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Assessments of Significance on Matters of National Environmental Significance

Abercrombie Wind Farm Pty Ltd

Abercrombie Wind Farm Project

Assessments of Significance on Matters of National Environmental Significance

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1. Terminology

The following terms and definitions outlined in Table 1-1 are used within this assessment.

Table 1-1 Project terminology

Term	Definition
Bioregion	Bioregions are relatively large land areas characterised by broad, landscape-scale natural features and environmental processes that influence the functions of entire ecosystems. They capture the large-scale geophysical patterns across Australia. These patterns in the landscape are linked to fauna and flora assemblages and processes at the ecosystem scale.
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
Direct impact	An impact on biodiversity values that is a direct result of vegetation clearance and loss of habitat for a development. It is predictable, usually occurs at or near to the Project area and can be readily identified during the planning, design, construction, and operational phases of a development.
Disturbance area	The Disturbance area encompasses the extent of physical disturbance likely to be required to accommodate construction activities and infrastructure needed to the Project
Development corridor	All project construction and operational components with a 100 m buffer on it to allow for design flexibility including micro-siting and footprint changes.
Ecological community	An ecological community is a naturally occurring group of native plants, animals and other organisms living in a unique location. Ecological communities can be listed as threatened under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population, or ecological community, including any biotic or abiotic component.
Indirect impact	An impact on biodiversity values that occurs when development related activities affect threatened species, threatened species habitat, or ecological communities in a manner other than direct impact. Compared to direct impacts, indirect impacts often: ▪ Occur over a wider area than just the site of the development ▪ Have a lower intensity of impact in the extent to which they occur compared to direct impacts ▪ Occur off site ▪ Have a lower predictability of when the impact occurs, and ▪ Have unclear boundaries of responsibility.
Local population	The population that occurs in the Project area. In cases where multiple populations occur in the Project area and/or a population occupies part of the Project area, impacts on the entirety of each population must be assessed separately.
Locality	Bioregion sub-regions in which the Project would be located – the Murrumbidgee sub-region of the Riverina Bioregion.
MNES	A matter of national environmental significance (MNES) protected by a provision of Part 3 of the EPBC Act.
Mitigation	Action to reduce the severity of an impact.
Mitigation measure	Any measure that facilitates the safe movement of wildlife and/or prevents wildlife mortality.
Plant community type	An NSW plant community type (PCT) is identified using the PCT classification system. The classification system is approved by the NSW Plant Community Type Control Panel and described in the BioNet Vegetation Classification database, which describes how to identify PCTs and TECs as per the NSW PCT classification and details each PCT and its geographic distribution.
Population	A group of organisms, all the same species, occupying a particular area.
Project area	The Project area encompasses of all properties that are hosting the Project.
Study area	The study area consists of the Disturbance area with a 500 m buffer used to capture indirect impacts to nest trees. The study area is consistent with the term 'subject land' defined in the BAM. It is land that is subject to development, activity, and/or clearing. Values outside of the Project area

Term	Definition
Threatened Biodiversity Data Collection	Part of the BioNet database, accessible from the BioNet website at www.bionet.nsw.gov.au.
Threatened species	A species listed under the NSW *Biodiversity Conservation Act 2016* (BC Act), *Fisheries Management Act 1994* (FM Act) or EPBC Act. For the purposes of this Assessment of Significance, threatened species refers exclusively to species listed under the EPBC Act.
Threatened ecological community	A community of different species associated with one another and sharing the same habitat, which is listed under the BC Act, FM Act and EPBC Act. Threatened ecological communities are listed as endangered or critically endangered under the NSW BC Act, or may be listed as vulnerable, endangered, or critically endangered under the Commonwealth EPBC Act.

2. Likelihood of Occurrence Assessment

2.1 Threatened species likelihood of occurrence assessment

The Likelihood of Occurrence (LoO) assessment has been undertaken on *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed threatened, communities, flora and fauna species recorded within a 10 km radius of the Project area determined through a desktop database search of the Protected Matters Search Tool (PMST) (DCCEEW 2024c) and the NSW BioNet Atlas (NSW DCCEEW 2024c). This list of potentially occurring threatened species has been assessed against the known habitats and environments of the Project area, based on associations listed within the Threatened Biodiversity Data Collection (TBDC) (NSW DCCEEW 2024b). As a result, species are identified as either having an unlikely, low, moderate, or high likelihood of occurring within the Project area. The criteria used in the LoO assessment are detailed in Table 2-1.

