastal or inland wetlands, saline or fresh. It is found mainly on muddy edges or rocky shores. During the breeding season in the northern hemisphere, it prefers freshwater lakes and shallow rivers.	May occur	Unlikely to occur	Low
Calidris acuminata Sharp-tailed Sandpiper EPBC- M	The Sharp-tailed Sandpiper prefers the grassy edges of shallow inland freshwater wetlands. It is also found around sewage farms, flooded fields, mudflats, mangroves, rocky shores and beaches.	May occur	Unlikely to occur	Low
Calidris melanotos Pectoral Sandpiper EPBC- M	Breeds in coastal tundra. Winters in freshwater wetlands, saltwater wetlands, wet grassland, mudflats, lake shores.	May occur	Unlikely to occur	Low

Species	Description of habitat[1]	PMST Likelihood of Occurrence	Field Verified Likelihood of Occurrence	Potential for Impact
Gallinago hardwickii Latham's Snipe EPBC- M	Latham's Snipe are seen in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture.	May occur	Unlikely to occur	Low

[1] Information sourced from species profiles on NSW OEH's threatened species database or the Australian Government's Species Profiles and Threats database (SPRAT) unless otherwise stated.

EPBC - CE = listed as Critically Endangered under the *Commonwealth Environment Protection & Biodiversity Conservation Act 1999.*

EPBC - E = listed as Endangered under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

EPBC - V = listed as Vulnerable under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

EPBC - M = listed as Migratory under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

3. ASSESSMENTS OF SIGNIFICANCE

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

White Box-Yellow Box Blakley's Red Gum Grassy Woodland and Derived Native Grassland - Critically Endangered

A Project is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

i. Reduce the extent of an ecological community

Australia-wide, there are an estimated 416,325 ha of EPBC Act listed *White Box-Yellow Box Blakley's Red Gum Grassy Woodland and Derived Native Grassland* (White-box TEC) remaining, representing approximately 8% of its original pre-1750 extent (Threatened Species Scientific Committee, 2006).

Within NSW, there are an estimated 250,729 ha of White-box TEC remaining, representing approximately 7% of the pre-1750 extent (Threatened Species Scientific Committee, 2006). As these estimates were established in 2006 and are now 15-years old, the current day extents within NSW and Australia-wide is likely to be lower.

The overall integrity of the White-box TEC has also undergone a significant decline post-1750, with no areas remaining that could be considered fully intact. Remaining areas of TEC exist in three different states:

- An overstorey of eucalypt trees exists, but there is no substantial native understorey.
- A native understorey exists, but the trees have been cleared.
- Both a native understorey and an overstorey of eucalypts exist in conjunction.

The White-box TEC was listed as critically endangered under the EPBC Act in May 2006. A *National Recovery Plan for White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland* has been developed and contains a description of recognised threats and threatening processes and what habitat constitutes critical habitat, amongst other things.

Habitat critical to the survival of the ecological community is defined by the Recovery Plan as all areas of box gum grassy woodland which meet the minimum condition criteria outlined in Section 3 of the recovery plan. This includes consideration of the overstorey species, native ground layer, size of patch and number of native understorey species.

Consistent with the above, and during the initial vegetation surveys for the Project in 2021, two patches of TEC (approximately 10.5 ha in size) were identified during field surveys, however both are located outside of the proposed Disturbance Footprint of the Project. Where observed, the White-box TEC is noted to be of high quality. Constraints developed for the Project during the design phase have ensured that the White-box TEC in this area has been actively avoided and will not be cleared or directly impacted by the Project.

In 2022, an additional disturbance area was added to the Project's development footprint to accommodate linear infrastructure. A site walkover of this new area was undertaken by NGH in May 2022. A number of small areas (approximately 0.85 ha in total) of **potential** White Box TEC was identified during this walkover, but it has not yet been confirmed whether these areas meet the criteria required to constitute White Box TEC. At this stage, a conservative approach has been adopted and it is assumed that these areas may constitute White Box TEC under the EPBC Act. These patches were located in a paddock that had been

White Box-Yellow Box Blakley's Red Gum Grassy Woodland and Derived Native Grassland - Critically Endangered

cleared in the past, and are split into multiple fragments. See Attachment 1 Project Description Figure 11 identifying where these potential White Box TEC fragments are located.

The Project design/footprint for this area has not yet been finalised. During this process, all efforts will be made to avoid/reduce clearing and other impacts to the potential White Box TEC, subject to landholder negotiations.

On this basis, and depending on the outcome of the design, the Project may reduce the extent of the ecological community up to 0.85 ha.

ii. Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines

During the initial vegetation surveys in 2021, White-box TEC was identified in two separate patches. The Proponent does not propose to disturb or otherwise further fragment these areas of confirmed White-box TEC and these patches have been actively avoided.

Following changes to the Project development footprint in 2022, additional areas of potential White-box TEC were identified that may be disturbed (up to 0.85 ha). These small areas are located adjacent to existing cleared areas currently used for agricultural purposes. Therefore, in the event disturbance may occur, it is unlikely to fragment or increase fragmentation, as the potential White-box TEC is adjacent to already cleared areas.

On this basis, the Project is not likely to fragment or increase fragmentation of the White-box TEC.

iii. Adversely affect habitat critical to the survival of an ecological community

In respect of direct impacts, up to 0.85 ha of potential White-box TEC may be disturbed following the changes to the Project's disturbance footprint in 2022. The areas of confirmed White-box TEC in other parts of the Project Area will not be subject to direct impacts.

In respect of indirect impacts, impact assessments for this Project do not suggest there will be any deterioration in water quality, there will be minimal habitat disturbance and removal as the Disturbance Footprint is situated on previously cleared land to the extent possible, and the transmission line will be underground.

Additionally, a bushfire management plan will be developed for the Project and incorporated into construction and operational plans. Within this plan, the reservoirs will be highlighted as an important body of water for authorities to access, if required, during bushfires. Bushfire mitigations include:

- Vehicles only to be parked in designated hardstand carpark
- Fire-fighting equipment to be on site, with select employees trained to respond to fires.
- No hot work or blasting on Total Fire Ban days (unless an exemption applies).
- Vegetation surrounding the site to be managed to reduce fuel loads (cutting tall grass, pruning etc.).
- Green waste stockpiles to be managed to limit combustion potential.
- All machinery on site to be diesel, where practicable.
- Limit machinery idling when not in use.
- Placement of plant (generators, lighting etc.) clear of vegetation in designated areas.

The Project site has a number of identified exotic species, and will therefore require a weed management

White Box-Yellow Box Blakley's Red Gum Grassy Woodland and Derived Native Grassland - Critically Endangered

plan to be incorporated into the Construction Environmental Management Plan/s (CEMP) and Operational Environmental Management Plan (OEMP) outlining measures to be implemented to further limit and prevent the establishment and / or spread of weeds within and beyond the Project boundaries, including:

- Specifications for all imported soil, plants, hay bales and the like, entering the site to be certified free of weeds and pathogens.
- Vehicle and machinery wash/brush down procedures.
- All vehicles and equipment to be inspected, and if required, cleaned prior to mobilisation to site.
- Minimisation of soil disturbance where possible.
- Weed monitoring and management will occur during construction, and for a minimum of two years after the completion of rehabilitated areas.
- Weed monitoring and control as part of the operations and included in the OEMP.

It is noted that the disturbance footprint avoids the two areas of confirmed White-box TEC, changes to water quality are predicted to be negligible, and a number of management plans will be implemented. There is the potential for the Project to contribute to the improved functioning and resilience of the two areas of TEC, as weed control will be implemented by the Project. This will contribute to minimising the encroachment of the numerous weed species on the site into the two areas of TEC.

Therefore the clearing of up to 0.85 ha of potential White-box TEC, located in a paddock that had been cleared in the past, and subject to further micrositing and avoidance measures, **is unlikely to adversely affect habitat critical to the survival of the TEC.**

iv. Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns

The location of the two larger patches of confirmed White-box TEC are up-gradient of any potential changes in hydrology, with water still draining through these TECs before entering the lower reservoir, located on Frying Pan Creek. The location of these two patches are on elevated plateaus over 500m to the east of Frying Pan Creek. Groundwater depths from monitoring bores near Frying Pan Creek indicate that the water table is approximately 8 to 14 m below ground level. An assessment of any potential mounding or drawdowns of the groundwater table has shown that it will be well below the root zone, and as such will not impact on this TEC.

In respect of the potential White-box TEC fragments along the water supply pipeline, these are located well away from any potential hydrological impacts associated with the Project. The relatively shallow nature of any excavations in this area are unlikely to result in any hydrological impacts.

On this basis, **it is unlikely that the Project will result in any hydrological changes that may significantly impact the TEC.**

v. Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting

The location of the TEC is up-gradient of any potential changes in hydrology, with water still draining through these TEC's before entering the lower reservoir, in place of draining into Frying Pan Creek. Any

White Box-Yellow Box Blakley's Red Gum Grassy Woodland and Derived Native Grassland - Critically Endangered
potential mounding or drawdowns of the groundwater table will be well below the root zone, and as such will not impact on this TEC. It is also unlikely that any hydrological changes will impact the small areas of potential White-Box TEC. A weed management plan will be incorporated into the CEMP and OEMP outlining measures to be implemented to further limit and prevent the establishment and / or spread of weeds within and beyond the Project boundaries. Refer to the *iii*. above for the details of these control measures. Considering the hydrological assessment and weed management plans to be implemented, it is unlikely that the Project would lead to any changes in the species composition of the TEC. As a result of the weed management plan, **the Project is expected to reduce the risks associated with current weed invasions.**
vi. **Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to assisting invasive species, that are harmful to the listed ecological community, to become established**
Weed invasion is one of the key mechanisms of degradation of this TEC, notably agricultural weeds and introduced exotic pasture grasses (Threatened Species Scientific Committee, 2006). A weed management plan will be incorporated into the CEMP and OEMP outlining measures to be implemented to prevent the establishment and / or spread of weeds within and beyond the Project boundaries. Refer to the *iii.* for the details of these control measures. As a result of the weed management plans, the Project is expected to reduce the risks associated with current weed invasions in the surrounding areas of the TEC. Considering these proposed measures, **it is unlikely that the Project will assist in any invasive species becoming established in the areas of TEC.**
vii. **Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community**
There should be no application of fertilisers or other pollutants to native vegetation in this Project, therefore this criterion does not apply.
viii. **Interfere with the recovery of an ecological community.**
This TEC has undergone extensive clearing, such that the conservation advice recommends protecting existing remnants, protecting remnants from weeds, and avoiding soil disturbance in or near remnants as priority Projects (Threatened Species Scientific Committee, 2006). The Project will not clear or disturb any areas of the confirmed TEC within the main Project site, and a weed management plan will be implemented. As a result of the Project's weed management plan and improved fire management response, the Project has the potential to assist with the recovery of the TEC in these areas. The Project may result in disturbance of up to 0.85 ha of potential White-box TEC. The Project design/footprint for this area has not yet been finalised. During this process, all efforts will be made to avoid/reduce clearing and other impacts to the potential White Box TEC. **Given the limited area of potential disturbance, it is unlikely the Project will interfere with the recovery of an ecological community.**

White Box-Yellow Box Blakley's Red Gum Grassy Woodland and Derived Native Grassland - Critically Endangered

ix. Conclusion

The TEC *White Box-Yellow Box Blakley's Red Gum Grassy Woodland and Derived Native Grassland* has undergone extensive clearing to the degree that just 8% of the pre-1750 extent remains, of which there are no areas which have not been significantly modified. The conservation advice for this TEC recommends retaining and protecting remaining areas of vegetation.

The Project has acknowledged the presence of two confirmed, high-quality patches of this TEC (approximately 10.5 ha in size) and as a consequence has modified the design of the Project to avoid disturbing the confirmed TEC present in the landscape. Underlying hydrological changes are not expected to affect the areas of TEC, fire management and weed management plans will be implemented to protect areas of retained native vegetation, including the TEC.

In 2022, an additional disturbance area was added to the Project's development footprint to accommodate linear infrastructure. A site walkover of this new area was undertaken by NGH in May 2022. A number of small areas (approximately 0.85 ha in total) of **potential** White Box TEC was identified during this walkover, but it has not yet been confirmed whether these areas meet the criteria required to constitute White Box TEC. At this stage, a conservative approach has been adopted and it is assumed that these areas may constitute White Box TEC under the EPBC Act. These White Box TEC patches were located in a paddock that had been cleared in the past, and consequently are comprised of multiple fragments.

The Project design/footprint for this area has not yet been finalised. During this process, all efforts will be made to avoid/reduce clearing and other impacts to the potential White Box TEC.

Given the limited area of potential disturbance, and the efforts to avoid and minimise impacts to this community more broadly, **it is considered unlikely that the Project will result in a significant impact to *White Box-Yellow Box Blakley's Red Gum Grassy Woodland and Derived Native Grassland*.**

3.2. Regent Honeyeater

Regent Honeyeater *Anthochaera Phrygia* - Critically Endangered

A Project is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

i. Lead to a long-term decrease in the size of a population

The Regent Honeyeater has a patchy distribution which extends from south-east Queensland, through NSW and the Australian Capital Territory (ACT), to central Victoria (VIC). It is a highly mobile species and will use different areas for foraging depending on resource availability (Department of the Environment, 2016).

The recovery plan for Regent Honeyeater considers habitat critical to the survival of the species as any breeding or foraging areas where the species is likely to occur.

The Project area is:

- not located in any of the four known key breeding areas mapped by the NSW Biodiversity Conservation Division (BCD), and is
- not in any of the known subsidiary habitat areas.

As the nearest identified breeding habitat for the Regent Honeyeater occurs approximately 40 km north of the Project area, targeted surveys for the species have not been undertaken for the Project. Nevertheless, the potential presence of the species was considered during multiple fauna surveys at different times of the year within the Project area.

The Regent Honeyeater is principally a canopy bird, and is most commonly associated with box-ironbark eucalypt woodland and dry sclerophyll forest, but also inhabits riparian vegetation (Oliver, et al., 1999) (Geering & French, 1998). Yellow Box *Eucalyptus melliodora* and Box Mistletoe *Amyema miquelli* which are listed as key feed species (i.e. foraging habitat) have been identified within the Project area.

As a result of the Project up to approximately 13.5 ha of potential foraging habitat may be cleared.

Although the Project has been specifically designed to avoid impacts to habitat associated with the Regent Honeyeater, the residual impact of 13.5 ha to non-TEC box gum is noted to be highly disturbed, with past clearing, degraded understorey and current grazing pressure, with several weed species present.

Whilst the vegetation present within the Project area is considered likely to be utilised by individuals for foraging purposes (on occasion), **it is not considered to support the population to the extent that impacts to this vegetation would lead to a long-term decrease in the size of the population.**

ii. Reduce the area of occupancy of the species

Approximately 13.5 ha of potential Regent Honeyeater foraging habitat may be impacted as a result of the Project.

As the recovery plan for the Regent Honeyeater states that critical habitat includes any breeding or foraging habitat in areas where the species is likely to occur (Department of the Environment, 2016), **the Project is considered to have the potential to reduce the area of occupancy of this species.**

iii. Fragment an existing population into two or more populations

The Regent Honeyeater comprises a single population, with some exchange of individuals between

Regent Honeyeater *Anthochaera Phrygia* - Critically Endangered

regularly used areas (Garnett, et al., 2011). Approximately 13.5 ha of potential Regent Honeyeater foraging habitat may be impacted as result of the Project.

Whilst targeted surveys for the species were not required, no individuals were opportunistically recorded during general flora/fauna surveys of the Project area. It is noted that this species is highly mobile and is thought to use different areas in different years depending on food availability and may not be present at the point in time when surveys are undertaken.

Considering the large home range, high mobility of the species and the relatively small area of impact to potential foraging habitat, **the Project is considered highly unlikely to fragment an existing population into two or more populations.**

iv. Adversely affect habitat critical to the survival of a species

Habitat identified as critical to the survival of the Regent Honeyeater includes any breeding or foraging habitat in areas where the species is likely to occur (Department of the Environment, 2016).

Breeding habitat is considered unlikely to occur in the Project area. Capertree Valley, some 40 km to the north of the Project area, is the closest known breeding location of the Regent Honeyeater. Approximately 13.5 ha of potential foraging habitat for the Regent Honeyeater may be cleared as a result of the Project.

The Project has been specifically designed to avoid impacts to habitat associated with the Regent Honeyeater (e.g. the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC). The residual impact to the non-TEC Box Gum woodland of 13.5 ha is noted to be highly disturbed, with past clearing, degraded understorey and current grazing pressure, with several weed species present. Nevertheless, the area could provide suitable foraging resource for the Regent Honeyeater.

Considering the large home range, high mobility of the species and the relatively small area of impact to potential foraging habitat**, the Project is considered highly unlikely to affect habitat critical to the survival of the species**

v. Disrupt the breeding cycle of a population

The nearest known breeding area for the Regent Honeyeater occurs approximately 40km to the north of the Project area, in Capertree Valley.

The Regent Honeyeater generally nests in the canopy of mature trees with rough bark, e.g. ironbarks, sheoaks (*Casuarina*) and rough-barked Apple (*Angophora*). Sheoaks, in small numbers, have been recorded within the Project site.

The Project will not impact on any known breeding habitat areas for the Regent Honeyeater, key habitat areas or subsidiary habitat areas and is unlikely to restrict movement to and from these areas.

As such, the Project is considered unlikely to disrupt the breeding cycle of the population.

vi. Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project site contains Box-Ironbark and riparian habitat which are preferentially inhabited by Regent Honeyeater (Oliver, et al., 1999) (Geering & French, 1998).

Regent Honeyeater *Anthochaera Phrygia* - Critically Endangered

The Project may impact up to 13.5 ha of potential foraging habitat for the Regent Honeyeater.

There are likely to be extensive areas of potentially suitable habitat, of equal or better quality, located immediately beyond the Project area (as there are some large stands of native vegetation within the nearby Nature Reserves). In addition to these areas, the Project area utilises land which has been subject to clearance due to historical pastoral and agricultural land uses and as such, the clearing of remnant vegetation has been minimised where practicable.

Given the high mobility of this species and relatively small, localised area of potential foraging habitat to be impacted by the Project, **it is considered that the Project is unlikely to impact the availability or quality of habitat to the extent that the species is likely to decline.**

vii. Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

Noisy miners (*Manorial melancephala)* are a recognised threat to the Regent Honeyeater, through competition for resources and defence of feeding and breeding habitat areas.

Increasing the fragmentation of native vegetation patches can lead to an increased abundance of Noisy Miners (*Manorina melanocephala*), which has potential to adversely impact the Regent Honeyeater (Crates, et al., 2018) (Maron, 2007) (Piper & Catterall, 2003).

Fragmentation and clearing of habitat as a result of the Project is not considered significant enough to result in a dramatic increase to the abundance of Noisy Miners. Of note, Noisy Miners have not been recorded as particularly common or abundant in existing cleared areas surrounding the Project.

No additional pest species are considered likely to become established within Regent Honeyeater habitat as a result of the Project.

Therefore, it is considered unlikely that the Project would result in invasive species that are harmful to a critically endangered or endangered species becoming established in the potential Regent Honeyeater foraging habitat.

viii. Introduce disease that may cause the species to decline

Spread of Root-rot Fungus (*Phytophthora cinnamomi)* causing tree dieback is considered a potential threat to Regent Honeyeater by reducing the extent of available foraging habitat. However, it is unlikely for Root-rot Fungus to occur in this region of NSW as it predominantly occurs in areas that receive a mean annual rainfall of more than 600 mm (DEWHA, 2009).

Although it is considered unlikely that Root-rot Fungus will impact the potential foraging habitat within the Project area, this potential threat to the Regent Honeyeater will be minimised by the Proponent introducing general weed management clean-down requirements for plant and machinery entering site throughout the life of the Project, and particularly during the construction phase (refer to Section 3.1.*iii*.).