Table 2-1 LoO Assessment criteria.

LoO	Criteria
Unlikely	▪ Species highly restricted to certain geographical areas not within the Project area. ▪ Species that have specific habitat requirements are not present in the Project area.
Low	Species that fit into one or more of the following criteria: ▪ Have not been recorded previously in the Project area/surrounds and for which the Project area is beyond the current distribution range. ▪ Use specific habitats or resources that are not present in the Project area. ▪ Are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
Moderate	Species that fit one or more of the following criteria: ▪ Have infrequently been recorded previously in the Project area/surrounds. ▪ Use specific habitats or resources present in the Project area but in a poor or modified condition. ▪ Are unlikely to maintain sedentary populations, however, may seasonally use resources within the Project area opportunistically or during migration. ▪ Are cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
High	Species that fit one or more of the following criteria: ▪ Have frequently been recorded previously in the Project area/surrounds. ▪ Use habitat types or resources that are present in the Project area that are abundance and/or in good condition within the Project area. ▪ Are known or likely to maintain resident populations surrounding the Project area. ▪ Are known or likely to visit the site during regular seasonal movements or migration.

The LoO results, along with the status of each entity under the EPBC Act, data source and presence text as described in the PMST search (known to be preset, likely present or may be present) are presented in Table A-1 in Appendix A.

Species with a moderate to high LoO, as summarised in the sections below, were then subject to further assessment, in the form of an Assessment of Significance, consistent with the *EPBC Act Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (DoE 2013a). This is described in Section 3.

2.1.1 Background research and field survey

The LoO assessment has been informed by a desktop review that included a review of state vegetation, geology, soil, landscape and hydrology mapping and searches of relevant threatened species databases within 10 km of the Project area. The desktop review was supported by preliminary field surveys undertaken in November and December 2023. The survey aimed to:

- Validate desktop state vegetation mapping

- Identify key ecological values and constraints to inform the preliminary Project design
- Identify the presence of threatened ecological communities and map potential habitat for threatened flora and fauna species
- Record opportunistic sightings of threatened flora and fauna species.

Due to access constraints, the field survey results provide a limited assessment of the Project area and generally focused on vegetation and habitat that was accessible near roads and access tracks.

Preliminary findings

The Project area is a predominantly flat landscape and comprises a large mosaic of shrublands, with grassland and wetland habitats, interrupted by established agricultural lands. Native vegetation is dominated by modified and intact shrublands comprised of drought and salt tolerant low shrub species, typically interspersed with sporadic patches of potentially derived grassland, with lignum/nitre goosefoot shrubland wetlands in lower-lying areas. Substantial areas of cropping land are also present across the Project area, which feature intensive farming operations and associated infrastructure such as shearing sheds, stock pens, feed and machinery storage sheds, and a network of access tracks.

The dominant class of vegetation in the landscape comprise Riverine Chenopod Shrublands. Many shrubland Plant Community Types (PCTs) are considered derived from an original and extensive Bladder Saltbush shrubland (PCT 157), which has changed over time from over a century of grazing. This was evidenced by the presence of several large areas of remnant intact Bladder Saltbush shrubland where grazing intensity has been low. These chenopod shrublands were of high condition in the Project area evidenced by their species diversity and diverse structural features.

A range of PCTs are present in the Project area varying in condition and patch sizes. The following PCTs were identified within the Project area based on the field survey and review of state vegetation mapping:

- PCT 11: River Red Gum - Lignum very tall open forest or woodland wetland
- PCT 15: Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)
- PCT 17: Lignum shrubland wetland
- PCT 24: Canegrass swamp tall grassland wetland of drainage depressions, lakes and pans of the inland plains
- PCT 28: White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone
- PCT 44: Forb-rich Spear-grass – Windmill Grass – White Top grassland
- PCT 45: Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW Southwestern Slopes Bioregion
- PCT 46: Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion
- PCT 153: Black Bluebush low open shrubland
- PCT 157: Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion
- PCT 160: Nitre Goosefoot shrubland
- PCT 163: Dillon Bush (Nitre Bush) shrubland
- PCT 164: Cotton Bush open shrubland
- PCT 166: Disturbed annual saltbush forbland
- PCT 216: Black Roly Poly low open shrubland
- PCT 236: Derived Giant Redburr low shrubland.