No other diseases are considered likely to be introduced as a result of the Project.

Given the above, the introduction of diseases that may cause the decline of the species are considered unlikely.

Regent Honeyeater *Anthochaera Phrygia* - Critically Endangered

ix. Interfere with the recovery of the species

The *National Recovery Plan for the Regent Honeyeater* (*Anthochaera phrygia*) evaluates success of the recovery plan against the following criteria:

- A robust population estimate, and trend have been established for the regent honeyeater, and the population is increasing.
- There has been an increase in regent honeyeater habitat protected and restored throughout the species' range.
- The captive population, including its genetic diversity, has been effectively maintained and there have been successful releases into the wild population.
- Understanding of the species' ecology has increased, in particular knowledge of movement patterns, habitat use and post-breeding dispersal.
- There is participation by key stakeholders and the public in recovery efforts and monitoring.

The Project may impact approximately 13.5 ha of potential foraging habitat for Regent Honeyeater, which has the potential to interfere with the National Recovery Plan's goal of increasing the area of Regent Honeyeater's habitat.

The Project has however been designed to avoid vegetation clearing by locating the Project area, where practicable, on pre-cleared land and in particular, through design, avoided mapped White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC. Further, the Proponent, with the support of landowners, is seeking to establish biodiversity stewardship sites adjacent to the Project, which will contribute toward the protection of potential habitat for this species.

Whilst the Proponent has attempted to avoid, where practicable, potential impacts to the Regent Honeyeater potential foraging habitat due to the Project, **the potential for the Project to interfere with the recovery of the species remains as 13.5 ha of potential foraging habitat may be cleared due to the Project.**

x. Conclusion

The Project may impact approximately 13.5 ha of highly disturbed but potential foraging habitat for Regent Honeyeater, which has the potential to interfere with the National Recovery Plan's goal of increasing the area of Regent Honeyeater's habitat and in turn may result in a significant impact to the species.

It is important to note that the Proponent has designed the Project, where practicable, to avoid and minimise impacts to potential foraging habitat for the Regent Honeyeater (e.g. Box-gum Woodlands). This has included modifying the layout to avoid impacts to 10.5 ha of high quality White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC. The Project has also been designed so that disturbance occurs, where possible, within previously cleared/ degraded areas, in an attempt to minimise adverse impacts. Further, the Proponent, with the support of landowners, is seeking to establish biodiversity stewardship sites adjacent to the Project, which will contribute toward the protection of potential habitat for this species.

Overall, the Project may result in a significant impact to the Regent Honeyeater due to impacts to the species recovery.

3.3. Painted Honeyeater

Painted Honeyeater *Grantiella picta* - Vulnerable

A Project is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

i. Lead to a long-term decrease in the size of an important population

The Painted Honeyeater (*Grantiella picta)* is a nomadic species which occurs at low densities throughout its range. The greatest concentrations of Painted Honeyeater individuals, and almost all breeding activity, occurs on the inland slopes of the Great Dividing Range of NSW, VIC, and southern Qld.

The Draft National Recovery Plan for the Painted Honeyeater *Grantiella picta* considers habitat critical to survival as breeding or foraging habitat in key habitats, associated with box gum woodlands and any areas considered as Key Biodiversity Areas (KBA) for this species (Department of Agriculture, Water and the Environment, 2021). The nearest KBA is located approximately 40 km north of the Project site, in Capertree Valley. The Project Area would not be considered as key habitat, as the box gum woodlands structure lacks the preferred canopy cover for this species, and has a low density of mistletoes (discussed further below).

Whilst targeted surveys for the species were not required, no individuals were opportunistically recorded during general flora/fauna surveys of the Project area. It is noted that this species is highly mobile and is thought to use different areas in different years depending on food availability and may not be present at the point in time when surveys are undertaken. However, there are also no BioNet records for this species within a 10km grid around the Project site.

Foraging habitat for the Painted Honeyeater primarily occurs in forest and woodland eucalypts and acacias. Its diet consists of mistletoe fruits, with a preference to feed on mistletoes of the genus *Amyena* (not identified during surveys undertaken), but also feeds on nectar (from flowering mistletoe, eucalypts and possibly banksias) and arthropods, especially in the non-breeding season (Higgins, et al., 2001); (Garnett, et al., 2011). As a result of the Project, 13.5 ha of low quality foraging habitat in the form of woodlands and riparian habitat may be disturbed. The Project has however been designed to avoid vegetation clearing by locating the Project area, where practicable, on pre-cleared land and in particular, through design, avoided mapped White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC. Further, the Proponent, with the support of landowners, is seeking to establish biodiversity stewardship sites adjacent to the Project, which will contribute toward the protection of potential habitat for this species.

Breeding habitat for the Painted Honeyeater generally occurs within Boree/Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) 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. As a result of the Project, 13.5 ha of low quality potential breeding habitat (same area as the foraging habitat) in the form of the NSW TEC White Box-Yellow Box-Blakely's Red Gum Grassy Woodland may be disturbed. Given the large home range of this species, the low quality and relatively small area of suitable habitat that will be impacted as a result of the Project and the adjacent habitat that will be left intact, **it is considered unlikely that the Project would lead to a long-term decrease in the size of an important population.**

ii. Reduce the area of occupancy of an important population

13.5 ha of low quality potential breeding habitat in the form of the NSW PCT White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands may be disturbed as a result of the Project. Whilst the Project would aim to avoid potential habitat wherever possible, clearing of a small area of low quality potential Painted Honeyeater habitat cannot be fully avoided. **The Project is unlikely to**

Painted Honeyeater *Grantiella picta* - Vulnerable
reduce the area of occupancy of an important population.
iii. Fragment an existing important population into two or more populations
The Painted Honeyeater is highly mobile, nomadic and sparsely distributed from south-eastern Australia to north-western Queensland and eastern Northern Territory. The species exhibits seasonal north-south movements governed principally by the fruiting of mistletoe, with which its breeding season is closely aligned (Barea & Watson, 2007). For these reasons, it is thought that the Painted Honeyeater comprises a single population (Garnett, et al., 2011). Given the large home range of this species and its nomadic behaviour, **it is considered highly unlikely that the Project would fragment an existing important population into two or more populations.**
iv. Adversely affect habitat critical to the survival of a species
Habitat loss is the key threat to this species (Department of Agriculture, Water and the Environment, 2021).The Project may impact approximately 13.5 ha of low quality potential foraging and breeding habitat. The recovery plan considers habitat critical to the survival of this species as breeding or foraging habitat in in particular vegetation communities including box-gum woodlands and areas determined to be KBAs. The nearest KBA is located approximately 40 km north of the Project site, in Capertree Valley. The Project Area would not be considered as key habitat, as the box gum woodlands structure lacks the preferred canopy cover for this species, and has a low density of mistletoes **The Project is therefore unlikely to impact habitat critical to the survival of the species.** The Project has however been designed to avoid vegetation clearing by locating the Project area, where practicable, on pre-cleared land, including minimising impacts to NSW PCT Box Gum. Also, the Project has through design, avoided mapped White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC. Further, the Proponent, with the support of landowners, is seeking to establish biodiversity stewardship sites adjacent to the Project, which will contribute toward the protection of potential habitat and breeding areas for this species.
v. Disrupt the breeding cycle of an important population
The Project may impact approximately 13.5 ha of Box-Gum Woodland; whilst this vegetation type is considered as key breeding habitat for this species, however the Project Area would not be considered as key habitat, as the box gum woodlands structure lacks the preferred canopy cover for this species, and has a low density of mistletoes. Considering the relatively small and localised loss of low quality potential breeding habitat along with the high dispersal ability, **the Project is unlikely to disrupt the breeding cycle of an important population.**
vi. Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The Project may impact approximately 13.5 ha of the NSW PCT White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands; this PCT is considered key vegetation for this species (Department of Agriculture, Water and the Environment, 2021), however the Project Area would not be considered as key habitat, as the box gum woodlands structure lacks the preferred canopy cover for this

Painted Honeyeater *Grantiella picta* - Vulnerable

species, and has a low density of mistletoes..

Given the nomadic nature and large home range of this species, the relatively small area of habitat to be impacted by the Project, the proposed actions to avoid and minimise impacts such as changes to the Project design, and the nearby higher quality habitat that will be left intact, **the Project is considered unlikely to impact the availability or quality of habitat to the extent that the species is likely to decline.**

vii. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Painted Honeyeaters compete for food resources with larger and/or more aggressive honeyeaters such as the Noisy Miner, Yellow-throated Miner, Noisy Friarbird and the Red Wattlebird.

The Noisy Miner is common in fragmented and degraded habitat due to its preference for open areas adjoining eucalypt woodland and may occupy areas up to 300 m from a forest edge. In areas occupied by Noisy Miners, the abundance and species richness of other bird species are about half that recorded at nearby areas unoccupied by Noisy Miners (Piper & Catterall, 2003) (Clarke & Oldland, 2007) (Maron, et al., 2013) (Thomson, et al., 2015). Fragmentation and clearing of habitat as a result of the Project is not considered significant enough to result in a dramatic increase to the abundance of Noisy Miners. Of note, Noisy Miners have not been recorded as particularly common or abundant in existing cleared areas surrounding the Project.

Other threats to the Painted Honeyeater include predation by invasive species (e.g., Black Rats *Rattus rattus*), and nest predation by over-abundant Pied Currawongs (*Strepera graculina*), Pied and Grey Butcherbirds (*Cracticus nigrogularis* and *Cracticus torquatus*), and crows and ravens (Corvidae) (Lindsay, 17 December 2014); (Department of Environment and Primary Industries, 2014)).

Several invasive flora and fauna species have been recorded on site, but are not expected to impact the Painted Honeyeater.

Weed and pest management measures will be developed for the site which will outline mitigation and monitoring measures to reduce the likelihood of spreading and increasing the number of invasive flora and fauna found on site (refer to the Section 3.1. *iii.*). **As such, it is considered unlikely that the Project will result in invasive species that are harmful to the Painted Honeyeater becoming established in its habitat.**

viii. Introduce disease that may cause the species to decline

Spread of Root-rot Fungus *Phytophthora cinnamomi* causing tree dieback is considered a potential threat to Painted Honeyeater by reducing available foraging habitat. However, it is unlikely this disease is to occur in this region of NSW; this disease predominantly occurs in areas that receive a mean annual rainfall of more than 600 mm (DEWHA, 2009).

Although it is considered unlikely that Root-rot fungus will impact the potential foraging habitat within the Project area, this potential threat to the Painted Honeyeater will be minimised by the Proponent introducing general weed management clean-down requirements for Plant and machinery entering site throughout the life of the Project, and particularly during the construction phase (refer to Section 3.1. *iii.*).

No other diseases are considered likely to be introduced as a result of the Project. **Given this, the introduction of disease that may cause the decline of the species is considered unlikely.**

Painted Honeyeater *Grantiella picta* - Vulnerable

ix. Interfere with the recovery of the species

The Draft National Recovery Plan for the Painted Honeyeater *Grantiella picta* evaluates success of the recovery plan against the following criteria (Department of Agriculture, Water and the Environment, 2021):

- The Painted Honeyeater population has increased from 2020 baseline counts, as a result of recovery Projects.
- Threats within the range of Painted Honeyeater are managed to avoid and mitigate impacts on their habitats.
- There has been an improvement in the quality and extent of Painted Honeyeater habitat throughout the species' range.
- Understanding of the species' ecology has increased, in particular knowledge of movement patterns, habitat use and post-breeding dispersal.
- There is increased participation by key stakeholders and the public in recovery efforts and monitoring.

13.5 ha of low quality potential breeding habitat in the form of the NSW PCT White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands will be disturbed as a result of the Project.

The Project has however been designed to avoid vegetation clearing by locating the Project area, where practicable, on pre-cleared land and in particular, has through design, avoided mapped White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC.

Further, the Proponent, with the support of landowners, is seeking to establish biodiversity stewardship sites adjacent to the Project which will contribute toward the protection of potential habitat for this species. These stewardship areas will not only contribute to the preservation of large areas of native vegetation in perpetuity, but will assist in forming a biodiversity corridor between two near-by Nature Reserves, and should assist with overall catchment management associated with Frying Pan Creek.

The Project Area would not be considered as key habitat, as the box gum woodlands structure lacks the preferred canopy cover for this species, and has a low density of mistletoes.

The Project is therefore unlikely to interfere with the recovery of the species.

x. Conclusion

Habitat loss is the key threat to the Painted Honeyeater (Department of Agriculture, Water and the Environment, 2021). The Project may impact 13.5 ha of the NSW PCT White Box Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grasslands. Whilst this vegetation type is key breeding and foraging habitat for the Painted Honeyeater, the Project Area would not be considered as key habitat, as the box gum woodlands structure lacks the preferred canopy cover for this species, and has a low density of mistletoes. Vegetation clearing within the Disturbance Footprint would not significantly increase the distance between habitat patches, so impacts to connectivity are not expected to be significant.

Given the nomadic nature, large but sparse distribution range of this species, and the relatively small impact area in the locality, **the Project is considered unlikely to result in a significant impact to this species.**

3.4. Spotted-tailed Quoll

Spotted-tailed Quoll (*Dasyurus maculatus*) - Endangered

A Project is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

i. Lead to a long-term decrease in the size of a population

The Spotted-tailed Quoll (STQ) is a carnivorous mammal, feeding on a wide variety of small to medium sized prey (Glen & Dickman, 2006a). They are solitary animals (Todd, et al., 2007) that occur at low densities (Körtner et al. 2015) and occupy large home ranges, in the order of 88 - 1,515 ha and 359 - 5,512 ha for females and males respectively (Glen & Dickman, 2006b).

The STQ is primarily a forest-dependent species that occupies a wide range of habitat types (Department of Environment, Land, Water and Planning, 2016) with the most important factors influencing STQ habitat use being prey density and availability of den sites (e.g. rocky outcrops, large hollow bearing trees and fallen hollow logs) (Belcher & Darrant, 2006) (Glen & Dickman, 2006a).

Consistent with the *National Recovery Plan for the Spotted-tailed Quoll (Dasyurus maculatus),* habitat loss and modification is most likely the greatest threat to the species (Belcher, 2004), as populations are limited to large, relatively intact patches of forest (Department of Environment, Land, Water and Planning, 2016). The National Recovery Plan also states a series of other recognised threats such as, habitat fragmentation, poison baiting, competition and predation, road mortality, bushfire, poisoning from cane toad and climate change.

While intact patches of vegetation present are within and surrounding the Project area, an assessment of the landscape within the Project area determined that the area consists mainly of cleared and/or disturbed land, historically used for roads and agricultural purposes. This disturbed land is comprised of native vegetation that lacks native understory and forb diversity due to the previous grazing land use practices. It is noted that there are some areas of dense woodland with varying conditions of groundcover, hollow-bearing trees, and scattered trees present within the Project area.

Whilst it is considered unlikely, the layout of the Project area may result in minor barriers to STQ movement across the landscape. To reduce the magnitude of potential impacts to the STQ, the Project has been designed such that:

- The upper reservoir it is situated within historically cleared or semi-cleared areas, and has avoided patches of remnant native vegetation,
- The lower reservoir is situated within historically disturbed vegetation, and the
- Project's linear infrastructure, has been predominantly located on previously disturbed areas / farmland, and the water pipeline and transmission cable are being installed underground.

It is considered that the Project is unlikely to present a significant barrier to movement of the STQ as disturbance is proposed to be located within areas of already degraded, cleared or fragmented vegetation. Notwithstanding, there is evidence that the STQ is capable of crossing cleared corridors (e.g. roads), which suggests the ability to move across the penstock or even around the proposed reservoirs.

The risk of direct mortality as a result of clearing is considered unlikely as clearing will be undertaken in accordance with a vegetation management plan developed for the Project, along with appropriate supervision by a suitably qualified ecologist/trained spotter catcher to allow for resident fauna to relocate or be relocated as required. It is also noted that areas associated with temporary infrastructure and potential spoil areas, both located predominantly on past cleared areas, will be rehabilitated, and where feasible, will include the creation of habitat features such as logs, log and/or rock piles.

Spotted-tailed Quoll (*Dasyurus maculatus*) - Endangered

The surrounding habitat such as relatively large, uncleared tracts of native vegetation (e.g. present within Eusdale Nature Reserve, Wambool Nature Reserve and Winburndale Nature Forest as well as surrounding State Forest), provide substantial foraging resources for the species, and is in better condition.

Therefore, the Project is unlikely to lead to a long-term decrease in the size of the population.

ii. Reduce the area of occupancy of the species

Approximately 147 ha of potential STQ habitat may be directly impacted as a result of the Project. It is noted that impacts will generally occur within, or adjacent to, areas that have been historically disturbed and relatively minimal impacts are proposed to occur on slopes which have a greater capacity to support STQ habitat.

Whilst the Project had been designed to minimise impacts to STQ habitat, impacts to potential STQ habitat cannot be fully avoided. **As such, the Project may reduce the area of occupancy of the species.**

iii. Fragment an existing population into two or more populations

As discussed above, the majority of the impacts to this species will occur within, or adjacent to, areas that have been previously cleared for agriculture or roads and remain relatively open/disturbed.

The Project area is located between the Eusdale Nature Reserve (located to the east) and the Wambool Nature Reserve (located to the west). Vegetation present in the Project area may contribute to connectivity values between the two nature reserves.

Whilst it is considered unlikely, the layout of the Project area may result in minor barriers to STQ movement across the landscape. To reduce the magnitude of potential impacts to the STQ, the Project has been designed such that:

- The upper reservoir it is situated within historically cleared or semi-cleared areas,
- The lower reservoir is situated within historically disturbed vegetation, and the
- Project's linear infrastructure, has been predominantly located on previously disturbed areas / farmland, and the water pipeline and transmission cable are being installed underground.

It is considered that the Project is unlikely to present a significant barrier to movement of the STQ as disturbance is proposed to be located within areas of already degraded, cleared or fragmented vegetation. Notwithstanding, there is evidence that the STQ is capable of crossing cleared corridors (e.g. roads), which suggests the ability to move across the penstock or even around the proposed reservoirs.

The historic disturbance and/or clearing of vegetation within the Project area suggests that fragmentation of the landscape has already occurred (i.e. prior to the commencement of the Project). The Project has been designed to avoid and/or minimise further impacts to intact vegetation where possible.

In addition to the above, the Proponent intends to undertake rehabilitation works following construction activities and where feasible, will include habitat features such as logs, log and/or rock piles. Further, the Proponent, with the support of landowners, is seeking to establish biodiversity stewardship sites adjacent to the Project which will contribute toward the protection of potential habitat for this species. These stewardship areas will not only contribute to the preservation of large areas of native vegetation in perpetuity, but will assist in forming a biodiversity corridor between two near-by Nature Reserves, and should assist with overall catchment management associated with Frying Pan Creek.

It is therefore considered unlikely that the Project will result in the further fragmentation of the

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landscape and is unlikely to split an existing population of STQ into two or more populations.

iv. Adversely affect habitat critical to the survival of a species

The highest quality STQ woodland habitat within the Project area, occurs along the slopes located between the two proposed reservoirs. In these areas, the vegetation is more dense, less disturbed, and there is a higher abundance of rocky areas, fallen logs, and hollow bearing trees, all of which may provide potential den sites for STQ.

As a result of the Project approximately 147 ha of potential STQ habitat may be impacted.

It is also noted that the Project is not located in population areas recognised in the National Recovery Plan considered to be important to the species long-term survival.

Considering the large home range and distribution of the STQ, along with habitat of equal or greater quality and availability within adjacent areas to the Project area, **it is unlikely that the potential STQ habitat to be cleared is critical to the survival of this species.**

v. Disrupt the breeding cycle of a population

Research by Belcher and Darrant (2006) indicates that the STQ requires suitable den sites for breeding activities to occur. Where available, microhabitat features such as complex rocky outcrops and large hollow logs are preferentially used as denning sites for STQ (Belcher & Darrant, 2006) (Glen & Dickman, 2006a). Where these microhabitat features are absent, the STQ has been recorded using hollow-bearing trees for denning. STQ are known to occupy very large home ranges (up to several thousand hectares) and use multiple dens (up to 20) (Department of Environment, Land, Water and Planning, 2016).