Threatened Ecological Communities

Natural Grasslands of the Murray Valley Plains – a critically endangered ecological community (CEEC) under the EPBC Act was preliminarily identified and mapped within the Project area during field surveys. However, further detailed floristic survey is required to confirm the condition of the vegetation and species composition is consistent with the listing advice.

Species habitat

The general condition of all surveyed PCTs was identified as moderate to good condition in terms of floristic species diversity, vegetation structure and abundance of exotic species. On this basis, despite the extent of existing disturbance from agricultural land use, much of the Project area provides potentially suitable habitat for a range of threatened flora and fauna species.

Bird species diversity was considered generally low based on preliminary observations, likely due to the absence of tree and woodland cover and the homogenous shrubland habitat types present over much of the Project area. The shrubland habitat mostly favours smaller, low-flying bird species. Several birds of prey were observed (i.e. Swamp Harrier and Black shouldered Kite) and the discrete woodland and riparian areas present within the Project area provide potential habitat for these and other woodland birds species. Wedge-tailed Eagles are also likely present in open areas with a number of old and existing eagle nests found. These areas may also provide habitat for bat species.

A possible sighting of a EPBC listed bird species, Diamond Firetail (*Stagonopleura guttata*) was recorded during field surveys. Potential habitat for the Southern Bell Frog (*Litoria raniformis*) (vulnerable under EPBC Act) was observed adjoining cropped land in the north west, in addition to ephemeral creek lines located at the southern extent.

2.1.2 Threatened Ecological Communities

Of the five identified (4 PMST, 1 BioNet) threatened ecological communities (TECs), one TEC has a moderate likelihood of occurring within the Project area:

- Natural Grasslands of the Murray Valley Plains – critically endangered ecological community (CEEC) under EPBC Act (moderate)

One additional TEC (identified in BioNet), 'Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions' is listed as endangered under the BC Act. The Finalised Priority Assessment List (FPAL) for the assessment period commencing 1 October 2023 has included a nomination by the Threatened Species Scientific Committee (TSSC) for this TEC to be listed as endangered under Commonwealth legislation. As such, this potentially EPBC Act listed TEC has been included in further assessments, as it has a moderate likelihood of occurring within the Project area.

2.1.3 Threatened Flora

Of the nine threatened flora species identified from database searches (8 PMST, 1 BioNet), seven have a moderate to high likelihood occurring in the Project area:

- *Austrostipa metatoris* (A spear grass) – vulnerable under EPBC Act (moderate)
- *Austrostipa wakoolica* (A spear grass) – endangered under EPBC Act (moderate)
- *Brachyscome papillosa* (Mossgiel Daisy) – vulnerable under EPBC Act (high)
- *Lepidium monoplocoides* (Winged Peppercress) – endangered under EPBC Act (moderate)
- *Maireana cheelii* (Chariot Wheels) – vulnerable under EPBC Act (high)
- *Solanum karsense* (Menindee Nightshade) – vulnerable under EPBC Act (moderate)
- *Swainsona murrayana* (Slender Darling Pea) – vulnerable under EPBC Act (high).

2.1.4 Threatened Terrestrial Fauna

Of the 23 threatened terrestrial fauna species identified from database searches (22 PMST, 1 observation of suitable habitat), 20 have a moderate to high likelihood occurring in the Project area:

Birds:

- Southern Whiteface (*Aphelocephala leucopsis*) – vulnerable under EPBC Act (moderate)
- Australasian Bittern (*Botaurus poiciloptilus*) – endangered under EPBC Act (high)
- Sharp-tailed Sandpiper (Calidris acuminata) – vulnerable (also marine/migratory) under EPBC Act (high)
- Curlew Sandpiper (*Calidris ferruginea*) – critically endangered (also marine/migratory) under EPBC Act (moderate)
- Brown Treecreeper (south-eastern subspecies) (*Climacteris picumnus victoriae*) – vulnerable under EPBC Act (moderate)
- Grey Falcon (*Falco hypoleucos*) – vulnerable under EPBC Act (moderate)
- Painted Honeyeater (*Grantiella picta*) – vulnerable under EPBC Act (moderate)
- White-throated Needletail (*Hirundapus caudacutus*) – vulnerable (also marine/migratory) under EPBC Act (moderate)
- Swift Parrot (*Lathamus discolor*) – critically endangered (also marine) under EPBC Act (moderate)
- Major Mitchell's Cockatoo (eastern subspecies) (*Lophochroa leadbeateri leadbeateri*) – endangered under EPBC Act (moderate)
- Hooded Robin (south-eastern) (Melanodryas cucullata cucullata) – endangered under EPBC Act (moderate)
- Blue-winged Parrot (*Neophema chrysostoma*) – vulnerable (also marine) under EPBC Act (high)
- Plains Wanderer (*Pedionomus torquatus*) – critically endangered under EPBC Act (moderate)
- Superb Parrot (*Polytelis swainsonii*) – vulnerable under EPBC Act (moderate)
- Australian Painted Snipe (*Rostratula australis*) – endangered (also marine) under EPBC Act (moderate)
- Diamond Firetail (*Stagonopleura guttata*) – vulnerable under EPBC Act (moderate)
- Common Greenshank (*Tringa nebularia*) – endangered (also marine/migratory) under EPBC Act (moderate).

Amphibians:

- Southern Bell Frog (*Litoria raniformis*) – vulnerable under EPBC Act (high).

Reptiles:

- Grey Snake (*Hemiaspis damelii*) – endangered under EPBC Act (high).

2.1.5 Threatened Aquatic Fauna

Of the six threatened aquatic fauna species identified from database searches (6 PMST), two have a moderate to high likelihood occurring in the Project area:

Fish:

- Silver Perch (*Bidyanus bidyanus*) – critically endangered under EPBC Act (high)
- Murray Cod (*Maccullochella peelii*) – vulnerable under EPBC Act (high).

2.1.6 Migratory and Marine Species

Of the 13 migratory species (9 PMST, 3 BioNet, 1 observation of suitable habitat) and 20 marine species (16 PMST, 3 BioNet and 1 observation of suitable habitat) identified from database searches,15 have a moderate to high likelihood occurring in the Project area:

- Fork-tailed Swift (*Apus pacificus*) – marine and migratory under EPBC Act (moderate)
- Sharp-tailed Sandpiper (*Calidris acuminata*) – marine and migratory (also vulnerable) under EPBC Act (high)
- Curlew Sandpiper (*Calidris ferruginea*) – marine and migratory (also critically endangered) under EPBC Act (moderate)
- Pectoral Sandpiper (*Calidris melanotos*) – marine and migratory under EPBC Act (moderate)
- Black-eared Cuckoo (*Chalcites osculans*) – marine under EPBC Act (moderate)
- Gull-billed Tern (*Gelochelidon nilotica*) – migratory and marine under EPBC Act (high)
- White-bellied Sea-Eagle (*Haliaeetus leucogaster*) – marine under EPBC Act (high)
- White-throated Needletail (*Hirundapus caudacutus*) – marine and migratory (also vulnerable) under EPBC Act (moderate)
- Caspian Tern (Hydroprogne caspia) – migratory and marine under EPBC Act (moderate)
- Swift Parrot (*Lathamus discolor*) – marine (also critically endangered) under EPBC Act (moderate)
- Rainbow bee-eater (*Merops ornatus*) – marine under EPBC Act (moderate)
- Blue-winged Parrot (*Neophema chrysostoma*) – marine (also endangered) under EPBC Act (high)
- Australian Painted Snipe (*Rostratula australis*) – marine (also endangered) under EPBC Act (moderate)
- Wood Sandpiper (*Tringa glareola*) – migratory and marine under EPBC Act (moderate)
- Common Greenshank (*Tringa nebularia*) – migratory and marine (also endangered) under EPBC Act (moderate).

3. EPBC Act Assessment of Significance

3.1 Matters of National Environmental Significance

Under the EPBC Act, an action will require approval from the Minister if the action has, will have, or is likely to have, a significant impact on a Matters of National Environmental Significance (MNES). Assessments of Significance for MNES listed under the EPBC Act have been undertaken for all species considered of moderate to high LoO (see Section 2.1). The Assessments of Significance for each MNES are detailed in Appendix B.

The particular facts and circumstances of a Proposed action will need to be taken into account in determining whether that action is likely to have a significant impact on a MNES. In general, the purpose of the test for significance is to determine whether an impact is 'important, notable, or of consequence, having regard to its context or intensity' (DoE 2013a).

Likely impacts and Assessment of Significance outcomes have been based on the current Disturbance area, of approximately 3,158.75 ha. These assessments of significance are preliminary and consider to be the worst-case impacts. and the assessment will be reviewed and updated to reflect any changes to the disturbance area and additional information from future surveys. This will be included in a Biodiversity Assessment Development Report (BDAR) to be appended to the EIS.

3.2 Significant Impact Criteria

Assessments of significance for MNES listed under the EPBC Act have been undertaken in accordance with the 'significant impact criteria' as outlined within the *EPBC Act Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (DoE 2013a).

The 'significant impact criteria' are intended to assist in determining whether the impacts of the proposed action on a MNES are likely to be significant . For each EPBC Act listing category (i.e., extinct in the wild, critically endangered, endangered, or vulnerable) specific impact criteria prompts are used to guide the assessment . These are listed below.

3.2.1 Critically endangered and endangered species

An action 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:

1. lead to a long-term decrease in the size of a population,
2. reduce the area of occupancy of the species,
3. fragment an existing population into two or more populations,
4. adversely affect habitat critical to the survival of a species,
5. disrupt the breeding cycle of a population,
6. modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,
7. result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat,
8. introduce disease that may cause the species to decline, or
9. interfere with the recovery of the species.

3.2.2 Vulnerable species

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

1. lead to a long-term decrease in the size of an important population of a species,
2. reduce the area of occupancy of an important population,
3. fragment an existing important population into two or more populations,
4. adversely affect habitat critical to the survival of a species,
5. disrupt the breeding cycle of an important population,
6. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,
7. result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat,
8. introduce disease that may cause the species to decline, or
9. interfere substantially with the recovery of the species.

3.2.3 Critically endangered and endangered ecological communities

An action 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:

1. reduce the extent of an ecological community,
2. fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines,
3. adversely affect habitat critical to the survival of an ecological community,
4. 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,
5. 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,
6. cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
    i. assisting invasive species, that are harmful to the listed ecological community, to become established, or
    ii. 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, or
7. interfere with the recovery of an ecological community.

3.2.4 Migratory species

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

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species,
- result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

3.3 Summary Findings of the Assessment of Significance

Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment that is affected, and upon the intensity, duration, magnitude and geographic extent of the impacts (DoE 2013a). Importantly, for a 'significant impact' to be 'likely', it is not necessary for a significant impact to have a greater than 50% chance of happening; it is sufficient if a significant impact on the environment is a real or not a remote chance or possibility (DoE 2013a). This advice has been considered while undertaking the assessments.

The conclusion of each assessment of significance under the EPBC Act are presented **Table 3-1** for threatened entities and **Table 3-2** for migratory and marine species. In summary, three threatened flora and three migratory/marine species may be significantly impacted by the Project.

Table 3-1 Summary of assessment of significance findings for threatened entities

EPBC listed entity	Assessment of significance criteria (EPBC Act)									Important population+	Likely significant impact
	1	2	3	4	5	6	7	8	9		
Threatened ecological communities											
Natural Grasslands of the Murray Valley Plains (critically endangered)	N	N	N	N	N	N	N	-	-	No	No
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions (endangered under BC Act)	N	N	N	N	N	N	N	-	-	No	No
Threatened flora											
Austrostipa metatoris (vulnerable)	N	N	N	N	N	N	N	N	N	No	No
Austrostipa wakoolica (endangered)	N	N	N	N	N	N	N	N	N	No	No
Brachyscome papillosa (vulnerable)	Y	Y	N	Y	Y	Y	Y	N	Y	Possible	**Yes**
Lepidium monoplocoides (endangered)	N	Y	N	N	Y	Y	Y	N	Y	Possible	**Yes**
Maireana cheelii (vulnerable)	Y	Y	N	Y	Y	Y	Y	N	Y	Possible	**Yes**
Solanum karsense (vulnerable)	N	N	N	N	N	N	N	N	N	No	No
Swainsona murrayana (vulnerable)	Y	Y	N	Y	Y	Y	Y	N	Y	Possible	Yes
Threatened fauna											
Southern Whiteface (vulnerable)	N	N	N	N	N	N	N	N	N	No	No
Australasian Bittern (endangered)	N	N	N	N	N	N	N	N	N	No	No
Sharp-tailed Sandpiper (vulnerable)	N	N	N	N	N	N	N	N	N	No	No