The Project area contains potential breeding habitat in areas of intact vegetation, particularly along the slope located between the two proposed reservoirs; these microhabitat features are not present along the alignment of the penstock but are likely found in areas outside the Project Area, particularly rocky and/or cliff areas. The key breeding habitat identified would be largely left intact, as the Project is primarily located with low lying and or flat areas (i.e. the proposed reservoirs) that have been impacted by past clearing, grazing and weed invasion.

The Project would clear approximately 147 ha of potential STQ habitat, however, has been designed such that:

- The upper reservoir it is situated within historically cleared or semi-cleared areas,
- The lower reservoir is situated within historically disturbed vegetation, and the
- Project's linear infrastructure, has been predominantly located on previously disturbed areas / farmland, and the water pipeline and transmission cable are being installed underground.

The Project has been designed to avoid and/or minimise impacts to intact vegetation where possible. On this basis, the likelihood of impacts to breeding habitat for the STQ is unlikely.

The Project is therefore considered unlikely to disrupt the breeding of individuals in the STQ local population as the species large home range and ability to move between habitats will not be disrupted.

Spotted-tailed Quoll (*Dasyurus maculatus*) - Endangered

vi. Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The STQ is a primarily forest-dependent species that occupies a wide range of habitat types (Department of Environment, Land, Water and Planning, 2016). As such, vegetated areas within the Project area are likely to provide suitable STQ habitat. The Project may result in the clearance of approximately 147 ha of potential STQ habitat.

As a result of potentially clearing approximately 147 ha of potential STQ habitat, **the Project may contribute to the modification, destruction, removal, isolation or decrease of the availability or quality of habitat. On this basis, the STQ may decline in the locality of the Project.**

To assist with mitigating these impacts, the Proponent intends to implement management and mitigation measures throughout the design, construction and operation of Project. The Project has been designed in such a way that impacts associated with habitat clearing and fragmentation have been minimised and avoided, where practicable. Examples of these design constraints and considerations include:

- Change from an overhead transmission line with a 60 m wide, cleared easement, to an underground cable with a cleared width during construction of approximately 10 m.
- Relocating the access road off Molybdonite Road and therefore avoiding the clearing of road reserve vegetation, including numerous large, old eucalypts, some of which many contain hollows useful for species refuge.
- Linear infrastructure, including underground transmission cable and water pipeline, have been located on predominantly previously cleared areas, with a section of the cable being co-located along an existing road to further minimise clearing.
- The upper reservoir was repositioned to avoid threatened ecological communities containing mature trees.
- Temporary construction areas have been located to avoid large stands of native vegetation, being positioned predominantly on previously cleared or partially cleared areas.
- The Project area has been designed to minimise and/or avoid the clearing of vegetation and therefore is largely located within previously cleared or disturbed areas.

In addition to the above, the Proponent intends to undertake rehabilitation works following construction activities and where feasible, will include habitat features such as logs, log and/or rock piles.

Further, the Proponent, with the support of landowners, is seeking to establish biodiversity stewardship sites adjacent to the Project which will contribute toward the protection of potential habitat for this species. These stewardship areas will not only contribute to the preservation of large areas of native vegetation in perpetuity, but will assist in forming a biodiversity corridor between two near-by Nature Reserves, and should assist with overall catchment management associated with Frying Pan Creek.

vii. Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The *National Recovery Plan for the Spotted-tailed Quoll* describes that a key threat to the STQ is dietary overlap between STQ and invasive species such as the Red Fox (*Vulpes vulpes*), Feral Cat (*Felis catus*) and Wild Dog (*Canis lupus ssp.)* (Department of Environment, Land, Water and Planning, 2016). This overlap is due to the strong competition for mutual pray, where small to medium mammals are an important

Spotted-tailed Quoll (*Dasyurus maculatus*) - Endangered

prey item for multiple predator species.

Whilst wild dogs have not been observed within the Project area during field surveys, including 70,560 hours of camera trapping, the management plans for Wambool and Eusdale Nature Reserves describe records of wild dogs, but fail to state they are a recognised pest species in the nature reserves. This is in contrast to Winburndale Nature Reserve, which is located approximately 8 km north of the Project, which has a management plan which specifically identifies wild dogs as a recognised pest species. Further, the surrounding landowners are known to control feral species, including fox, as part of their livestock management practices.

No other invasive species are considered to be a significant threat to this species.

It is therefore considered unlikely that the Project will introduce, or result in an increase in, invasive species other than those which are likely already present within the Project area becoming more established.

Notwithstanding this, any potential threat to the STQ will be minimised by the Proponent introducing general weed management clean-down requirements for Plant and machinery entering site throughout the life of the Project, and particularly during the construction phase (refer to Section 3.1.*iii*.).

viii. Introduce disease that may cause the species to decline

The *National Recovery Plan for the Spotted-tailed* Quoll does not state that there are any recognised diseases which are a threat to the STQ.

It is understood however, that ectoparasites may have the potential to impact STQs and have been recorded on STQ within NSW. In low abundance ectoparasites are not considered to pose a risk to the persistence of STQ (Vilcins, et al., 2008).

To assist with managing the introduction of potential diseases which may impact STQs, pets will not be permitted onsite during either the construction or operation stage of the Project.

It is considered unlikely that the Project would introduce a disease that may cause the species to decline.

ix. Interfere with the recovery of the species

The National Recovery Plan for the STQ *Dasyurus maculatus* evaluates success of the recovery plan against the following criteria:

- Determine the distribution and status of STQ populations throughout the range, and identify key threats and implement threat abatement management practices.
- Investigate key aspects of the biology and ecology of the STQ to acquire targeted information to aid recovery.
- Reduce the rate of habitat loss and fragmentation on private land.
- Evaluate and manage the risk posed by silvicultural practices.
- Determine and manage the threat posed by introduced predators (foxes, cats, wild dogs) and of predator control practices on STQ populations.
- Determine and manage the impact of fire regimes on STQ populations.
- Reduce deliberate killings of STQ.
- Reduce the frequency of STQ road mortality.

Spotted-tailed Quoll (*Dasyurus maculatus*) - Endangered

- Assess the threat Cane Toads pose to STQ and develop threat abatement projects if necessary.
- Determine the likely impact of climate change on STQ populations.
- Increase community awareness of the STQ and involvement in the Recovery Program.

The Project may clear approximately 147 ha of potential habitat for the STQ which **is inconsistent with the recovery plan objective of reduce the rate of habitat loss and fragmentation on private land, and may interfere with the recovery of this species.**

x. Conclusion

The Project has been designed such that:

- The upper reservoir it is situated within historically cleared or semi-cleared areas, and
- The lower reservoir is situated within historically disturbed vegetation, and the
- Project's linear infrastructure has been predominantly located on previously disturbed areas / farmland, and the water pipeline and transmission cable are being installed underground.

As a result of the above and avoidance and minimisation measures outlined in Section 3.4. *vi*., substantial areas of potential habitat will not be impacted. Further, minimal clearing of the sloped areas (which provide greater quality potential STQ habitat) is required to undertake the Project. However, the Project may still result in the clearing of approximately 147 ha of potential habitat for the STQ. Given the large home range and the ability for the STQ to move through the landscape (as indicated by evidence of the STQ crossing roads near the Project area), it is considered therefore unlikely that the Project will adversely affect the movement of the species through the existing landscape.

The Project may still result in the clearing of approximately 147 ha of potential habitat for the STQ and **therefore has the potential to have a significant impact to the STQ.**

3.5. Greater Glider

On 5 July 2022, the listing status for Greater Glider (*Petauroides volans)* under the EPBC Act was amended from Vulnerable to Endangered. Accordingly, the below Significant Impact Assessment has been undertaken utilising the Significant Impact Guideline 1.1. Endangered Species criteria.

Greater Glider *Petauroides volans* - Endangered
A Project is likely to have a significant impact on a endangered species if there is a real chance or possibility that it will:
i. Lead to a long-term decrease in the size of a population
The Greater Glider (*Petauroides volans)* is an arboreal nocturnal marsupial and is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers (Kavanagh & Lambert, 1990) (van der Ree, et al., 2004). Home ranges of Greater Gilders are between 1 and 3 ha (Gibbons & Lindenmayer, 2002); (Pope, et al., 2005) and have low dispersal abilities (DCCEEW, 2022). Greater Gliders are typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows (van der Ree, et al., 2004) (Vanderduys, et al., 2012). Greater Gliders favour forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species (Kavanagh, 1984). During the day greater gliders shelter in large tree hollows in large, old trees (Smith, et al., 2007) (Goldingay, 2012). Several large hollow-bearing trees were observed during field surveys within riparian areas, along road public corridors and in some paddock trees. To minimise potential impacts to the Greater Glider, the Project has been designed to avoid removing large tree hollows wherever practicable, including relocating the Project access road off the majority of public roads containing old native trees. A total of four greater gliders were observed on 28th October 2021 during nocturnal field surveys in the immediate surrounds of the Project area; three in the Sunny Corner State Forest block just north of the Project area (and outside of the Development Footprint), and one in the vegetation corridor along Molybdonite Road. This vegetation corridor is intended to be undisturbed, and therefore will be subject to reduced extent of impacts. It is noted that numerous surveys have been undertaken across the site, including targeted nocturnal surveys for the Greater Glider, and a significant number of cameras deployed for multiple weeks (~ 70,560 camera hours). Four gliders were identified during these efforts, all located outside the Project Area and associated Development Footprint. Approximately 89.5 ha of potential greater glider habitat may be impacted as a result of the Project, noting that the condition of this habitat is highly variable across the site, and subject to varying degrees of degradation and fragmentation due to historical clearing in the area. Further, the surrounding habitat such as relatively large, uncleared tracts of native vegetation (e.g. present within Eusdale Nature Reserve, Wambool Nature Reserve and Winburndale Nature Forest as well as surrounding State Forest), provide substantial foraging resources for the species, and is in better condition, with more mature, structured forests. It is noted that there is currently no recovery plan for the species. As a result of impacts to approximately 89.5 ha of habitat, containing some hollow bearing trees as well as confirmed Greater Glider records in the Project vicinity, **it is considered that the Project may lead to a long-term decrease in the size of the greater glider population.**

Greater Glider *Petauroides volans* - Endangered

ii. Reduce the area of occupancy of the species

Although the Project has avoided and minimised impacts to Greater Glider habitat where practicable (see below), clearing of Greater Glider habitat due to the Project cannot be fully avoided, and some 89.5 ha of potential greater glider habitat may be impacted. It is noted that the condition of this habitat is variable across the site, and subject to varying degrees of degradation. Additionally, suitable habitat is located within the Sunny Corner State Forest Block and along Molybdonite Road, outside of the Project area, where the four gliders were observed.

The majority of the potential impacts to the Greater Glider are likely to occur on, or adjacent to, patches of land that have previously been cleared for roads or agricultural purposes.

To assist with mitigating these impacts, the Proponent intends to implement management and mitigation measures throughout the design, construction and operation of Project. The Project has been designed in such a way that impacts associated with habitat clearing and fragmentation have been minimised and avoided, where practicable. Examples of these design constraints and considerations include:

- Change from an overhead transmission line with a 60 m wide, cleared easement, to an underground cable with a temporary cleared width during construction of approximately 10 m.
- Relocating the access road off Molybdonite Road and therefore avoiding the clearing of road reserve vegetation, including numerous large, old eucalypts, some of which many contain hollows useful for species refuge.
- Linear infrastructure, including underground transmission cable and water pipeline, have been located on predominantly previously cleared areas, with a section of the cable being co-located along an existing road to further minimise clearing.
- The upper reservoir was repositioned to avoid threatened ecological communities containing mature trees.
- Temporary construction areas have been located to avoid large stands of native vegetation, being positioned predominantly on previously cleared or partially cleared areas.
- The Project area has been designed to minimise and/or avoid the clearing of vegetation and therefore is largely located within previously cleared or disturbed areas.

In addition to the above, the Proponent intends to undertake rehabilitation works following construction activities and where feasible, will include habitat features such as logs, log and/or rock piles. Further, the Proponent, with the support of landowners, is seeking to establish biodiversity stewardship sites adjacent to the Project which will contribute toward the protection of potential habitat for this species. These stewardship areas will not only contribute to the preservation of large areas of native vegetation in perpetuity but will assist in forming a biodiversity corridor between two near-by Nature Reserves.

Notwithstanding, the Project may impact up to approximately 89.5 ha of potential Greater Glider habitat. **It is therefore considered likely that the Project would reduce the area of occupancy of the species.**

iii. Fragment an existing population into two or more populations

Vegetation currently present within the Project area is fragmented and shows evidence of previous clearing due to historic land use practices (e.g. grazing). The Project area is located between the Wambool Nature Reserve (to the west) and Eusdale Nature Reserve (to the east).

The majority of the potential impacts to the Greater Glider are likely to occur on, or adjacent to, patches of

Greater Glider *Petauroides volans* - Endangered

land that have previously been cleared for roads or agricultural purposes.

Due to the design of the Project, linear infrastructure, including access road, underground transmission cable and underground water pipeline, have been located on predominantly previously cleared areas, with a section of the cable being co-located along an existing road to further minimise clearing. Where limited clearing of potential habitat is required, it would largely be limited to a corridor of approximately 10 - 15 m wide. The required clearing for construction of the linear infrastructure is unlikely to fragment the present greater gilder population as research suggests that the Greater Glider can glide lengths of up to 120 m (DCCEEW, 2022) and an average gliding distance is considered to be 40 m.

The upper and lower reservoir have the potential to result in barriers to movement for this species in the immediate locality however, the location of the Disturbance Footprint is within previously cleared areas and clearing of intact vegetation has been minimised where possible. The upper reservoir is situated on predominantly cleared or semi-cleared vegetation, the majority of the large trees that remain in the area are greater than 40 m apart. The lower reservoir is located amongst already disturbed vegetation however, there are large trees that will be removed hence will reduce the number of available trees for this species if present in the area.

Further to the above avoidance and minimisation measures, the Proponent will implement a series of specific management measures to ensure that the Project further reduces potential impacts to local Greater Gliders. An example of this is barbed wire, which is known to result in Greater Glider fatalities and as such is a potential Project hazard. To mitigate this possible risk to Greater Glider populations within the Project area, wherever feasible, fences installed for the Project will have plain top wire rather than barbed wire.

Based on the above, it is considered that the Project is unlikely to fragment an existing population of Greater Glider into two or more populations.

iv. Adversely affect habitat critical to the survival of a species

The approved *Conservation Advice for Petauroides volans* identifies habitat critical to the survival of the species as meeting any one of the following, irrespective of current abundance or density of Greater Gliders or the perceived quality of the site (DCCEEW, 2022).:

- Large contiguous areas of eucalypt forest which contain hollow-bearing trees and a diverse range of the species preferred food species
- Smaller or fragmented habitat patches which are connected to larger patches that facilitate the dispersal of the species
- Cool microclimate forest/woodland areas
- Areas identified as refuges under future climate change scenarios; and
- Short-term or long-term post-fire refuges that allow the species to persist, recover and recolonise burnt areas.

The Project may clear up to approximately 89.5 ha of fragmented potential Greater Glider habitat patches, containing some hollow-bearing trees (identified during field surveys). These hollow-bearing trees were most prominent along road corridors, which have been avoided, in disturbed riparian areas, and as scattered paddock trees. Large contiguous areas of eucalypt forest exist in nearby areas (e.g. present within Eusdale Nature Reserve, Wambool Nature Reserve and Winburndale Nature Forest as well as surrounding State Forest). It is possible that the fragmented patches of habitat within the project area facilitates dispersal of the species.

Greater Glider *Petauroides volans* - Endangered

The Project will avoid removing large tree hollows where practicable, through deliberate design although some impacts may be unavoidable, specifically in relation to inundation areas. Examples of deliberate design include placement of road alignments into already cleared paddock areas avoiding the removal of substantial mature trees along the Molybdonite Road reserve, and substantially reducing clearing by the adoption of an underground transmission cable as opposed to an overhead transmission line with its accompanying 60 m wide easement (see also Section 3.5 *ii*.).

Notwithstanding, the Greater Glider habitat cleared as a result of the Project may be critical for the survival of the species.

v. Disrupt the breeding cycle of a population

Greater Gliders depend on hollows for breeding. Numerous trees with large hollows have been observed within the Project area, particularly along the public road corridors, which have been avoided, within riparian areas, and as scattered paddock trees. Clearing of large trees which contain hollows due to the Project will be avoided where practicable.

Consistent with the *Conservation Advice for the Petauroides Volans (greater glider [southern and central])*, Greater Glider females birth a single young from March to June, following sexual maturity at two years of age (DCCEEW, 2022). It is noted that the species has a small home range (approximately 1 - 4 ha), and removal of habitat containing resident hollow-bearing trees (used for denning) may cause potential impacts to individual breeding cycles.

The broader area around the Project site supports connectivity between areas of Eusdale Nature Reserve and Wambool Nature Reserve. The Project will fragment some areas and the reservoirs have the potential to limit or alter species movement across the landscape; this may then limit some dispersal for breeding and gene flow across the landscape.

The Project has been designed such that the potential impacts to Greater Gliders have been minimised where practicable. Examples of these design constraints/considerations which result in impact reduction are summarised in Section 3.5*. ii.*

The Proponent intends to undertake rehabilitation works following construction activities and is actively seeking opportunities to establish stewardship areas and undertake rehabilitation works, not just for offsets but to increase and improve available habitats.

Based on the above, the Project is likely to disrupt the breeding cycle of the local population of Greater Glider.

vi. Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project may impact up to approximately 89.5 ha of potential Greater Glider habitat.

On 5 July 2022, the Greater Glider EPBC listing status was updated to reflect the separation of the species into two sub-species, *Petauroides minor* and *Petauroides volans,* with specific species ranges. The distribution of the Greater Glider (*Petauroides volans)* identified within the Project Area occurs from Northern Queensland (near to Townsville) to Central Victoria, as such, it is considered that the Project will not impact the overall availability and or quality of habitat to the extent that the species is likely to decline.

The Project has been designed such that the potential impacts to Greater Gliders have been minimised

Greater Glider *Petauroides volans* - Endangered

where practicable. Examples of these design constraints/considerations which result in impact reduction are summarised in Section 3.5*. ii.*.

In addition to the above, the Proponent intends to undertake rehabilitation works following construction activities and where feasible. Further, the Proponent, with the support of landowners, is seeking to establish biodiversity stewardship sites adjacent to the Project which will contribute toward the protection of potential habitat for this species. These stewardship areas will not only contribute to the preservation of large areas of native vegetation in perpetuity but will assist in forming a biodiversity corridor between two near-by Nature Reserves.

The abovementioned measures to minimise and/or avoid Greater Glider habitat disturbance also contribute to the reduction of impact on the availability of quality habitat for the species.

Given the small home range and low dispersal ability of Greater Gliders, it is likely that the identified habitat within the Project area is relied upon by local Greater Gliders. **However, it is considered that the Project will not impact the overall availability and or quality of habitat to the extent that the species is likely to decline.**

vii. Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The Conservation Advice for *Petauroides volans* recognises both feral cats (*Felis catus*), and European red fox (*Vulpes vulpes*) as threats to the survival of the species (DCCEEW, 2022)., of which European red fox has been identified within the Project area during field surveys.

The Proponent intends to implement weed and pest management control measures throughout the construction and operation of the Project. These control measures will outline mitigation and monitoring measures to reduce the likelihood of introducing, spreading and/or increasing the number of invasive flora and fauna which may impact species such as the Greater Glider.