EPBC listed entity	Assessment of significance criteria (EPBC Act)									Important population+	Likely significant impact
	1	2	3	4	5	6	7	8	9		
Curlew Sandpiper (critically endangered)	N	N	N	N	N	N	N	N	N	No	No
Brown Treecreeper (south-eastern subspecies) (vulnerable)	N	N	N	N	N	N	N	N	N	No	No
Grey Falcon (vulnerable)	N	N	N	N	N	N	N	N	N	No	No
Painted Honeyeater (vulnerable)	N	N	N	N	N	N	N	N	N	No	No
White-throated Needletail (vulnerable)	N	N	N	N	N	N	N	N	N	No	No
Swift Parrot (critically endangered)	N	N	N	N	N	N	N	N	N	No	No
Major Mitchell's Cockatoo (eastern subspecies) (endangered)	N	N	N	N	N	N	N	N	N	No	No
Hooded Robin (south eastern) (endangered)	N	N	N	N	N	N	N	N	N	No	No
Blue-winged Parrot (vulnerable)	N	N	N	N	N	N	N	N	N	No	No
Plains Wanderer (critically endangered)	N	N	N	N	Y	N	N	N	N	No	No
Superb Parrot (vulnerable)	N	N	N	N	N	N	N	N	N	No	No
Australian Painted Snipe (endangered)	N	N	N	N	N	N	N	N	N	No	No
Common Greenshank (endangered)	N	N	N	N	N	N	N	N	N	No	No
Diamond Firetail (vulnerable)	N	N	N	N	N	N	N	N	N	No	No
Southern Bell Frog (vulnerable)	N	N	N	N	N	N	N	N	N	No	No
Grey Snake (endangered)	N	N	N	N	N	N	N	N	N	No	No
Threatened aquatic fauna											
Silver Perch (critically endangered)	N	N	N	N	N	N	N	N	N	No	No
Murray Cod (vulnerable)	N	N	N	N	N	N	N	N	N	No	No

Notes: Y= Yes (negative impact), N= No (no or positive impact), X= not applicable, ?= unknown impact.
+ An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

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

Table 3-2 Summary of assessment of significance findings for migratory and marine species

Migratory/Marine species	EPBC Act status	Important habitat*	Likely significant impact
Fork-tailed Swift	Marine; Migratory (CAMBA, JAMBA, ROKAMBA)	No	No
Sharp-tailed Sandpiper	Marine; Migratory (EPBC Act, Bonn, CAMBA, JAMBA, ROKAMBA)	No	Yes

Migratory/Marine species	EPBC Act status	Important habitat*	Likely significant impact
Curlew Sandpiper	Marine; Migratory (EPBC Act, Bonn, CAMBA, JAMBA, ROKAMBA)	No	No
Pectoral Sandpiper	Marine; Migratory (EPBC Act, Bonn, JAMBA, ROKAMBA)	No	No
Black-eared Cuckoo	Marine	No	No
Gull-billed Tern	Marine, Migratory (EPBC Act, CAMBA)	Possible	**Yes**
White-bellied Sea-Eagle	Marine	No	No
White Throated Needletail	Marine, Migratory (EPBC Act, CAMBA, JAMBA, ROKAMBA)	No	No
Caspian Tern	Marine, Migratory (EPBC Act, JAMBA)	Possible	**Yes**
Swift Parrot	Marine	No	No
Rainbow Bee-eater	Marine	No	No
Blue-winged Parrot	Marine	No	No
Australian Painted Snipe	Marine	No	No
Wood Sandpiper	Marine, Migratory (EPBC Act, Bonn, CAMBA, JAMBA, ROKAMBA)	No	No
Common Greenshank	Marine, Migratory (EPBC Act, Bonn, CAMBA, JAMBA, ROKAMBA)	No	No

Notes: CAMBA = China-Australia Migratory Bird Agreement, JAMBA = Japan-Australia Migratory Bird Agreement, ROKAMBA = Republic of Korea-Australia Migratory Bird Agreement, Bonn = Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II)

*The Significant Impact Guidelines (DoE 2013a) define an area of 'important habitat' for a migratory species as:

- Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or
- Habitat that is of critical importance to the species at particular life-cycle stages, and/or
- Habitat utilised by a migratory species which is at the limit of the species range, and/or
- Habitat within an area where the species is declining.