As such, it is considered unlikely that the Project will result in the introduction or establishment of invasive species which are otherwise not already present within the Project area, that are harmful to the Greater Glider.

viii. Introduce disease that may cause the species to decline

Whilst chlamydia has been recorded in Greater Gliders in the past (Bodetti, et al., 2003), it is not a recognised threatening process for the Greater Glider. Although not debilitating, chlamydia has the potential to decrease the vigour of the population. Stress is regarded as a major factor in an animal's susceptibility to chlamydia (Maloney, 2007). The Project may impact approximately 89.5 ha of potential Greater Glider habitat which has the potential to cause a stress response in individuals within the immediate vicinity.

Although not a recognised threating process, the spread of Root-rot Fungus *Phytophthora cinnamomi* which causes tree dieback is another potential threat to the Greater Glider, through the reduction of available foraging and nesting habitat. However, it is unlikely for Root-rot Fungus is to occur in this region of NSW as it predominantly occurs in areas that receive a mean annual rainfall of more than 600 mm (DEWHA, 2009).

Although it is considered unlikely that Root-rot fungus will impact the potential foraging habitat within the

Greater Glider *Petauroides volans* - Endangered

Project area, this potential threat to the Greater Glider will be minimised by the Proponent introducing general weed management clean-down requirements for Plant and machinery entering site throughout the life of the Project, and particularly during the construction phase (refer to Section 3.1. *iii.*).

The Proponent intends to manage these abovementioned potential threats to Greater Gliders through the implementation measures such as hygiene protocols to reduce the spread of disease.

No diseases are considered likely to be introduced as a result of the Project which are not already likely present in the population. **As such, the introduction of disease that may cause the decline of this species is considered unlikely to occur.**

ix. Interfere with the recovery of the species

There is currently no approved recovery plan for the Greater Glider, however it has been recognised that a recovery plan is required in the future (DCCEEW, 2022). However, the *Approved Conservation Advice for Petauroides volans* states that known threats to the species include habitat removal, habitat fragmentation, and inappropriate fire regimes (DCCEEW, 2022)..

As described in the above Sections, strong principles of hierarchical vegetation disturbance mitigation have been applied to the design of the Project, specifically avoid, minimise and offset. As part of this, the loss of hollow bearing trees will be minimized where possible.

The Project will be constructed on bushfire prone land, and as such a bushfire management plan will be developed and incorporated into construction and operational plans. Within this plan, the reservoirs will be highlighted as an important body of water for authorities to access, if required, during bushfires. Bushfire mitigations include:

- Vehicles only to be parked in designated hardstand carpark
- Fire-fighting equipment to be on site, with select employees trained to respond to fires.
- No hot work or blasting on Total Fire Ban days (unless an exemption applies).
- Vegetation surrounding the site to be managed to reduce fuel loads (cutting tall grass, pruning etc.).
- Green waste stockpiles to be managed to limit combustion potential.
- All machinery on site to be diesel, where practicable.
- Limit machinery idling when not in use.
- Placement of plant (generators, lighting etc.) clear of vegetation in designated areas.

Further, the Proponent, with the support of landowners, is seeking to establish biodiversity stewardship sites adjacent to the Project which will contribute toward the protection of potential habitat for this species. These stewardship areas will not only contribute to the preservation of large areas of native vegetation in perpetuity, but will assist in forming a biodiversity corridor between two near-by Nature Reserves.

The Project may impact up to approximately 89.5 ha of potential Greater Glider habitat which may interfere with the recovery of the species.

x. Conclusion

The Project may impact approximately 89.5 ha of potential Greater Glider habitat.

Out of the numerous diurnal and nocturnal surveys undertaken and significant amount of remote camera sensing (some 70,560 camera hours), four Greater Gliders were recorded during a field survey undertaken

Greater Glider *Petauroides volans* - Endangered

in October 2021; three in the State Forest block north of the immediate Project area and one in the vegetation corridor along Molybdonite Road; all outside the Project's Development Footprint.

Given the number of sightings, it is possible that Greater Gliders are using habitat present within the Project area. There are also several NSW BioNet records indicating that Greater Gilders are present in habitat areas adjacent to the Project area (e.g. in May 2016 Greater Gilders were recorded in *E. viminalis* Forest in Eusdale Nature Reserve).

The Project has been designed such that the potential impacts to Greater Gliders have been avoided and minimised where practicable. Examples of these design constraints and considerations include changing from an overhead transmission line to an underground cable, relocating the Project main access road off Molybdonite Road to avoid clearing mature hollow bearing trees, repositioning the upper reservoir to avoid threatened ecological communities containing mature trees, and temporary construction areas located to avoid large stands of native vegetation.

In addition, the Proponent intends to undertake rehabilitation works following construction activities and where feasible. Further, the Proponent, with the support of landowners, is seeking to establish biodiversity stewardship sites adjacent to the Project which will contribute toward the protection of potential habitat for this species. These stewardship areas will not only contribute to the preservation of large areas of native vegetation in perpetuity but will assist in forming a biodiversity corridor between two near-by Nature Reserves

Due to the small home range and low dispersal ability of this species, the removal of suitable habitat (e.g. hollow-bearing trees), **the Project may result in a significant impact to the species.**

3.6. Grey-headed Flying-fox

Grey-headed Flying-fox (*Pteropus poliocephalus*) - Vulnerable

A Project is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

i. Lead to a long-term decrease in the size of an important population

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is a frugivore/nectivore which utilises a wide variety of canopy trees which include eucalypts, melaleuca and banksia, as well as fruit trees and non-native blossoming trees. The Grey-headed Flying-fox migrates across the landscape in response to changing fruiting and blossom conditions (Department of Agriculture Water and the Environment, 2022). The Grey-headed Flying-fox population is considered to be a single mobile population (Department of Agriculture Water and the Environment, 2022).

Flying-fox, including flying-fox roosts were not identified within the Project area during general and targeted field surveys in 2020, 2021 and 2022, however suitable foraging habitat was identified. Suitable foraging habitat identified within the Project area comprises of a mix of both remnant, and non-remnant regrowth vegetation

The closest known Grey-headed Flying-fox camp is located at Bathurst, approximately 20 km west of the Project area, and the closest nationally important camp is located at Richmond, approximately 90km east of the Project area (Department of Agriculture, Water and the Environment, 2022).

The mean distance of Grey-headed Flying-fox foraging sites from the camp in which the animals roost, and to which they returned, is 10.9 km, although they have been known to fly as far as 40 km to feed before returning to their camp (Department of Agriculture Water and the Environment, 2022). As the Project area is located within 40 km of the Bathurst Camp Flying Foxes from this camp may utilise the Project area for foraging purposes.

The Project may impact approximately 147 ha of Grey-headed Flying-fox foraging habitat.

However, the surrounding habitat such as relatively large, uncleared tracts of native vegetation (e.g. present within Eusdale Nature Reserve, Wambool Nature Reserve and Winburndale Nature Forest as well as surrounding State Forest), provide substantial foraging resources for the species, and is in better condition.

Due to the Grey-headed Flying-fox's ability to migrate across landscapes in response to changing fruiting and blossom conditions in combination with the absence of the species (during field surveys), the Project is considered unlikely to result in reduced access to foraging habitat across the landscape and it is not expected to impact on genetic diversity, breeding opportunities or dispersal functions of the Grey-headed Flying-fox.

Accordingly, the Project is unlikely to contribute to a long-term decrease in the size of an important population.

ii. Reduce the area of occupancy of an important population

Grey-headed Flying-foxes have a large range extending from Bundaberg in Queensland to Melbourne in Victoria, and from the coast to the inland western slopes of New South Wales.

There have also been recent reports of Grey-headed Flying-fox in South Australia. Patterns of occupancy and abundance vary widely, seasonally and temporally (Department of Agriculture Water and the

Grey-headed Flying-fox (*Pteropus poliocephalus*) - Vulnerable

Environment, 2022).

Grey-headed Flying-foxes return to certain locations referred to as camps, for rest and sleep during the day. According to DAWE's National Flying-fox monitoring viewer (Department of Agriculture Water and the Environment, 2022), the closest known Grey-headed Flying-fox camp is located at Bathurst, approximately 20 km west of the Project area, and the closest nationally important camp is located at Richmond, approximately 90km east of the Project area (Department of Agriculture, Water and the Environment, 2022).The mean distance of Grey-headed Flying-fox foraging sites from the camp in which the animals roost, and to which they returned, is 10.9 km, although they have been known to fly as far as 40 km to feed before returning to their camp (Department of Agriculture Water and the Environment, 2022). This suggests that the Project site is within the extended range of a nearby flying-fox camp.

Approximately 147 ha of Grey-headed Flying-fox foraging habitat may be cleared due to the Project.

The Project has been designed such that the potential impacts to Grey-headed Flying-fox have been minimised where practicable. Examples of these design constraints/considerations which result in impact reduction are summarised in Section 3.5. *ii*.

In addition to the above, the Proponent intends to undertake rehabilitation works following construction activities and, with the support of landowners, is seeking to establish biodiversity stewardship sites adjacent to the Project which will contribute toward the protection of potential habitat for this species. These stewardship areas will not only contribute to the preservation of large areas of native vegetation in perpetuity but will assist in forming a biodiversity corridor between two near-by Nature Reserves.

Whilst the Project would aim to avoid impacts to potential habitat wherever possible, clearing of Grey-headed Flying-fox foraging habitat cannot be fully avoided. It is however, **unlikely that the Project would lead to a reduction in area of occupancy of an important population given the availability of equal or greater quality foraging habitat in the broader area and the absence of breeding flying-fox camps within the Project area.**

iii. Fragment an existing important population into two or more populations

Flying-fox, including flying-fox roosts were not identified within the Project area during targeted field surveys, however suitable foraging Grey-headed Flying-fox was identified. Suitable foraging habitat identified within the Project area comprises of a mix of both remnant, and non-remnant regrowth vegetation

The closest known Grey-headed Flying-fox camp is located at Bathurst, approximately 20 km west of the Project area, and the closest nationally important camp is located at Richmond, approximately 90km east of the Project area (Department of Agriculture, Water and the Environment, 2022). As the Project area is located within 40 km of the Bathurst Camp Flying Foxes from this camp may utilise the Project area for foraging purposes.

The Project would result in the clearing of approximately 147 ha of potential Grey-headed Flying-fox foraging habitat.

Given the high dispersal ability of this species and localised nature of the Project's potential impacts (due to clearing), **it is considered unlikely that the Project will fragment an important Grey-headed Flying-fox population into two or more populations.**

iv. Adversely affect habitat critical to the survival of a species

The *National Recovery Plan for the Grey Headed Flying Fox* describes habitat critical to the survival of the

Grey-headed Flying-fox (*Pteropus poliocephalus*) - Vulnerable

species as containing:

- native species that are known to be productive as foraging habitat during the final weeks of gestation, and during the weeks of birth, lactation and conception (August to May)
- contain native species used for foraging and occur within 20 km of a nationally important camp as identified on the Department's interactive flying-fox web viewer, or
- contain native and or exotic species used for roosting at the site of a nationally important Grey-Headed Flying-Fox camp as identified on the Department's interactive flying-fox web viewer

The closest known Grey-headed Flying-fox camp is located at Bathurst, approximately 20 km west of the Project area, however the closest nationally important camp is located at Richmond, approximately 90km east of the Project area (Department of Agriculture, Water and the Environment, 2022).

The Project may result in the clearing of approximately 147 ha of potential grey-headed flying-fox foraging habitat. The *National Recovery Plan for the Grey Headed Flying Fox* states that the loss of foraging habitat is considered to be the primary threat to the Grey-headed Flying-fox (Tidemann, et al., 1999), (Dickmann & Flemming, 2002), (Eby & Lunney, 2002).

Whilst the Project would result in a small reduction of foraging habitat within the Project area for the Grey headed flying fox, suitable foraging habitat of equal or better quality exists outside of the Project area, which is expected to maintain capacity to seasonally support Grey-headed Flying-fox populations (e.g. those located in Bathurst) that would be moving through the area.

The Project is therefore not expected to significantly affect habitat critical to the survival of this species.

v. Disrupt the breeding cycle of an important population

Grey-headed Flying-foxes are seasonal breeders, with a single breeding event occurring in each year. Females give birth to a single pup, with most births occurring between October and December. The main disruption to breeding occur in response to disturbance to camps and habitat clearing (Department of Agriculture Water and the Environment, 2022).

The closest known Grey-headed Flying-fox camp is located at Bathurst, approximately 20 km west of the Project area, and the closest nationally important camp is located at Richmond, approximately 90km east of the Project area (Department of Agriculture, Water and the Environment, 2022).

The Project would not impact Grey-headed Flying-fox breeding habitat and therefore would not disrupt the breeding cycle of an important population.

vi. Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project may result in the clearing of approximately 147 ha of potential Grey-headed Flying-fox foraging habitat.

Large areas of suitable foraging habitat of equal or greater quality are present in the broader region which are unlikely to be affected by the Project.

Additionally, the Project area will not result in obstruction of movement of the species across the landscape. For example, the placement of the transmission line is underground and will not interfere with the

Grey-headed Flying-fox (*Pteropus poliocephalus*) - Vulnerable

movements of the species.

The Project has been designed such that the potential impacts to Grey-headed Flying-fox have been minimised where practicable. Examples of these design constraints/considerations which result in impact reduction are summarised in Section 3.5. *ii*. above.

In addition to the above, the Proponent intends to undertake rehabilitation works following construction activities and, with the support of landowners, is seeking to establish biodiversity stewardship sites adjacent to the Project which will contribute toward the protection of potential habitat for this species. These stewardship areas will not only contribute to the preservation of large areas of native vegetation in perpetuity but will assist in forming a biodiversity corridor between two near-by Nature Reserves.

As such, the Project is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that Grey-headed Flying-fox is likely to decline.

vii. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The *National Recovery Plan for the Grey Headed Flying Fox* does not identify any key threatening processes related to invasive species.

Notwithstanding, weed and pest management measures will be implemented for the Project which will outline mitigation and monitoring measures to reduce the likelihood of spreading and increasing the number of invasive flora and fauna found on site which may have the potential to adversely impact the Grey-headed Flying-fox.

It is considered unlikely that the Project would result in the further establishment of invasive species that are harmful to Grey-headed Flying-fox.

viii. Introduce disease that may cause the species to decline

The incidence of Lyssavirus (a rabies like disease) in healthy adult Grey-headed Flying-fox is low (<1%), whereas sick, injured, or orphaned individuals have a higher incidence (5-10%). Other diseases include the Hendra and Menangle viruses. These diseases can be transmitted from Flying-foxes to horses and pigs, who can then transmit the disease to humans. However, the impact of these diseases on Grey-headed Flying Foxes is unknown (Department of Agriculture Water and the Environment, 2022).

Whilst Lyssavirus has a low likelihood of causing an impact on the population of Grey-headed Flying-fox, when populations are subject to significant ecological stress the incidence of Lyssavirus can increase to a point where it may impact effected populations.

Whilst the *National Recovery Plan for the Grey Headed Flying Fox* does not identify any key threatening processes related to diseases, it does identify that public misunderstanding of disease risk is a key threat to the species.

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

ix. Interfere with the recovery of the species

The National Recovery Plan for the Grey-headed Flying-fox (Department of Agriculture Water and the Environment, 2022) evaluates success of the recovery plan against the following criteria:

Grey-headed Flying-fox (*Pteropus poliocephalus*) - Vulnerable

- a robust estimate of an increasing population trend
- an improved understanding of habitat critical to the survival of the species
- an increase in protection of habitat critical to the survival of the species and nationally important camp sites
- implementation of effective habitat restoration projects
- a reduction of conflict between people and flying-foxes in residential areas through investment in household mitigation measures
- greater uptake of crop netting under subsidy schemes
- decrease in the number of licenses issued to harm the species
- an improved understanding of threats with as yet unquantified impacts on flying-foxes, such as electrocution, entanglements and climate change

The Project is not expected to interfere with the success in any of the listed criteria. **As such, the Project is unlikely to interfere with the recovery of the species.**

x. Conclusion

The Project may impact approximately 147 ha of foraging habitat for the Grey-headed Flying-fox.

The Project will not interfere with areas of foraging habitat outside of the Project area, which is expected to be capable of seasonally supporting Grey-headed Flying-fox populations that would be moving through the area foraging, or the population occupying the Bathurst Camp approximately 20 km west of the Project area.

The Project will also not result in obstruction of movement of Grey-headed Flying-fox across the landscape. It is unlikely that the Project would contribute to isolation of the existing Grey-headed Flying-fox habitat.

Considering the above, **the Project is unlikely to result in a significant impact to Grey headed Flying fox.**

3.7. Booroolong Frog

Booroolong Frog *Litoria booroolongensis* – Endangered

A Project is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

i. Lead to a long-term decrease in the size of a population

The Booroolong Frog is a medium sized tree frog with a body which may be coloured dull grey, olive or reddish brown and may be uniform or consist of indistinct black markings and salmon-coloured flecks (Barker, et al., 1995); (Moore, 1961).

The Booroolong Frog is generally associated with permanent streams in wet and dry forest, woodland, and cleared grazing land (Gillespie, 1999), (Hunter, 2007) within dissected mountainous country, tablelands, foothills and lowland plains at 200 to 1300 m ASL (Gillespie 1999; NSW OEH 2011). The primary habitat requirements for the Booroolong Frog are extensive rock bank structures along permanent rivers (Gillespie, 1999), (Hunter & Smith, 2006).

The Booroolong Frog appears to be tolerant a range of water quality parameters as it is often found in streams subject to intensive agricultural practises (Hunter, 2007). However, the species appears to be reliant on access to permanent water with studies showing declines of this species during severe drought (Hunter & Smith, 2006).

Targeted surveys for the Booroolong Frog within the Project area in areas of suitable habitat, including aquatic assessments in 2020, 2021 and 2022, did not detect the presence of the species. Therefore, the species is not considered to occur on site.

It is considered that habitat for the Booroolong Frog has the potential to occur within Fish River (a tributary of the Macquarie River which also has known records of the Booroolong Frog) and the surrounding riparian habitat (NSW BioNET, 2022). Four individuals have been recorded at a single location on the lower Fish River in 2009 (located at latitude -33.490128044, longitude 149.670485818). This location is 20 km downstream from the Project area, near the confluence of the Campbells River.

Hydrological modelling is currently being finalised for the assessment of potential downstream impacts from the Project's proposed water extraction, however, the preliminary results indicate that significant changes to the downstream environment are unlikely. This is on the basis of the proposed extraction regime that maintains sufficient volumes for downstream water users and considers minimum environmental flows. This extraction regime was developed with an emphasis on understanding and mitigating impacts during periods of low flow (noting that the Booroolong Frog is particularly vulnerable during periods of severe drought).

Per the current Project design, the Project has the potential to impact a small area (approximately 0.5 ha) of potential Booroolong Frog habitat, where water extraction infrastructure is to be installed in the Fish River, for a water supply pipeline from the Fish River to the lower reservoir. Small patches of assumed Booroolong Frog habitat were also identified along the water supply pipeline. The design of this infrastructure is subject to refinement during later stages of Project development.

Generally, Project design features which reduce the likelihood of potential impacts occurring include:

- The intention is to operate the lower reservoir in a manner that runoff from Frying Pan Creek's upstream catchment and the small catchments surrounding the impoundment will not be stored in the reservoir, rather the flows will be discharged back into Frying Pan Creek downstream of the embankment dam. This operation is referred to as a transparent dam.
- The temporary nature of the water take from Fish River for the initial fill, and the fact that extraction will occur when the minimum environmental flow requirements are met and sufficient volumes for

Booroolong Frog *Litoria booroolongensis* – Endangered

downstream water users remain.

- Physical controls (e.g. installing pumps raised off the creek bed) associated with water extraction to avoid sediment disturbance.
- Installing screens on pumps to avoid entrapment of fish and other aquatic biota;
- Water trading – the Project will purchase existing water allocations for the annual top-up of the reservoirs during operation and therefore, there will be no net change in the flow volumes from the river.
- The cycling of water between the upper and lower reservoirs, ensures mixing of the water column, and as such no stratification of the water column and associated water quality impacts are expected to occur.

In respect of impacts to the Booroolong Frog from the introduction of other species such as trout, the Project has no mechanism to increase the population of trout within the Fish River, and also into Frying Pan Creek. However, BioNet records of the Booroolong Frog suggest that trout and carp are already present in the Fish River, following the introduction of this species to the waterway in the early 1900s (Bathgate, 2013). Baumgartner et. al (2008) indicate that both Brown and Rainbow Trout populations in the Fish River are self-sustaining, with natural recruitment occurring most years. Nevertheless, there are 21 trout stocking locations within the Fish River Catchment. Of the nine release locations along Fish River downstream of Oberon Dam DPI freshwater fish stocking records for 2019-2020 reveal some 16,000 and 18,00 Brown and Rainbow Trout were released respectively (from DPI's NSW Fish Stoking Map).

On the basis of the current Project design, it is considered unlikely that the Project would lead to a long-term decrease in the size of the Booroolong Frog population in Fish River.

ii. Reduce the area of occupancy of the species

Targeted surveys for the Booroolong Frog within the Project area in areas of suitable habitat, including aquatic assessments in 2020, 2021 and 2022, did not detect the presence of the species. Therefore the species is not considered to occur on site. Historical BioNet records indicate that the Booroolong Frog may be present approximately 20 km downstream of the Project's proposed extraction point.

Hydrological modelling is currently being finalised for the assessment of potential downstream impacts from the Project's proposed water extraction, however, the preliminary results indicate that significant changes to the downstream environment are unlikely. This is on the basis of the proposed extraction regime that maintains sufficient volumes for downstream water users and considers minimum environmental flows. This extraction regime was developed with an emphasis on understanding and mitigating impacts during periods of low flow (noting that the Booroolong Frog is particularly vulnerable during periods of severe drought). On this basis, it is considered unlikely that the proposed water take will impact on a potential population 20km downstream from the Project.

Per the current Project design, the Project has the potential to impact a small area (approximately 0.5 ha) of potential Booroolong Frog habitat, where water extraction infrastructure is to be installed in the Fish River, for a water supply pipeline from the Fish River to the lower reservoir. Small patches of assumed Booroolong Frog habitat were also identified along the water supply pipeline. The design of this infrastructure is subject to refinement during later stages of Project development.

Whilst the Project has been designed to minimise impacts to potential habitat where practicable, impacts cannot be fully avoided. **As such, the Project may reduce a small area of potential occupancy of this**

Booroolong Frog *Litoria booroolongensis* – Endangered

species, if they are present within the Project area.

iii. Fragment an existing population into two or more populations

Frying Pan Creek is a headwater tributary that starts just north of the Great Western Highway and flows southward to the Fish River. Approximately 1300 m of the creek and adjacent disturbed riparian habitat would be inundated by the Project (due to the construction of the lower reservoir).

Targeted surveys for the Booroolong Frog were conducted along the section of the creek to be inundated, with no individuals of this species recorded during surveys in 2020, 2021 and 2022. However, there are BioNet records for this species on the lower area of Fish River (located at latitude -33.490128044 and longitude 149.670485818) (NSW BioNET, 2022) located on the Fish River, some 20km downstream of the confluence of Frying Pan Creek with Fish River. The most recent record of this species on Fish River was 3 November 2009, when four individuals were identified at this location.

It is considered unlikely that the Booroolong Frog would occur in the section of Frying Pan Creek upstream of the Project area. As such, it is considered unlikely that the Project would fragment an existing population of Booroolong Frog.

iv. Adversely affect habitat critical to the survival of a species

The *National Recovery Plan for the Booroolong Frog* identifies habitat critical to the survival of the Booroolong Frog as rocky sections of permanent streams occupied by the species. Any project that reduces stream permanency (e.g. pumping water) or results in loss of rock crevices (e.g. smothering by weeds or sedimentation), is likely to threaten the persistence of local populations of this species.

Hydrological modelling is currently being finalised for the assessment of potential downstream impacts from the Project's proposed water extraction, however, the preliminary results indicate that significant changes (such as affecting stream permanency) to the downstream environment are unlikely. This is on the basis of the proposed extraction regime that maintains sufficient volumes for downstream water users and considers minimum environmental flows. This extraction regime was developed with an emphasis on understanding and mitigating impacts during periods of low flow (noting that the Booroolong Frog is particularly vulnerable during periods of severe drought).

It is also considered unlikely that the Project would result in the loss of rock crevices, for example by smothering with weeds or sediment.

The Proponent has considered potential impacts from the Project relating to altered flow, decreased water quality and habitat degradation, and incorporated these into the design of the Project. On this basis, appropriate constraints and controls have been considered during the construction phase, and the design of the Project has been altered to avoid, minimise and/or prevent potential impacts to the Booroolong Frog. Refer to Section (i) for design controls.

Further, the Proponent is in discussion with a downstream landowner to remediate some 2.5km of degraded Frying Pan Creek, as part of a commercial land access agreement.

As a result of the above, it is considered unlikely that the Project would have a significant effect on the habitat critical downstream of the Project which is critical to the survival of the Booroolong Frog.

Booroolong Frog *Litoria booroolongensis* – Endangered

v. Disrupt the breeding cycle of a population

The Booroolong Frog is particularly sensitive to stream drying due to its rapid life cycle (one year for males and two for females in low altitude populations) as it renders populations intolerant of failed recruitment to metamorphosis over two or more consecutive years.

Hydrological modelling is currently being finalised for the assessment of potential downstream impacts from the Project's proposed water extraction, however, the preliminary results indicate that significant changes (such as affecting stream permanency) to the downstream environment are unlikely. This is on the basis of the proposed extraction regime that maintains sufficient volumes for downstream water users and considers minimum environmental flows. This extraction regime was developed with an emphasis on understanding and mitigating impacts during periods of low flow (noting that the Booroolong Frog is particularly vulnerable during periods of severe drought). It is also noted that water take for the initial fill is temporary, and will not occur on a permanent, annual basis.

It is considered unlikely that the Project would disrupt the breeding cycle of the population as a result of in-stream drying, as flows for downstream water users and minimum environmental flows will be maintained to meet regulatory requirements. The Project comprises a transparent dam, which means that Frying Pan Creek flows will not be impounded by the embankment dam. The water will flow into the reservoir, continue through the reservoir, and be released downstream through an outlet pipe.

As such, the Project is unlikely to disrupt the breeding cycle of the Lower Fish River population of the Booroolong Frog that may occur downstream of the Project area.

vi. Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The Project will result in the inundation and loss of approximately 1300 m of aquatic and riparian habitat associated with Frying Pan Creek due to the construction of a proposed onstream reservoir with a 30 m high embankment wall.

Targeted surveys in areas of suitable habitat for the Booroolong Frog in 2020, 2021 and 2022, including aquatic assessments, did not detect the presence of the species. It is therefore considered the species does not occur within the Project area. Historical BioNet records from 2009 identify that a potential Booroolong Frog population may be present approximately 20 km downstream of the Project extraction point.

Hydrological modelling is currently being finalised for the assessment of potential downstream impacts from the Project's proposed water extraction, however, the preliminary results indicate that significant changes to the downstream environment are unlikely. This is on the basis of the proposed extraction regime that maintains sufficient volumes for downstream water users and considers minimum environmental flows. This extraction regime was developed with an emphasis on understanding and mitigating impacts during periods of low flow (noting that the Booroolong Frog is particularly vulnerable during periods of severe drought). On this basis, it is considered unlikely that the proposed water take will impact (e.g. lead to a decline of the species) on a potential population 20km downstream from the Project. Further, the Proponent is working with a downstream landowner to remediate some 2.5km of degraded Frying Pan Creek, as part of a commercial land access agreement.

Per the current Project design, the Project has the potential to impact a small area (approximately 0.5 ha) of potential Booroolong Frog habitat, where water extraction infrastructure is to be installed in the Fish River, for a water supply pipeline from the Fish River to the lower reservoir. Small patches of assumed

Booroolong Frog *Litoria booroolongensis* – Endangered

Booroolong Frog habitat were also identified along the water supply pipeline. The design of this infrastructure is subject to refinement during later stages of Project development. However, based on the current understanding of potential impacts associated with the Project design, it is not considered likely that these potential impacts would lead to the decline of a potential local population.

As such, the Project is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that Booroolong Frog is likely to decline.

vii. Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The *National Recovery Plan for the Booroolong Frog* recognises a number of threats to the Booroolong Frog. These include predation by introduced fish such as Brown and Rainbow Trout, Mosquito Fish, Redfin Perch and European Carp which all have the potential to prey on the tadpoles of the Booroolong Frog (Hunter, 2007) (Hunter, et al., 2011), and may be impacting on this species at the population level.

Additionally the *National Recovery Plan for the Booroolong Frog* also recognises invasive weeds, habitat damage by domestic stock and predation by feral cats.

The colonisation of the riparian zone by environmental weeds such as Willows and Blackberries also significantly reduces the extent of suitable habitat for the Booroolong Frog (Hunter, 2007). Willows are particularly effective at disrupting the life-cycle of the Booroolong Frog as their surface roots fill all rock crevices required by this species for oviposition.

In respect of impacts to the Booroolong Frog from the introduction of other species such as trout, the Project has no mechanism to increase the population of trout within the Fish River, and also into Frying Pan Creek. However, BioNet records of the Booroolong Frog suggest that trout and carp are already present in the Fish River, following the introduction of this species to the waterway in the early 1900s (Bathgate, 2013). Baumgartner et. al (2008) indicate that both Brown and Rainbow Trout populations in the Fish River are self-sustaining, with natural recruitment occurring most years. Nevertheless, there are 21 trout stocking locations within the Fish River Catchment. Of the nine release locations along Fish River downstream of Oberon Dam DPI freshwater fish stocking records for 2019-2020 reveal some 16,000 and 18,00 Brown and Rainbow Trout were released respectively (from DPI's NSW Fish Stoking Map).

The Project has the potential to transfer invasive species such as the Mosquito Fish (*Gambusia holbrooki*), trout and environmental weeds into Frying Pan Creek via pumped flows from the Fish River into the reservoir.

However, as the species was not recorded in Frying Pan Creek during surveys, it is unlikely that there will be an impact to Booroolong Frog from invasive species in Fish River as a result of the Project. Further, management measures will be implemented by the Proponent regarding the use of pumping methods, screens etc, to minimise risks of invasive species being transferred between the Fish River and Frying Pan Creek.

In consideration of the above, **it is therefore considered unlikely that the Project would result in the establishment of invasive species that are harmful to the Booroolong Frog which are not otherwise already present within the Project area.**

Booroolong Frog *Litoria booroolongensis* – Endangered

viii. Introduce disease that may cause the species to decline

Chytridiomycosis is an infectious disease that affects amphibians worldwide, recognised by the *National Recovery Plan for the Booroolong Frog* as a threat to the species. The diseases caused by Amphibian Chytrid Fungus (*Batrachochytrium dendrobatidis*) and, is considered to be the primary cause of many species of amphibian declines along the eastern ranges of Australia over the past 30 years (Skerratt, et al., 2007).

There is potential for the Project to introduce, or increase the risk of, infection of frogs with Amphibian Chytrid Fungus which may lead to degraded health and loss of individuals within the local area. Chytridiomycosis is easily spread by human activity – mud and soil on boots, clothes, vehicles and equipment are possible vectors of fungus.

These threats will be mitigated through hygiene protocols applied throughout the Project and ongoing management. No other diseases are considered to be likely to be introduced as a result of the Project. **As such, the introduction of disease that may cause the decline of this species is considered unlikely.**

ix. Interfere with the recovery of the species

The factors identified as contributing to the historic and continued decline of the Booroolong Frog include disease (Chytridiomycosis) caused by infection with the Amphibian Chytrid Fungus (*Batrachochytrium dendrobatidis*), habitat degradation, altered stream flows, stream drying and the introduction of exotic predatory fish.

Hydrological modelling is currently being finalised for the assessment of potential downstream impacts from the Project's proposed water extraction, however, the preliminary results indicate that significant changes to the downstream environment are unlikely. This is on the basis of the proposed extraction regime that maintains sufficient volumes for downstream water users and considers minimum environmental flows. This extraction regime was developed with an emphasis on understanding and mitigating impacts during periods of low flow (noting that the Booroolong Frog is particularly vulnerable during periods of severe drought). On this basis, it is considered unlikely that the proposed water take will impact (i.e. lead to habitat degradation, altered stream flows or stream drying) on a potential population 20km downstream from the Project. Further, the Proponent is working with a downstream landowner to remediate some 2.5km of degraded Frying Pan Creek, as part of a commercial land access agreement.

The introduction of exotic predatory fish as a result of the Project is considered unlikely, given that the water supply is flowing from the Fish River to Frying Pan Creek. Screens will installed on the Fish River water supply pipeline to prevent the migration of exotic fish to Frying Pan Creek.

Per the current Project design, the Project has the potential to impact a small area (approximately 0.5 ha) of potential Booroolong Frog habitat, where water extraction infrastructure is to be installed in the Fish River, for a water supply pipeline from the Fish River to the lower reservoir. Small patches of assumed Booroolong Frog habitat were also identified along the water supply pipeline. The design of this infrastructure is subject to refinement during later stages of Project development. However, based on the current understanding of potential impacts associated with the Project design, it is not considered likely that these potential impacts would interfere with the recovery of the species.

The Project will not change water flows in Frying Pan Creek due to the incorporation of an outlet pipe on the dam to allow flows entering the reservoir to pass through downstream (i.e. transparent dam).

On the basis of the above, it is considered unlikely that potential impacts from the Project will

Booroolong Frog *Litoria booroolongensis* – Endangered

interfere with the recovery of the species.

x. Conclusion

Targeted surveys for the Booroolong Frog within the Project area in areas of suitable habitat, including aquatic assessments in 2020, 2021 and 2022, did not detect the presence of the species.

It is considered that habitat for the Booroolong Frog has the potential to occur within Fish River (a tributary of the Macquarie River which also has known records of the Booroolong Frog) and the surrounding riparian habitat (NSW BioNET, 2022). Four individuals have been recorded at a single location on the lower Fish River in 2009 (located at latitude -33.490128044, longitude 149.670485818). This location is 20 km downstream from the Project area, near the confluence of the Campbells River.

Hydrological modelling is currently being finalised for the assessment of potential downstream impacts from the Project's proposed water extraction, however, the preliminary results indicate that significant changes to the downstream environment are unlikely. This is on the basis of the proposed extraction regime that maintains sufficient volumes for downstream water users and considers minimum environmental flows. This extraction regime was developed with an emphasis on understanding and mitigating impacts during periods of low flow (noting that the Booroolong Frog is particularly vulnerable during periods of severe drought).

Per the current Project design, the Project has the potential to impact a small area (approximately 0.5 ha) of potential Booroolong Frog habitat, where water extraction infrastructure is to be installed in the Fish River for a water supply pipeline from the Fish River to the lower reservoir. Small patches of assumed Booroolong Frog habitat were also identified along the water supply pipeline. The design of this infrastructure is subject to refinement during later stages of Project development.

On the basis of the current Project design and potential impacts arising from that design, and the completion of the hydrological modelling, **it is considered unlikely that a significant impact to the Booroolong Frog from the Project may occur.**

3.8. Bathurst Copper Butterfly

Bathurst Copper Butterfly *(Paralucia spinifera)* - Vulnerable
A Project is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
i. Lead to a long-term decrease in the size of an important population of a species

The Bathurst Copper Butterfly (*Paralucia spinifera*) prior to 2000 was thought to be endemic to the NSW Central Tablelands of NSW, between Bathurst and Hartley, recorded in approximately 38 locations (Braby, 2000); NSW Department of Planning Industry and Environment, 2020). An apparent disjunct population has been since discovered near Mount David in the early 2000s, and a further population was most recently recorded in Namadgi National Park (ACT) in August 2021.

The Bathurst Copper Butterfly feeds exclusively on a native subspecies of Blackthorn, *Bursaria spinosa subsp. lasiophylla* (Braby, 2000), with population densities correlated with the spatial distribution of *Bursaria* (NSW National Parks and Wildlife Service, 2001).The Bathurst Copper Butterfly also has a mutualistic relationship with the ant *Anonychomyrma itinerans* whereby, the Bathurst Copper Butterfly's geographic distribution is restricted to locations where both *A. itinerans* and its feed species (*Bursaria*) are both present (generally altitudes above 850 m ASL).

The Bathurst Copper Butterfly larvae do not appear to cross open ground (Threatened Species Scientific Committee, 2016), and adults are rarely found more than 10-15 m from habitat patches (Mjadwesch & Nally, 2008; New South Wales National Parks and Wildlife Service, 1999).

The Bathurst Copper Butterfly and suitable habitat (i.e. patches containing *Bursaria)* have been recorded at various locations within the Project area. The *Bursaria* patches (14 in total) range from 2 to >10 individual *Bursaria* plants. The total habitat for the species in the Project Area (which includes a 40m buffer around the *Bursaria* stands) is 13.5 ha. Nine patches of *Bursaria* (total area 9.5 ha) occur in the Project area, but are outside of the Development Footprint. Seven *Bursaria* patches (including a 40m buffer) within the Development Footprint represents 4 ha.

Adult butterflies were observed to occur on several of the *Bursaria* patches (but not all). However, as a precautionary principle, it has been assumed that every *Bursaria* plant would at some time host the larvae of the species and/or be a feed plant for an adult.

The presence of the species is complimented by several records in adjacent areas, including around the township of Yetholme and Eusdale Nature Reserve (NSW Bionet).

Given the butterfly's highly specific habitat requirements, the relatively limited stands of suitable habitat within the Project Area and limited dispersibility, **it is likely that the removal of these habitat patches will lead to a temporary decrease in the size of the local population within the Project Area.**

The Project has been specifically developed (i.e. modified) such that both permanent and temporary construction infrastructure layouts avoid patches of *Bursaria* where practicable.

The Proponent will undertake rehabilitation works following construction activities and is actively seeking opportunities to establish biodiversity stewardship areas and undertake rehabilitation works, not just for offsets but to increase and improve available habitats. Nurseries that collect and propagate *Bursaria spinosa subsp. lasiophylla* have been identified to ensure that this species can be included in rehabilitated

Bathurst Copper Butterfly *(Paralucia spinifera)* - Vulnerable

areas, both in the seedmix and also tube stock plantings. This rehabilitation work aims to improve habitat for the Bathurst Copper Butterfly within the local area. To assist with meeting these aims, a Bathurst Copper Butterfly Management Plan will be created for the Project to support the oversight of the rehabilitation trials and a range of other proposed mitigation measures, including:

- translocate *B*. *spinosa subsp. lasiophylla* that will be impacted to nearby areas not to be impacted in an effort to salvage plants and their associated host ants;
- plant and maintain seedlings and young saplings of *B. spinosa subsp. lasiophylla* near to *Bursaria* patches / individuals that will be disturbed by the Project, at least four to six months prior to disturbance in an effort to encourage replacement habitat patches;
- the use of attractants adjacent to planted *Bursaria* to facilitate establishment of *A. itinerans*; and
- monitoring the effectiveness of the mitigation measures over at least three breeding seasons.

ii. Reduce the area of occupancy of an important population

As above, as the Bathurst Copper Butterfly habitat is restricted to patches which contain *Bursaria.* The Bathurst Copper Butterfly is also endemic to the NSW Central Tablelands, with two known disjunct populations occurring in geographically isolated areas. Accordingly, clearing of any patches containing *Bursaria* would temporarily reduce the area of occupancy of a population, likely to be an important population, of the Bathurst Copper Butterfly.

iii. Fragment an existing population into two or more populations

The species is entirely reliant on the presence of *Bursaria* and the Bathurst Copper Butterfly larvae do not appear to cross open ground (Threatened Species Scientific Committee, 2016). Additionally, adults are rarely found more than 10-15 m from habitat patches (Mjadwesch & Nally, 2008; New South Wales National Parks and Wildlife Service, 1999).