Appendix A. LoO assessment

Table A-1 Known or potentially occurring TECs in the Project area

Name	BC Act	EPBC Act	Data Source - Presence	Likelihood of Occurrence in the Project area
Weeping Myall Woodlands	-	Endangered	PMST – Likely	**Low** No PCTs associated with the TEC are mapped within the Project area, based on preliminary ground-truthing vegetation surveys. Suitable habitat is present in the surrounding areas beyond the Project area. Preliminary vegetation surveys did not identify any areas of this TEC across the Project area.
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	-	Endangered	BioNet PMST – May	**Low** No PCTs associated with the TEC are mapped within the Project area, based on preliminary ground-truthing vegetation surveys . Suitable habitat is present in the surrounding areas beyond the Project area. Preliminary vegetation surveys did not identify any areas of this TEC across the Project area.
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	-	Endangered	BioNet PMST – May	**Low** No PCTs associated with the TEC are mapped within the Project area, based on preliminary ground-truthing vegetation surveys. Suitable habitat is present in the surrounding areas beyond the Project area. Preliminary vegetation surveys did not identify any areas of this TEC across the Project area.
Natural Grasslands of the Murray Valley Plains	-	Critically Endangered	BioNet	**Moderate** Associated PCTs 44, 45 and 46 are mapped across the Project area, based on preliminary ground-truthing vegetation surveys. Vegetation survey required to determine presence. Preliminary vegetation surveys identified areas of PCT 44, 45 and 46, however Project area located on northern

Name	BC Act	EPBC Act	Data Source - Presence	Likelihood of Occurrence in the Project area
				boundary of known TEC range. As such, only southern extent of associated PCTS consistent with the TEC listing.
Plains mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions	-	Critically Endangered	BioNet PMST – Likely	**Low** No PCTs associated with the TEC are mapped within the Project area, based on preliminary ground-truthing vegetation surveys. Suitable habitat is present in the surrounding areas beyond the Project area. Preliminary vegetation surveys did not identify any areas of this TEC across the Project area.
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	Endangered	Listed on FPAL. Currently under assessment.	BioNet	**Moderate** Associated PCT 28 mapped across the Project area, based on preliminary ground-truthing vegetation surveys. Vegetation survey required to determine presence. Preliminary vegetation surveys identified areas of PCT 28 potentially consistent with TEC within the Project area and Disturbance area.

Table A-2 Known or potentially occurring threatened, marine and migratory species in the Project area