Generally speaking, species least susceptible to habitat fragmentation are those that can persist within the remaining habitat (Lindenmayer & Burgman, 2005), which is not the case with the Bathurst Copper Butterfly due to the reliance on *Bursaria,* their small size and weak erratic flight.

Although the Bathurst Copper Butterfly in the Project Area forms part of a metapopulation in the region, with highly localised subpopulations at each patch of *Bursaria* which are subject to natural fluctuations of extinction and colonisation, **the clearing of identified habitat may temporarily isolate localised butterfly populations reliant on the *Bursaria* patches, causing recolonisation to become increasingly more difficult for the species.**

It is noted that the Project area has been specifically designed to utilise areas disturbed by historic land uses where practicable to minimise the likelihood of fragmentation. Further, a range of mitigation measures aimed at increasing habitat availability for this species is proposed through the activities described in Section 3.8. *i.* for the Bathurst Copper Butterfly Management Plan.

Notwithstanding, the potential for fragmentation of species habitat remains due to the inability for adults to disperse more than 10-15 m from habitat patches and the inability for larvae to cross cleared/open land.

It is likely that the Project has the potential to temporarily fragment the population of the Bathurst

Bathurst Copper Butterfly *(Paralucia spinifera)* - Vulnerable
Copper Butterfly within the Project area.
iv. Adversely affect habitat critical to the survival of a species
Consistent with the adopted Bathurst Copper Butterfly (*Paralucia spinifera)* Recovery Plan (NSW National Parks and Wildlife Service, 2001) habitat critical to the survival of the Bathurst Copper Butterfly has not been declared. Notwithstanding, as the Bathurst Copper Butterfly is entirely reliant on the presence of *Bursaria* as a food source, there is potential for impacts to occur to habitat for the Bathurst Copper Butterfly. The Project has been specifically developed (i.e. modified) such that infrastructure layouts avoid patches of *Bursaria* where practicable. The Proponent will undertake rehabilitation works following construction activities and is actively seeking opportunities to establish biodiversity stewardship areas and undertake rehabilitation works, not just for offsets but to increase and improve available habitats. Nurseries that collect and propagate *Bursaria spinosa subsp. lasiophylla* have been identified to ensure that this species can be included in rehabilitated areas, both in the seed mix and also tube stock plantings. This rehabilitation work aims to improve habitat for the Bathurst Copper Butterfly within the local area. To assist with meeting these aims, a Bathurst Copper Butterfly Management Plan will be created for the Project to support the oversight of the rehabilitation trials and a range of other proposed mitigation measures as described in Section 3.8. *i*..
v. Disrupt the breeding cycle of an important population
One *P. spinifera* generation is completed annually (Threatened Species Scientific Committee, 2016). Adults enclose from late winter to summer (Mjadwesch & Nally, 2008). Adult males fly about 1 m from the ground to establish territories around *Bursaria* patches. After mating, females oviposit onto the underside of leaves at the base of *Bursaria* bushes, or onto adjacent surrounding low vegetation and debris. Host plants are always associated with *A. itinerans*. Eggs take 14-17 days to hatch, during which time the ants patrol the *Bursaria*, presumably inspecting eggs and looking for new larvae (Dunn, et al., 1994). First instar larvae feed on the underside of the *Bursaria* leave. By the third instar, the larvae develop eversible organs that secrete sugar and protein-rich nectar, harvested by the ants (Braby, 2000) (Mjadwesch & Nally, 2008). Later instar larvae have never been observed on *Bursaria* without attendant ants (Mjadwesch & Nally, 2008). Full larval disturbance takes between 48-70 days (Braby, 2000). Larvae spend approximately 9 months as pupae, within the upper chambers of the ants' nests. Newly enclosed adults then emerge from the nests, where they dry in the sun, attended by ants (Mjadwesch & Nally, 2008). The species is entirely reliant on *Bursaria* as a food source and habitat to enable the completion of its life cycle. It appears also to be reliant on *A. itinerans* during larval development. The Project will remove up to approximately 4 ha of Bathurst Copper Butterfly Habitat (i.e. patches containing *Bursaria* and a 40m buffer around these patches). Based on the above, and primarily due to the species low capacity for long-range dispersal across landscapes, the **Project has the potential to disrupt the breeding cycle of populations within individual patches of *Bursaria* of Bathurst Copper Butterfly.**

Bathurst Copper Butterfly *(Paralucia spinifera)* - Vulnerable
vi. Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The Project will remove up to approximately 4 ha of Bathurst Copper Butterfly habitat. **As described above, the clearing of this habitat (containing *Bursaria*) is likely to lead to localised decline of the Bathurst Copper Butterfly.** As the population is endemic to the NSW Central Tablelands (with exception of two additionally geographically isolated disjunct populations), it is considered that the clearing of upto 4 ha of *Bursaria* patches is likely to result in a decrease in the availability of habitat to an extent which may result in a localised decline of the population of the species within the project area. It is noted that the Project has applied avoidance and minimisation approaches to reducing disturbance to the overall number of *Bursaria* patches impacted. The Proponent will undertake rehabilitation works following construction activities and is actively seeking opportunities to establish biodiversity stewardship areas and undertake rehabilitation works, not just for offsets but to increase and improve available habitats. To assist with meeting these aims, a Bathurst Copper Butterfly Management Plan will be developed, as detailed in Section 3.8. *i*.
vii. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
Consistent with the adopted recovery advice, weed invasion into *Bursaria* patches, particularly by blackberry (*Rubus fruticosus* aggregate) and scotch broom (*Cytisus scoparius*), is a known threatening process to the Bathurst Copper Butterfly. Invasive weed species invade and outcompete the emergence of *Bursaria* critical to the survival of the Bathurst Copper Butterfly. Large stands of scotch broom have been observed within the Project area and the broader region. The Project may further facilitate the establishment of scotch broom through increased disturbance and enable the movement of the species into new areas if appropriate mitigation measures are not implemented. A weed management plan will be incorporated into the CEMP and OEMP outlining measures to limit and prevent the further establishment and / or spread of weeds within the Project area. The weed management plan should include, but not be limited to the following: • Specifications for all imported soil, plants or materials entering the site to be certified free of weeds and pathogens • Vehicle, machinery and personnel wash/brush down procedures • All vehicles and equipment to be inspected, and if required, cleaned prior to mobilization to site or new area • Minimisation of soil disturbance where possible • Weed monitoring and management will occur for a minimum of two years in rehabilitated areas. • Weed monitoring and control as part of the operations and included in the OEMP. **The Project is therefore unlikely to result in the establishment of a weed species which are not otherwise already present with the Project area**. Through the implementation of appropriate management measures, this potential is reduced even further.

Bathurst Copper Butterfly *(Paralucia spinifera)* - Vulnerable

viii. Introduce disease that may cause the species to decline

There are no diseases currently known to affect the Bathurst Copper Butterfly.

ix. Interfere substantially with the recovery of the species

The overall recovery objective of the *adopted Bathurst Copper Butterfly Recovery Plan* is to stabilise the population through prevention of threatening processes and to increase the in-situ population and ultimately down list the species to vulnerable.

The Bathurst Copper Butterfly recovery plan is underpinned by performance criteria which are assessed by the number of sub-populations and individuals present, along with whether populations fluctuate and or decline over five years in accordance with knowledge of the species ecology.

As recognised by the adopted recovery plan, the two most serious threatening processes facing the Bathurst Copper Butterfly are habitat destruction and weed invasion (Threatened Species Scientific Committee, 2016).

Where practicable, the Project has been specifically designed to avoid disturbance to several patches of Bathurst Copper Butterfly habitat, and otherwise has been designed (where practicable) to utilise areas of the landscape which have been historically cleared, or fragmented (e.g. agriculture). Whilst considering the above avoidance measures, the Project will remove up to approximately 4 ha.

In addition, clearing as a result of the Project adjacent to undisturbed patches of Bathurst Copper Butterfly habitat may increase the potential for weed incursion into new areas. The Proponent will implement measures to minimise and avoid weed invasion.

Overall, due to the clearing of habitat for the Bathurst Copper Butterfly, **it is possible that the Project will interfere with the recovery of the species as the number of individual populations at *Bursaria* patches present within the local metapopulation will temporarily decline outside of the fluctuations observed naturally in Bathurst Copper Butterfly populations.**

x. Conclusion

In consideration of the Bathurst Copper Butterfly's specific habitat requirements, low dispersibility and endemic relationship with the NSW Central Tablelands, the removal of suitable habitat as a result of the Project would likely result in a temporary decline of the local metapopulation which has the potential to interfere with the recovery of the species.

Therefore, the Project may result in a significant impact.

Where practicable, the Project has been specifically designed to avoid disturbance to several patches of Bathurst Copper Butterfly habitat, and otherwise has been designed (where practicable) to utilise areas of the landscape which have been historically cleared, or fragmented (e.g. agriculture). Whilst considering the above avoidance measures, the Project will remove up to approximately 4 ha.

In addition, clearing as a result of the Project adjacent to undisturbed patches of Bathurst Copper Butterfly habitat may increase the potential for weed incursion into new areas. The Proponent will implement measures to minimise and avoid weed invasion.

Bathurst Copper Butterfly *(Paralucia spinifera)* - Vulnerable

The Proponent will undertake rehabilitation works following construction activities and is actively seeking opportunities to establish biodiversity stewardship areas and undertake rehabilitation works, not just for offsets but to increase and improve available habitats. Nurseries that collect and propagate *Bursaria spinosa subsp. lasiophylla* have been identified to such that this species can be included in rehabilitated areas, both in the seedmix and also tube stock plantings. This rehabilitation work aims to improve habitat for the Bathurst Copper Butterfly within the local area.

To assist with meeting these aims, a Bathurst Copper Butterfly Management Plan will be created for the Project to support the oversight of the rehabilitation trials and a range of other proposed mitigation measures, including:

- translocate *B*. *spinosa subsp. lasiophylla* that will be impacted to nearby areas not to be impacted in an effort to salvage plants and their associated host ants;
- plant and maintain seedlings and young saplings of *B. spinosa subsp. lasiophylla* near to *Bursaria* patches / individuals that will be disturbed by the Project, at least four to six months prior to disturbance in an effort to encourage replacement habitat patches;
- the use of attractants adjacent to planted Bursaria to facilitate establishment of A. itinerans; and
- monitoring the effectiveness of the mitigation measures over at least three breeding seasons.

3.9. Gang-gang Cockatoo

Gang-gang Cockatoo *(Callocephalon fimbriatum)* – Endangered

A Project is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

i. Lead to a long-term decrease in the size of a population

The Gang-gang Cockatoo is a small parrot native to Australia. The Gang-gang Cockatoo is identifiable via a small but stocky build, wispy crest, broad wings and a short tail. Adult males have a distinctive scarlet red head and crest, whilst adult females have dark head and crest with pink and yellow under feathers (Department of Agriculture, Water and the Environment, 2022).

The Gang-gang Cockatoo is endemic to south-eastern Australia, with isolated known records at extremities of its species range recorded from as far north as Coffs Harbour, and as far west as Mudgee (Higgins, 1999). Whilst the species is dispersed throughout south-eastern Australia, the last known breeding sub-population is located in the Hornsby and Ku-ring-gai Local Government Areas, recognised as an endangered population.

Gang-gang Cockatoos are monogamous, breeding mainly between October and January (Higgins, 1999). The species generally favours old growth forest and woodland assemblages for breeding activities, where hollows can be found in tree trunks and limbs, or within the dead sprout of large, living eucalypts (Higgins, 1999) (Gibbons, 1999); (Gibbons & Lindenmayer, 2000). Gang-gang Cockatoo breeding sites are often located near water, where larger hollow-bearing trees are more prevalent. Importantly, breeding pairs utilise multiple nest sites over different years, with only about half of the known nesting sites utilised in any given breeding season. Gang-gang Cockatoo nests tend to be situated within a few hundred metres of each other.

Gang-gang Cockatoos were recorded in the Project area during general and targeted surveys. It is noted that during field surveys, no breeding nests or breeding related activities were observed.

Whilst the Project proposes to clear approximately 147 ha of potential Gang-gang Cockatoo breeding and or foraging habitat, the surrounding landscape contains equivalent or better habitat capable of supporting the species. Specifically, the surrounding habitat such as relatively large, uncleared tracts of native vegetation (e.g. present within Eusdale Nature Reserve, Wambool Nature Reserve and Winburndale Nature Forest as well as surrounding State Forest), likely to provide substantial foraging and nesting resources for the species.

It is unlikely that the Project is likely to result in a long-term decrease in the size of the population of Gang-gang Cockatoo as the species is not endemic to the Project area (or its surrounds) and the Project area does not contain an important population. The Project is also not expected to impact on genetic diversity, breeding opportunities or dispersal functions of the species.

ii. Reduce the area of occupancy of the species

The Gang-gang Cockatoo is an altitudinal migrant.

In warmer months the species primarily inhabits mature, wet sclerophyll forests, typically dominated by eucalypts (Frith, 1969); (NSW Scientific Committee, 2008). Eucalypt dominated assemblages with dense,

Gang-gang Cockatoo *(Callocephalon fimbriatum)* – Endangered

shrubby acacia, wattle and banksia understory support the highest density of birds (Higgins, 1999).

In cooler months, the species tends to inhabit woodland assemblages at lower, drier altitudes. Most Gang-gang Cockatoos during this time occur in open eucalypt assemblages (Shields & Chrome, 1992); (Higgins, 1999). During winter months, the species is also known to inhabit suburban areas.

The Project area is located in the western-plains region of NSW which resides in the South-eastern Highlands IBRA region. Accordingly, the Project is located in an area which the Gang-gang Cockatoo inhabits during warmer months, and evidence of suitable habitat (including hollow-bearing trees) are present.

There is the potential for the Project to impact the area of occupancy of the species due to clearing activities which reduce the area of potential breeding habitat. It is noted that during field surveys, no breeding nests or breeding related activities were observed. The Project proposes to clear approximately 147 ha of potential Gang-gang Cockatoo breeding and foraging habitat. Relative to the area of the occupancy for the species, this area of clearance is likely to be negligible and ultimately would not likely reduce the area of occupancy for the species as habitat of equal or better quality is present within the surrounding region and more probably used for breeding activities.

Further, the Project has applied avoidance and minimisation approaches to reducing vegetation disturbance. The Proponent will undertake rehabilitation works following construction activities and is actively seeking opportunities to establish biodiversity stewardship areas and undertake rehabilitation works, not just for offsets but to increase and improve available habitats.

iii. Fragment an existing population into two or more populations

The Gang-gang Cockatoo inhabits eucalypt open forests and woodlands with an acacia understorey. In summer it lives in moist highland forest types, and in winter it moves to more open types at lower elevations. The species is highly mobile and can disperse or migrate tens of kilometres, so population fragmentation is unlikely except where populations are isolated by extensive suburbia.

The Project is therefore unlikely to have the potential to fragment an existing population into two or more populations.

iv. Adversely affect habitat critical to the survival of a species

Habitat critical to the survival of the Gang-gang Cockatoo is identified as all foraging habitat during both the breeding and non-breeding season (generally October to January), not including ornamental and or exotic trees/shrubs and hedges. The species relies on stands of suitable hollow-bearing trees, and habitat critical to the survival of the species includes hollow-bearing trees with known or potential hollow chambers (Davey & Mulvaney, 2020).

The Project has the potential to impact habitat critical for the survival of the species, as the Project area is located in higher altitudes (used for breeding), has present hollow-bearing trees, and is in proximity to water. Therefore, the Project contains habitat, that the species could utilise for breeding. The habitat present meets the definition of habitat critical to the survival of the species.

Gang-gang Cockatoo *(Callocephalon fimbriatum)* – Endangered
v. Disrupt the breeding cycle of a population
The Gang-gang Cockatoo breeding pairs commonly return to breeding habitat annually and sometimes gather in larger family groups. The breeding season for the Gang-gang Cockatoo usually occurs during warmer months, typically October to January (with some breeding events occurring as early as August, and as late as March (Higgins, 1999)). **The Project is considered unlikely to disrupt the breeding cycle of a population of Gang-gang Cockatoos** as the proposed clearing of 147 ha of potential breeding and or foraging habitat is negligible in nature when considering the availability of suitable habitat of equivalent or higher quality in the surrounding landscape. It is noted that during field surveys, no breeding sites were identified.
vi. Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
Gang-gang Cockatoos commonly utilise Eucalypt dominated assemblages with dense, shrubby acacia, wattle and banksia understory support. The Gang-gang Cockatoo habitat is associated with all nine PCTs identified within the Project area and therefore have the potential to form breeding and or foraging habitat for the species. The Project proposes to clear approximately 147 ha of potential breeding and or foraging habitat. Whilst the Project will result in a reduction in available habitat for the Gang-gang Cockatoo, it is unlikely that the extent of this clearing would result in impacts to the availability or overall quality of habitat for the species. Notwithstanding, given the availability of suitable habitat of equal or better quality in the surrounding landscape, and the mobility of the species, **it is unlikely that the proposed clearing would result in a significant impact to the species to the extent the species is likely to decline.** Further, the Project has applied avoidance and minimisation approaches to reducing vegetation disturbance. The Proponent will undertake rehabilitation works following construction activities and is actively seeking opportunities to establish biodiversity stewardship areas and undertake rehabilitation works, not just for offsets but to increase and improve available habitats.
vii. Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
Several invasive flora and fauna species (including the Common Brushtail Possum *Trichosurus vulpecula)* have been recorded within the Project area. Predation on Gang-gang Cockatoo eggs and young by Common Brushtail Possums could lead to the decline in a population. Rates of predation are likely elevated when habitat becomes fragmented, Weed and pest management measures will be developed which will outline mitigation and monitoring measures to reduce the likelihood of spreading and increasing the number of invasive flora and fauna. **As such, it is considered unlikely that the Project will result in invasive species that are harmful to the Gang-gang Cockatoo becoming established in its habitat**.

Gang-gang Cockatoo *(Callocephalon fimbriatum)* – Endangered

viii. Introduce disease that may cause the species to decline

Psittacine beak and feather disease (PBFD) – Also known as psittacine circovirus (PCV) or Psittacine Circoviral Disease (PCD) is listed as a key threatening process under the EPBC Act in 2001.

Gang-gang Cockatoos are known to be susceptible to PBFD (Sarker, et al., 2018) which is the most common and infections viral disease among parrots. Distribution of the disease is Australia wide (Department of Agriculture, Water and the Environment, 2022). PBFD has the potential to result in very high death rates in nestlings, cause long-term immunological suppression, as well as cause feather and beak abnormalities.

PBFD is spread through sharing of food sources (with infected parrots), fresh or dried excrement and feather and skin particles (Department of Agriculture, Water and the Environment, 2022). PBFD is extremely stable in the environment and can survive in nest hollows for extended durations of time (up to years) (Department of Agriculture, Water and the Environment, 2022).

A threat abatement plan was developed in 2005 as a feasible, effective and efficient way to assess the impact of the disease on native parrots, however ceased on 1 October 2015 (Department of Agriculture, Water and the Environment, 2022). A non-statutory threat abatement advice was developed following cessation of the threat abatement plan named *Threat Abatement Advice for the key threatening process 'Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and is relevant to the Project* (the PBFD Threat Abatement Advice) (Department of the Environment and Energy, 2016).

It is unlikely that the Project would introduce a disease that may cause the species to decline as the PBFD is spread through parrot-to-parrot interactions. Additionally, PBFD is known to be distributed across Australia and is not endemic to a particular region.

ix. Interfere with the recovery of the species

The Species Profile and Threats Database does not provide any information regarding a species recovery plan or threat abatement plan for the Gang-gang Cockatoo.

Approved conservation advice exists for the species which identify the following threats of relevance to the Project:

- Habitat loss and degradation – Land Clearing (clearing of native vegetation which is required for foraging and breeding).
- Fire - Fire management regimes (inappropriate fire management regimes including planned burning that is too frequent or infrequent, too hot, or too excessive.
- Predation and competition – competition for nest hollows (increasing shortages of nest hollows from clearing, fire etc), nest predation (by Common Brushtail Possum).

The Project intends to clear approximately 147 ha of breeding and/or foraging habitat for the Gang-gang Cockatoo. The Project area contains suitable habitat with hollow bearing trees which can potential be used by the species for breeding purposes given the proximity to local water sources as well as the presence of eucalypt assemblages represented by PCTs identified onsite.

The Project proposes to clear 147 ha of potential breeding and or foraging habitat for the Gang-gang Cockatoo which is inconsistent with the abovementioned known threats identified by the

Gang-gang Cockatoo *(Callocephalon fimbriatum)* – Endangered

species conservation advice and may interfere with the recovery of the species.

x. Conclusion

The clearing of approximately 147 ha of potential breeding and or foraging habitat for the Gang-gang Cockatoo is likely to impact habitat critical to the survival of the species (potential breeding habitat) and interfere with the recovery of the species.

As such, the Project has the potential to have a significant impact on the Gang-gang Cockatoo given the abovementioned assessment criteria. The Project has been designed such that vegetation disturbance has been avoided and minimised where practicable. Examples of these design constraints and considerations include changing from an overhead transmission line to an underground cable, relocating the Project main access road off Molybdonite Road to avoid clearing mature hollow bearing trees, repositioning the upper reservoir to avoid threatened ecological communities containing mature trees, and temporary construction areas located to avoid large stands of native vegetation (see also Section 3.5 *ii*.).

Further, the Proponent, with the support of landowners, is seeking to establish biodiversity stewardship sites adjacent to the Project which will contribute toward the protection of potential habitat for this species. These stewardship areas will not only contribute to the preservation of large areas of native vegetation in perpetuity, but will assist in forming a biodiversity corridor between two near-by Nature Reserves

3.10. Koala

Due to the recent EPBC listing update of the Koala, from Vulnerable to Endangered, the species-specific extension to the EPBC Referral Guidelines is outdated and not to be used until a revised guideline has been developed. In the absence of a relevant species-specific referral guideline, the standard EPBC Referral Guideline Assessment of Significance for Endangered species has been utilised to be consistent with the updated EPBC listing status of the Koala.

Koala (combined populations of Qld, NSW and the ACT) *(Phascolarctos cinereus)* – Endangered

A Project is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

i. Lead to a long-term decrease in the size of a population

Koala (combined populations of Qld, NSW and the ACT) (*Phascolarctos cinereus*) is an arboreal (tree-dwelling), medium-sized marsupial. There population is fragmented throughout eastern Australia. No Koalas have been recorded within the Project area however, suitable Koala habitat has been identified through field surveys comprising communities with *Eucalyptus sp*. To date, the following PCTs have recorded relative abundance of *Eucalyptus sp.:*

- PCT 351 – Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest
- PCT 731 – Broad-leaved Peppermint - Red Stringybark grassy open forest
- PCT 732 – Broad leaved Peppermint - Ribbon Gum grassy open forest

The Koala is an herbivore that relies on the presence of various *Eucalyptus* species to support their diet. Within the Project area *Eucalyptus viminalis*, present within PCT 732, is an example of such species relied on by the Koala. Targeted and general field surveys to date have not identified any, or evidence of, any Koalas within the Project area. Further there are no records of Koala in the general area (NSW Bionet), and anecdotal evidence from local landowners support the absence of the species. Nevertheless, the present PCTs suggests the potential to support Koalas.

The Project may impact approximately 147 ha of potential Koala habitat. However, the surrounding habitat such as relatively large, uncleared tracts of native vegetation, Eusdale Nature Reserve, Wambool Nature Reserve and Winburndale Nature Forest and surrounding State Forest, also provide substantial foraging resources.

The Project is not likely to decrease the ability for Koalas to access habitat across the landscape, impact on genetic diversity, reduce breeding opportunities or impede dispersal functions of the Koalas. The Project is not expected to contribute to a long-term decrease in the size of an important population of Koala.

ii. Reduce the area of occupancy of the species

Koalas have a range along the coast of Queensland that extends beyond Cairns and as far west as Hughenden and Charleville. They also inhabit New South Wales, Victoria, and some parts of coastal South Australia. Some of the highest densities of Koala populations are found in habitat fragments in parts of northeast New South Wales (Melzer, et al., 2000). Targeted Koala field surveys together with general field

Koala (combined populations of Qld, NSW and the ACT) *(Phascolarctos cinereus)* – Endangered

surveys have not identified Koalas, or evidence of Koalas within the Project area.

Patterns of Koala occupancy within Eucalypt Forest across Australia are limited by drought, wildfire, disease, predation, and habitat loss. The Project may impact approximately 147 ha of potential Koala habitat. **It is therefore possible that the Project may have the potential to reduce the area of occupancy for Koalas in the local area.**

Further, the Project has applied avoidance and minimisation approaches to reducing vegetation disturbance. The Proponent will undertake rehabilitation works following construction activities and is actively seeking opportunities to establish biodiversity stewardship areas and undertake rehabilitation works, not just for offsets but to increase and improve available habitats.

iii. Fragment an existing population into two or more populations

The potential Koala habitat surveyed within the Project area shows evidence of past clearance, fragmentation and disturbance due to previous land use practices. The Project would not likely further separate (i.e. fragment) any whole patches of potential Koala habitat as the Project is to be located on, or adjacent to, areas which are already fragmented.

It is therefore unlikely that the Project will further fragment an existing Koala population into two or more populations. Furthermore, the Project would implement a series of management and mitigation measures to minimise potential impacts to the species. The Project has also been designed to utilise patches of already cleared/impacted land, to reduce further impact to remnant habitats.

iv. Adversely affect habitat critical to the survival of a species

The EPBC Act referral guidelines for the endangered Koala focus on the impacts of projects to habitat critical to the survival of the Koala present and future. The Project may impact 147 ha of habitat.

The Project would not interfere with areas of good quality foraging habitat outside of the Project site, which is expected to maintain capacity to support any potential Koala populations that would be moving through the area. The Project is not expected to adversely affect habitat that is critical to the survival of this species as targeted Koala surveys indicated that Koalas were absent from the Project site.

v. Disrupt the breeding cycle of a population

Females breed in high quality habitat with dense resource species. The Project area supports Koala food trees and has the possibility to support some breeding behaviour, however, it does not contain the highest quality habitat within the connective landscape. Additionally, targeted Koala surveys did not indicate the presence of individuals within the Project site.

It is unlikely that this is part of a key breeding area for a dispersed population of this species and therefore it is unlikely that the Disturbance Footprint will disrupt the breeding cycle of an important population.

Koala (combined populations of Qld, NSW and the ACT) *(Phascolarctos cinereus)* – Endangered
vi. Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The Project is expected to impact approximately 147 ha of suitable habitat. Large areas of suitable foraging habitat will remain in the broader region and are unlikely to be affected by the Project. Additionally, the Project site will not result in obstruction of movement across the landscape for this species. It is unlikely that the Project would contribute to isolation of the existing Koala habitat. **As such, the Project is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that Koalas are likely to decline.**
vii. Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
Several invasive flora and fauna species have been recorded within the Project site. Weed and pest management measures will be developed for the site which will outline mitigation and monitoring measures to reduce the likelihood of spreading and increasing the number of invasive flora and fauna found on site. **As such, it is considered unlikely that the Project will result in invasive species that are harmful to Koalas becoming established in its habitat.**
viii. Introduce disease that may cause the species to decline
Facilitating the introduction or spread of disease or pathogens for example Chlamydia or *Phytophthora cinnamomi*, to habitat critical to the survival of the Koala, that are likely to significantly reduce the reproductive output of Koalas or reduce the carrying capacity of the habitat. However, it is unlikely for Root-rot Fungus is to occur in this region of NSW as it predominantly occurs in areas that receive a mean annual rainfall of more than 600 mm (DEWHA, 2009). Although it is considered unlikely that Root-rot fungus will impact the potential foraging habitat within the Project area, this potential threat to the Koala will be minimised by the Proponent introducing general weed management clean-down requirements for Plant and machinery entering site throughout the life of the Project, and particularly during the construction phase (refer to Section 3.1. *iii.*). The Project may impact up to 147 ha of suitable habitat which has the potential to cause a stress response in individuals that may be present within the Project area. However, targeted Koala surveys revealed no evidence of Koalas in the Project area. Therefore, it is unlikely that Koala populations in the local area will experience elevated stress levels as a result of the Project. As such, susceptibility to disease is unlikely to increase as a result of the Project. Although it is unlikely the Project will impact disease susceptibility in Koalas, any potential threats from disease will be mitigated through hygiene protocols applied throughout the Project and ongoing management. No other diseases are considered likely to be introduced as a result of the Project. **As such, the introduction of disease that may cause the decline of this species is considered unlikely.**

Koala (combined populations of Qld, NSW and the ACT) *(Phascolarctos cinereus)* – Endangered

ix. Interfere with the recovery of the species

The EPBC Act referral guidelines for the endangered Koala list several potential impacts that could interfere substantially with the recovery of the species. Impacts relevant to this project include:

- Facilitating the introduction or spread of disease or pathogens for example Chlamydia or *Phytophthora cinnamomi*, to habitat critical to the survival of the Koala, that are likely to significantly reduce the reproductive output of Koalas or reduce the carrying capacity of the habitat.
- Creating a barrier to movement to, between or within habitat critical to the survival of the Koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the Koala.
- Changing hydrology which degrades habitat critical to the survival of the Koala to the extent that the carrying capacity of the habitat is reduced in the long-term.

As mentioned, the habitat to be removed may constitute critical habitat for Koala. Direct mortality of individuals from Projects such as disruption of breeding is considered unlikely and any potential impacts can be reliably mitigated by installing fauna exclusion fencing and barriers to movement. Implementing hygiene protocols for plant and equipment, and through ensuring that hydrological regimes remain unaltered as far as is practical would protect remaining adjacent vegetation.

There is no national recovery plan for this species. A NSW state plan exists under the Saving our Species Program. The objectives of this program include aiming to secure the species in the wild in NSW for 100 years, engaging local communities in its conservation and encourage the NSW community to identify with it as a flagship for threatened species conservation. There is the potential that the proposed activity resulting from the construction and operation of the Project will interfere with securing this species in the wild as it requires the removal of 147 ha Koala habitat. However, targeted Koala surveys did not provide evidence that Koalas inhabit the Project area and therefore it is unlikely that the Project will interfere with local Koala populations. **It is unlikely that the development of this Project will interfere with securing this species in the wild.**

x. Conclusion

The Project is unlikely to result in a significant impact on an important population of the Koala however, the Project has the potential to impact Koala habitat within the area.

Disturbance or removal of 147 ha of potential Koala habitat in the Disturbance Footprint is unlikely to significantly impact habitat critical to the Koala.

Considering the above, **the Project is unlikely to result in a significant impact to Koala.**

3.11. Pink-tailed Legless Lizard

Pink-tailed Legless Lizard *(Aprasia parapulchella)* – Vulnerable

A Project is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

i. Lead to a long-term decrease in the size of an important population

The Pink-tailed Legless Lizard (*Aprasia parapulchella)* is a small, legless and very slender lizard that lives underground, growing to approximately 25 cm in length, with small hind-limb flaps which distinguish it from juvenile snakes. Pink-tailed Legless Lizards occur in New South Wales (NSW), Victoria, and the Australian Capital Territory. In NSW the Pink-tailed Legless Lizard is known from the Central and Southern Tablelands and the South Western Slopes, where the species is widespread, but highly isolated from sub-populations (DoE, 2015).

Surveys were undertaken for the Pink-tailed Legless Lizard on 27 September 2021, and 15 and 17 November 2021 (over five sites, and 8 hours of survey effort). The species was not detected during surveys or incidentally at any other locations during survey efforts for other species.

In May 2022, additional disturbance areas not previously surveyed were added to the Development Footprint. There has not yet been an opportunity to undertake species surveys within these areas, and therefore a conservative approach has been adopted. Presence has been assumed for the Pink-tailed Legless Lizard within 1.5 ha of these new areas which were identified as containing suitable rocky habitat following a walkthrough of the vegetation completed by NGH ecologists in May 2022. These areas correspond with the following PCTs:

- PCT 227 – Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
- PCT 351 - Brittle Gum - Broad-leaved Peppermint - Red Stringybark open forest.

Whilst important populations of the Pink-tailed Legless Lizard have not been identified in conservation advice for the species (DoE, 2015), the Matters of National Environmental Significance Significant Impact Guideline 1.1 (DAWE, 2013) defines important populations as:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

Accordingly, the Project is located at the edge of the known species range and occurs in isolated populations which likely form important populations.

Targeted and general surveys for the Pink-tailed Legless Lizard did not detect their presence. However, a small area of potential habitat associated with the Project's water supply pipeline was not surveyed for the species. This area represents 3 ha, and to apply the precautionary principle, the species is assumed to be present.

As a result of the above, the Project may impact up to approximately 1.5 ha of potential Pink-tailed Legless Lizard Habitat.

The Project is unlikely to result in a long-term decrease in the size of an important population of

Pink-tailed Legless Lizard *(Aprasia parapulchella)* – Vulnerable

Pink-tailed Legless Lizard.

ii. Reduce the area of occupancy of an important population

The Pink-tailed Legless Lizard usually inhabits sloping sites that contain rocky habitats (e.g. rocky outcrops or scattered/partially buried rocks) which are well drained, located on mid-slopes or ridge-tops, where ant galleries are present. Key microhabitat features include rockiness and the presence of ground-layer species, especially native grasses (DoE, 2015).

The Conservation Advice for the species (DoE, 2015) identifies that the Pink-tailed Legless Lizard is cryptic and fossorial in nature, with observations of activity patterns being relatively limited. As a result, within the Development Footprint, four rocky habitat areas were assumed to contain Pink-tailed Legless Lizard populations, as species surveys have not yet been undertaken.

Whilst important populations of the Pink-tailed Legless Lizard have not been identified in conservation advice for the species (DoE, 2015), the Matters of National Environmental Significance Significant Impact Guideline 1.1 (DAWE, 2013) defines important populations as:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

The Project is located at the edge of the species range and occurs in isolated populations which likely form important populations.

Targeted and general surveys for the Pink-tailed Legless Lizard did not detect their presence. However, a small area of potential habitat associated with the Project's water supply pipeline was not surveyed for the species. This area represents approximately 3 ha, and to apply the precautionary principle, the species is assumed to be present.

Whilst the Project may impact approximately 1.5 ha of potential Pink-tailed Legless Lizard habitat which may contain an important population of the species, the species range extends north (to Tamworth, NSW) and south (to central Victoria), and any local population is unlikely to be important for the survival of the species.

It is therefore unlikely that the Project would reduce the area of occupancy of an important population of Pink-tailed Legless Lizard.

iii. Fragment an existing important population into two or more populations

Areas surveyed within the Development Footprint display evidence of previous clearing, fragmentation and disturbance due to historic land uses (e.g. cattle grazing).

Pink-tailed Legless Lizard habitat includes primary and secondary grassland, grassy woodland, and woodland communities. The Pink-tailed Legless Lizard usually inhabits sloping sites that contain rocky habitats (e.g. rocky outcrops or scattered/partially buried rocks) which are well drained, located on mid-slopes or ridge-tops, where ant galleries are present (DoE, 2015).

Targeted and general surveys for the Pink-tailed Legless Lizard did not detect their presence. However, a

Pink-tailed Legless Lizard *(Aprasia parapulchella)* – Vulnerable

small area of potential habitat associated with the Project's water supply pipeline was not surveyed for the species. This area represents approximately 3 ha, and to apply the precautionary principle, the species is assumed to be present. Disturbance within these areas of identified habitat is designated for linear infrastructure which has the potential to temporarily fragment the assumed populations into two or more populations during the construction phase. However, following construction, it is likely that these areas will contain limited amounts of ongoing disturbance, and otherwise disused areas will undergo rehabilitation which is unlikely to result in fragmentation of species habitat

As a result, it is considered unlikely that the Project will fragment an important the population into two or more populations.

iv. Adversely affect habitat critical to the survival of a species

Habitat critical to the survival of the species has not been defined within published conservation advice for the Pink-tailed Legless Lizard (DoE, 2015). Notwithstanding, the Matters of National Environmental Significance Significant Impact Guideline 1.1 (DAWE, 2013) habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community.

Consistent with the *Conservation Advice Aprasia parapulchella Pink-tailed Legless Lizard,* areas which contain suitable rocky habitat provide important shelter and foraging opportunities for the species (DoE, 2015).

Targeted and general surveys for the Pink-tailed Legless Lizard did not detect their presence. However, a small area of potential habitat associated with the Project's water supply pipeline was not surveyed for the species. This area represents 3 ha, and to apply the precautionary principle, the species is assumed to be present. As a result of the Project, about 1.5ha of these areas will be removed. However, due to the large geographic distribution of the species from Tamworth NSW, south to central Victoria, it is unlikely that the habitat within the Project area forms habitat critical to the survival of the species as a whole.

Accordingly, the Project is unlikely to significantly affect habitat critical to the survival of the species.

v. Disrupt the breeding cycle of an important population

The Pink-tailed Legless Lizard is oviparous with a clutch size of two. Pink-tailed Legless Lizard eggs are likely laid within ant nests and are assumed to hatch during mid to late summer (DoE, 2015). Sexual maturity of the species is thought to be approximately three years for males and four years for females (DoE, 2015). Articles suggest that this late age of sexual maturity may indicate a relatively long-lived life cycle, however there are no estimates of maximum age (DoE, 2015).

Pink-tailed Legless Lizard *(Aprasia parapulchella)* – Vulnerable

Whilst the Project may remove and/or fragment areas assumed to contain Pink-tailed Legless Lizard habitat, **the Project is unlikely to disrupt the breeding cycle of an important population** as areas of suitable breeding habitat will be retained where otherwise not completely removed.

vi. Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Areas which contain suitable rocky habitat provide important shelter and foraging opportunities for the species (DoE, 2015). The Pink-tailed

Targeted and general surveys for the Pink-tailed Legless Lizard did not detect their presence. However, a small area of potential habitat associated with the Project's water supply pipeline was not surveyed for the species. This area represents 3 ha, and to apply the precautionary principle, the species is assumed to be present. As a result of the Project, about 1.5ha of these areas will be removed. However, due to the larger geographical range of the species, and arability of habitat in surrounding landscapes, it is unlikely that the Project would reduce the availability or quality of habitat to the extent that the species is likely to decline

As such, the Project is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

vii. Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

The conservation advice for the species (DoE, 2015) describes recognised threats that impact the survival of the species. Generally, these threats include habitat loss, fragmentation and degradation. It is noted that degradation of habitat can occur through the invasion of weeds, including the introduction of pasture species and tree planting within habitat areas.

In addition, the conservation advice for the species (DoE, 2015) describes recognised predators including feral cats and red foxes, however the relative threat to the species is unknown. Red fox (*Vulpes vulpes)* was recorded within the Project area by NGH during field surveys.

Potential threats to the Pink-tailed Legless Lizard will be minimised by the Proponent introducing general weed management clean-down requirements for Plant and machinery entering site throughout the life of the Project, and particularly during the construction phase.

It is considered unlikely that the Project would result in the further introduction of, and/or further establishment of, invasive species (which are not already present).

viii. Introduce disease that may cause the species to decline

The conservation advice for the species (DoE, 2015) does not identify any known diseases which are a recognised threat for the species.

Accordingly, the Project is unlikely to introduce a disease that may cause the species to decline.

Pink-tailed Legless Lizard *(Aprasia parapulchella)* – Vulnerable
ix. Interfere with the recovery of the species
A recovery plan has been determined by the Minister for the Environment to not be required for the Pink-tailed Legless Lizard, as it would not provide a significant conservation planning benefit above the conservation advice available for the species (DCCEEW, 2022). Furthermore, the area is unlikely to be suitable for re-introduction of the species, due to the specific microhabitat requirements of the species. **As such, the Project is unlikely to interfere with the recovery of the species as described under a recovery plan.**
x. Conclusion
The Pink-tailed Legless Lizard was not detected during targeted surveys or incidentally within potential habitat located in the Project area. However, the Project may remove up to 1.5 ha of *assumed habitat* for the Pink-tailed Legless Lizard associated with some linear infrastructure. However, due to the larger geographical range of the species, and arability of habitat in surrounding landscapes, **the Project is unlikely to have a significant impact on the Pink-tailed Legless Lizard given the abovementioned assessment criteria.**

REFERENCES

Andrews, A., 1990. Fragmentation of Habitat by Roads and Utility Corridors: A Review. *Australian Zoologist,* 26(3-4), pp. 130-141.

Barea, L. P. & Watson, D. M., 2007. Temporal variation in food resources determines onset of breeding in an Australian mistletoe specialist. *Emu,* Volume 107, pp. 203-209.

Barker, J., Grigg, G. & Tyler, M. J., 1995. *A Field Guide to Australian Frogs.* 2 ed. Chippy Norton NSW: Surrey Beatty.

Bekker, R. M., Oomes, M. J. M. & Bakker, J. P., 1998. The impact of groundwater level on soil seed bank survival. *Seed Science Research,* 8(3), pp. 399-404.

Belcher, C., 2004. The largest surviving marsupial carnivore on mainland Australia: the Tiger or Spotted-tailed Quoll Dasyurus maculatus, a nationally threatened, forest-dependent species. *Conservation of Australia's Forest Fauna,* pp. 612-623.

Belcher, C. A. & Darrant, J. P., 2006. Habitat use by the tiger quoll (Dasyurus maculatus) (Marsupialia: Dasyuridae) in south-eastern Australia. *Journal of Zoology,* Volume 28, pp. 59-64.

Bodetti, T. J., Viggers, K., Warren, K. S. & Swan, R., 2003. Wide range of Chlamydiales types detected in native Australian mammals. *Veterinary Microbiology,* 2(96), pp. 177-187.

Braby, M. F., 2000. *Butterflies of Australia. Their identification, biology and distribution,* Melbourne: CSIRO Publishing.

Chen, J., Franklin, J. F. & Spies, T. A., 1990. Microclimatic pattern and basic biological responses at the clearcut edges of old-growth Douglas Fir stands. *Northwest Environmental Journal,* Volume 6, pp. 424-425.

Chen, J., Franklin, J. F. & Spies, T. A., 1991. Vegetation responses to edge environments in old-growth Douglas-fir forest. *Ecological Applications,* Volume 2, pp. 387-396.

Clarke, M. F. & Oldland, J. M., 2007. Penetration of remnant edges by noisy miners (Manorina melanocephala) and implications for habitat restoration. *Wildlife Research,* Volume 34, pp. 253-261.

Crates, R. et al., 2018. Contemporary breeding biology of critically endangered Regent Honeyeaters: implications for conservation. *International Journal of Avian Science,* 161(3), pp. 521-532.

Davey, C. & Mulvaney, M., 2020. *Report on a survey of breeding activity of the Gang-gang Cockatoo within urban Canberra,* s.l.: Canberra Bird Notes.

DAWE, 2013. *Significant Impact Guidelines - 1.1 Matters of National Environmental Significance,* s.l.: s.n.

DCCEEW, 2022. *Conservation Advice Petauroides volans greater glider,* Canberra: Department of Climate Change, Energy, the Environment and Water.

DCCEEW, 2022. *Species Profile and Threats Database - Aprasia parapulchella - Pink-tailed Worm Lizard, Pink-tailed Legless Lizard.* [Online]
Available at: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1665
[Accessed 14 July 2022].

DCCEEW, 2022. *Species Profile and Threats Database - Petauroides volans — Greater Glider (southern and central).* [Online]
Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=254
[Accessed 14 July 2022].

Department of Agriculture Water and the Environment, 2022. *Species Profile and Threats Database - Pteropus poliocephalus Grey-headed Flying-fox,* Canberra: Department of Agriculture Water and the Environment.

Department of Agriculture, Water and the Environment, 2021. *Draft National Recovery Plan for the Painted Honeyeater Grantiella picta,* Canberra: Commonwealth of Australia.

Department of Agriculture, Water and the Environment, 2022. *Conservation Advice for Callocephalon fimbriatum (Gang-gang Cockatoo),* Canberra: Department of Agriculture, Water and the Environment.

Department of Agriculture, Water and the Environment, 2022. *National Flying-fox monitoring viewer.* [Online]
Available at: http://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf
[Accessed 2022].

Department of Environment and Primary Industries, 2014. *Submission in response to the listing nomination for the painted honeyeater,* Victoria: Flora and Fauna Guarantee Scientific Advisory Committee.

Department of Environment, Land, Water and Planning, 2016. *National Recovery Plan for the Spotted-tailed Quoll Dasyurus maculatus,* Canberra: Australian Government.

Department of the Environment and Energy, 2016. *Threat Abatement Advice for the key threatening process 'Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species',* s.l.: Department of the Environment and Energy.

Department of the Environment, 2016. *National Recovery Plan for the Regent Honeyeater (Anthochaera phrygia),* s.l.: Australian Government.

DEWHA, 2009. *Background Document for the Threat Abatement Plan: Disease in Natural Ecosystems Caused by Phytophthora Cinnamomi,* Canberra: Department of the Environment, Water, Heritage and the Arts.

Dickmann, C. & Flemming, M., 2002. Pest, or Passenger Pigeon? The New South Wales Scientific Committee's assessment of the status of the Grey-headed Flying-fox. *Managing the Grey-headed Flying-fox as a Threatened Species in NSW,* pp. 20-28.

DoE, 2015. *Conservation Advice Aprasia parapulchella Pink-tailed worm-lizard,* Canberra: Department of the Environment.

Dunn, K. L., Kitching, R. L. & Dexter, E. M., 1994. The Conservation Status of Australian Butterfies. *Unpublished Report to Australian National Parks.*

Eby, P. & Lunney, D., 2002. Managing the Grey-headed Flying-fox Pteropus poliocephalus as a threatened species in NSW: Adjusting to a long-term vision. *Managing the Grey-headed Flying-fox as a threatened Species in NSW,* pp. 273-284.

Frith, H. J., 1969. *Birds of the Australian High Country.* Reed, Sydney: s.n.

Garnett, S., Szabo, J. & Dunson, G., 2011. *The Action Plan for Australian Birds 2010,* s.l.: CSIRO.

Garnett, S. T., Szabo, J. K. & Dutson, G., 2011. *The Action Plan for Australian Birds 2010,* Melbourne: CSIRO Publishing.

Geering, D. & French, K., 1998. Breeding biology of the Regent Honeyeater, Xanthomyza phrygia in the Capertee Valley, NSW. *Emu,* Volume 98, pp. 104-116.

Gibbons, P., 1999. *Habitat-tree retention in wood production forests,* Canberra: Australian National University.

Gibbons, P. & Lindenmayer, D., 2000. *Tree Hollows and Wildlife Conservation in Australia,* Canberra: CSIRO Publishing.

Gibbons, P. & Lindenmayer, D. B., 2002. Tree hollows and wildlife conservation in Australia. *CSIRO.*

Gillespie, G. R., 1999. *Survey of the Distribution and Habitat of the Booroolong frog Litoria Booroolongensis on the South-western Slopes of the Great Dividing Range in New South Wales,* s.l.: Arthur Rylah Institute.

Glen, A. S. & Dickman, C. R., 2006a. Home range, denning behaviour and microhabitat use of the carnivorous marsupial Dasyurus maculatus in eastern Australia. *Journal of Zoology, London,* Volume 268, pp. 347-354.

Glen, A. S. & Dickman, C. R., 2006b. Diet of the spotted-tailed quoll (Dasyurus maculatus) in eastern Australia: effects of season, sex and size. *Journal of Zoology,* 269(241-248).

Goldingay, R. L., 2012. Characteristics of tree hollows used by Australian arboreal and scansorial mammals. *Australian Journal of Zoology,* Volume 59, pp. 277-294.

Higgins, P. J., 1999. Handbook of Australian, New Zealand & Antartic birds. *Oxford University Press,* Volume 4 Parrots to dollarbird.

Higgins, P. J., Peter, J. M. & Steele, W. K., 2001. *Handbook of Australian, New Zealand and Antarctic Birds.* Volume 5: Tyrant-flycatchers to Chats ed. Melbourne: Oxford University Press.

Hunter, D., 2007. *Conservation management of two threatened frog species in south-eastern New South Wales, Australia,* Canberra: University of Canberra.

Hunter, D. A., Smith, M. J., Scroggie, M. P. & Gilligan, D., 2011. Experimental Examination of the Potential for Three Introduced Fish Species to Prey on Tadpoles of the Endangered Booroolong Frog, Litoria booroolongensis. *Journal of Herpetology,* Volume 45, pp. 181-185.

Hunter, D. & Smith, M. J., 2006. *Survey, habitat assessment and management recommendations for the endangered Booroolong Frog (Litoria booroolongensis) in the Murray Catchment Management area of New South Wales,* s.l.: s.n.

Kavanagh, R. P., 1984. Seasonal changes in habitat use by gliders and possums in southeastern New South Wales. *Possums and Gliders.*

Kavanagh, R. P. & Lambert, M., 1990. Food selection by the greater glider: is foliar nitrogen a determinant of habitat quality?. *Australian Wildlife Research,* Volume 17, pp. 285-299.

Lawrence, R. E., 2001. The impacts of hydro-electric construction works on the hydrology of a subalpine area in Australia. *Environmental Geology,* Volume 40, pp. 612-621.

Le Maitre, D. C., Scott, D. F. & Colvin, C., 1999. A review of information on interactions between vegetation and groundwater. *Water SA,* 25(2), pp. 137-151.

Lindenmayer, D. & Burgman, M., 2005. 10. Landscapes and habitat fragmentation. In: *Practical Conservation Biology.* Collingwood, VIC: CSIRO Publishing, pp. 255-292.

Lindsay, K., 17 December 2014. *Personal communication by email* [Interview] (2014 December 17 December 2014).

MacPhee, E. & Wilks, G., 2013. Rehabilitation of Former Snowy Scheme Sites in Kosciuszko National Park. *Ecological Management & Restoration,* 14(3), p. 159–171.

Maloney, K. S., 2007. *The status of the Greater Glider Petauroides volans in the Illawarra region,* Wollongong: School of Biological Sciences, University of Wollongong.

Maron, M., 2007. Threshold effect of eucalypt density on an aggressive avian competitor. *Biological Conservation,* Volume 136, pp. 100-107.

Maron, M. et al., 2013. Avifaunal disarray due to a single despotic species.. *Diversity and Distributions,* Volume 19, pp. 1468-1479.

Melzer, A. et al., 2000. Overview, critical assessment, and conservation implications of koala distribution and abundance. *Conservation Biology,* Volume 14, pp. 619-628.

Mjadwesch, R. & Nally, S., 2008. Emergency relocation of a purple copper butterfly colony during roadworks: successes and lessons learned. *Ecological Management and Restoration ,* Volume 9, pp. 100-109.

Moore, J. A., 1961. The frogs of eastern New South Wales. *Bulletin of the American Museum of Natural History,* Volume 121, pp. 149-386.

Normyle, A. & Pittock, J., 2019. A review of the impacts of pumped hydro energy storage construction on subalpine and alpine biodiversity: lessons for the Snowy Mountains pumped hydro expansion project. *Australian Geographer,* pp. 1-16.

NSW BioNET, 2022. *NSW BioNet Atlas - Species Sightings Search.* [Online]
Available at:
https://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx
[Accessed 2022].

NSW National Parks and Wildlife Service, 2001. *Bathurst Copper Butterfly (Paralucia spinifera),* Canberra: Natural Heritage Trust.

NSW Scientific Committee, 2008. *Gang-gang Cockatoo Callocephalon fimbriatum. Review of Current Information in NSW,* Hurstville: NSW Scientific Committee.

Oliver, D., Ley, A. & Williams, M., 1999. Habitat of the Regent Honeyeater Xanthomy zaphrygia and the value of the Bundarra-Barraba region for the conservation of avifauna. *Pacific Conservation Biology,* Volume 5, pp. 224-239.

Piper, S. & Catterall, C., 2003. A particular case and a general pattern: hyperaggressive behaviour by one species may mediate avifaunal decreases in fragmented Australian Forests. *Oikos,* Volume 101, pp. 602-614.

Piper, S. D. & Catterall, C. P., 2003. A particular case and a general pattern: hyperaggressive behaviour by one species may mediate avifaunal decreases in fragmented Australian forests. *Oikos,* Volume 101, pp. 602-614.

Pope, M. L., Lindenmayer, D. B. & Cunningham, R. B., 2005. Patch use by the greater glider (Petauroides volans) in a fragmented forest ecosystem. *Wildlife Research,* Volume 31, pp. 559-568.

Sarker, S., Dixon, K. & Banks, S., 2018. The effects of fire history on hollow-bearing tree abundance in montane and subalpine eucalypt forests in southeastern Australia. *Forest Ecology and Management,* Volume 428, pp. 93-103.

Shields, J. & Chrome, F., 1992. *Parrots and Pigeons of Australia.* Sydney: Angus and Robertson.

Skerratt, L. F. et al., 2007. Spread of chytridiomycosis has caused the rapid global decline and extinction of frogs. *EcoHealth,* Volume 4, pp. 125-134.

Smith, G. C., Mathieson, M. & Hogan, L., 2007. Home range and habitat use of a low-density population of Greater Glider, Petauroides volans (Pseudocheiridae: Marsupialia), in a hollow-limiting environment. *Wildlife Research,* Volume 34, pp. 472-483.

Thomson, R. et al., 2015. Avifaunal disarray: quantifying models of the occurrence and ecological effects of a despotic bird species. *Diversity and Distributions,* Volume 21, pp. 451-464.

Threatened Species Scientific Committee, 2006. *Advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee (TSSC) on Amendments to the List of Ecological Communities under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act),* s.l.: Threatened Species Scientific Committee.

Threatened Species Scientific Committee, 2016. *Conservation Advice Paralucia spinifera purple copper butterfly,* Canberra: Department of the Environment and Energy.

Threatened Species Scientific Committee, 2016. *Conservation Advice Petauroides volans greater glider,* Canberra: Department of Environment.

Tidemann, C., Eby, P., Parry-Jones, K. & Vardon, M., 1999. Grey-headed Flying-fox. *The Action Plan for Australian Bats,* pp. 31-35.

Todd, C., Belcher, C. & Nelson, J., 2007. A population viability model for the management of the spotted-tailed quoll Dasyurus maculatus maculatus. *The Arthur Rylah Institute for Environmental Research unpublished report to the Department of the Environment and Water resources.*

van der Ree, R., Ward, S. J. & Hansasyde, K. A., 2004. Distribution and conservation status of possums and gliders in Victoria. *The Biology of Australian Possums and Gliders,* pp. 91-110.

Vanderduys, E. P., Kutt, A. S. & Kemp, J. E., 2012. Upland savannas: the vertebrate fauna of largely unknown but significant habitat in north-eastern Queensland. *Australian Zoologist,* Volume 36, pp. 59-74.

Vilcins, I., Old, J. M., Kortner, G. & Deane, E. M., 2008. ctoparasites and Skin Lesions in Wild-Caught Spotted-Tailed Quoll (Dasyurus maculatus). *Comparative Parasitology,* 75(2), pp. 271-277.

Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

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

Report created: 21-Jul-2022

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	43
Listed Migratory Species:	12

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	6
Commonwealth Heritage Places:	None
Listed Marine Species:	19
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	3
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	2
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands)		[Resource Information]
Ramsar Site Name	Proximity	Buffer Status
Banrock station wetland complex	800 - 900km upstream from Ramsar site	In feature area
Riverland	800 - 900km upstream from Ramsar site	In feature area
The coorong, and lakes alexandrina and albert wetland	900 - 1000km upstream from Ramsar site	In feature area
The macquarie marshes	300 - 400km upstream from Ramsar site	In feature area

Listed Threatened Ecological Communities			[Resource Information]

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

Community Name	Threatened Category	Presence Text	Buffer Status
Natural Temperate Grassland of the South Eastern Highlands	Critically Endangered	Community likely to occur within area	In feature area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area	In feature area

Listed Threatened Species			[Resource Information]

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

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia			
Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat known to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pycnoptilus floccosus Pilotbird [525]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rostratula australis			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
FISH			
Maccullochella macquariensis			
Trout Cod [26171]	Endangered	Species or species habitat may occur within area	In feature area
Maccullochella peelii			
Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area	In feature area
Macquaria australasica			
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area	In feature area
FROG			
Litoria aurea			
Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area	In feature area
Litoria booroolongensis			
Booroolong Frog [1844]	Endangered	Species or species habitat known to occur within area	In feature area
Litoria castanea			
Yellow-spotted Tree Frog, Yellow-spotted Bell Frog [1848]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
INSECT			
Paralucia spinifera			
Bathurst Copper Butterfly, Purple Copper Butterfly, Bathurst Copper, Bathurst Copper Wing, Bathurst-Lithgow Copper, Purple Copper [26335]	Vulnerable	Species or species habitat known to occur within area	In feature area
MAMMAL			
Chalinolobus dwyeri			
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area	In feature area
Dasyurus maculatus maculatus (SE mainland population)			
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Petauroides volans](#)			
Greater Glider (southern and central) [254]	Endangered	Species or species habitat known to occur within area	In feature area
[Petaurus australis australis](#)			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Petrogale penicillata](#)			
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)](#)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
[Pteropus poliocephalus](#)			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area	In feature area
PLANT			
[Dichanthium setosum](#)			
bluegrass [14159]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Eucalyptus aggregata](#)			
Black Gum [20890]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Eucalyptus pulverulenta](#)			
Silver-leaved Mountain Gum, Silver-leaved Gum [21537]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Eucalyptus robertsonii subsp. hemisphaerica](#)			
Robertson's Peppermint [56223]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Euphrasia arguta](#)			
[4325]	Critically Endangered	Species or species habitat may occur within area	In feature area
[Lepidium aschersonii](#)			
Spiny Pepper-cress [10976]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Lepidium hyssopifolium Basalt Pepper-cress, Peppercress, Rubble Pepper-cress, Pepperweed [16542]	Endangered	Species or species habitat likely to occur within area	In feature area
Leucochrysum albicans subsp. tricolor Hoary Sunray, Grassland Paper-daisy [89104]	Endangered	Species or species habitat may occur within area	In feature area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area	In feature area
Swainsona recta Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat may occur within area	In feature area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Zieria obcordata Granite Zieria [3240]	Endangered	Species or species habitat may occur within area	In feature area
REPTILE			
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Delma impar Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Tympanocryptis pinguicolla Grassland Earless Dragon [66727]	Endangered	Species or species habitat may occur within area	In buffer area only

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			

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

Scientific Name	Threatened Category	Presence Text	Buffer Status
Numenius madagascariensis			
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

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

Commonwealth Land Name	State	Buffer Status
Commonwealth Trading Bank of Australia		
Commonwealth Land - Commonwealth Trading Bank of Australia [12385]	NSW	In feature area
Commonwealth Land - Commonwealth Trading Bank of Australia [12386]	NSW	In feature area
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian Telecommunications Commission [12387]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [12388]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Corporation [12370]	NSW	In buffer area only
Defence		
Defence - AIRTC BATHURST [10099]	NSW	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
Eusdale	Nature Reserve	NSW	In feature area
Wambool	Nature Reserve	NSW	In feature area
Winburndale	Nature Reserve	NSW	In buffer area only

EPBC Act Referrals [Resource Information]

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

Caveat

1 PURPOSE

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

The report contains the mapped locations of:

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

2 DISCLAIMER

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

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

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

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

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

4 LIMITATIONS

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

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

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

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

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

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

Acknowledgements

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

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

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

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