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
Flora						
Austrostipa metatoris (A spear grass)	V	V	Most records occur in the Murray Valley with sites including Cunninyeuk Station, Stony Crossing, Kyalite State Forest (now part of Murrumbidgee Valley Regional Park) and Lake Benanee. Scattered records also occur in central NSW including Lake Cargelligo, east of Goolgowi, Condobolin and southwest of Nymagee. Otherwise only known from near Bordertown in southeast South Australia, where it may be locally extinct. Grows in sandy areas of the Murray Valley; habitats include sandhills, sand ridges, undulating plains, and flat open mallee country, with red to red-brown clay-loam to sandy-loam soils.	PMST – May	Associated with PCT 28.	**Moderate** Suitable habitat for the species is present across sandhills, records within locality.
Austrostipa wakoolica (A spear grass)	E	E	Confined to the floodplains of the Murray River tributaries of central-western and south-western NSW, with localities including Manna State Forest, Matong, Lake Tooim, Merran Creek, Tulla, Cunninyeuk and Mairjimmy State Forest (now part of South-West Woodland Nature Reserve). Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine Forest on low sandy range; and a low, rocky rise.	PMST – May	Alluvial plains and plains. South of the Murrumbidgee River. Associated with PCTs 17 and 28.	**Moderate** Suitable habitat for the species is present across sandhills, records within locality.
Brachyscome papillosa (Mossgiel Daisy)	V	V	The Mossgiel Daisy is endemic to NSW and chiefly occurs within the Riverina Bioregion, from Mossgiel in the north, Murrumbidgee Valley (Yanga) National Park in the southwest to Urana in the southeast. Sites are scattered across this Bioregion including the Jerilderie area, the Hay Plain (Maude and Oxley) and around Darlington Point. In addition, there are a number of records from the Willandra Lakes World Heritage Area (including Mungo National Park) with a north-western outlier at Byrnedale Station, north of Menindee. The only known site on the South West Slopes is Ganmain Reserve. Recorded primarily in clay soils on Bladder Saltbush (*Atriplex vesicaria*) and Leafless Bluebush (*Maireana aphylla*) plains, but also in grassland	PMST – Known BioNet – 3,719	Associated with PCTs 13, 15, 24, 44, 45, 46, 153, 157, 160, 163, 164 and 216.	**High** Suitable habitat for the species is present in the Cypress Pine forests, with records within the Project area. Suitable chenopod shrubland and grassland habitat occurs in the Project area.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
			and in Inland Grey Box (*Eucalyptus microcarpa*) - Cypress Pine (*Callitris* spp.) woodland.			
Calotis moorei (Moore's Burr-daisy)	E	E	Moore's Burr-daisy is an erect to ascending perennial herb to 45 cm high. All but one of the specimens of Moore's Burr-daisy have been collected from Mt Mulyah, west of Louth, NSW. Moore's Burr-daisy occurs on red-brown fine sand in relatively flat areas on upper areas of low sandhills. This species has been found growing among a large population of the closely related species *Calotis cymbacantha*. Other populations of *C. cymbacantha* observed tended to occur in open areas away from stands of trees or shrubs.	BioNet - 42	-	**Low** Project area located outside of known species distribution, to the east of known populations.
Lepidium monoplocoides (Winged Peppercress)	E	E	Widespread in the semi-arid western plains regions of NSW. Occurs on seasonally moist to waterlogged sites, on heavy fertile soils, with a mean annual rainfall of around 300-500 mm. Predominant vegetation is usually an open woodland dominated by *Allocasuarina luehmannii* (Bulloak) and/or eucalypts, particularly *Eucalyptus largiflorens* (Black Box) or *Eucalyptus populnea* (Poplar Box). The field layer of the surrounding woodland is dominated by tussock grasses. Recorded in a wetland-grassland community comprising *Eragrostis australasicus, Agrostis avenacea, Austrodanthonia duttoniana, Homopholis proluta, Myriophyllum crispatum, Utricularia dichotoma* and *Pycnosorus globosus*, on waterlogged grey-brown clay. Also recorded from a Maireana pyramidata shrubland.	PMST – Known BioNet – 133	Associated with PCTs 13, 15, 24, 45, 46, 153, 160, 163, 216.	**Moderate** Suitable habitat in waterlogged and swamp areas, several records within the locality, most recent from 2023.
Maireana cheelii (Chariot Wheels)	V	V	Restricted to the southern Riverina region of NSW, mainly in the area between Deniliquin and Hay. Usually found on heavier, grey clay soils with *Atriplex vesicaria* (Bladder Saltbush). Recorded on the Hay Plain in *Atriplex vesicaria, Maireana aphylla* and *Acacia homalophylla* shrublands. Soils include heavy brown to red-brown clay-loams, hard cracking red clay, other heavy texture-contrast soils. Tends to grow in shallow depressions, often on eroded or scalded surfaces, and does not extend to the higher soils in the habitat. It has been found on the edges of bare, windswept claypans, in shallow depressions of	BioNet – 1,032 PMST – Known	Heavy grey clay soils and claypans or shallow depressions West of Darlington Point, west of Jerilderie. Associated with PCTs 44, 46, 157, 164.	**High** Suitable habitats and soil conditions present, many records within the Project area.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
			eroded surfaces where rainwater collects and on a "shelf" in the crabhole complex of heavy grey soils.			
Solanum karsense (Menindee Nightshade)	V	V	Menindee Nightshade is a species of Solanum endemic to NSW, restricted to the far south-western plains, extending up the Darling River to the Menindee and Wilcannia districts. Mainly restricted to the area between the Darling and Lachlan Rivers. Localities include Kars Station, Lake Tandou, Lake Cawndilla, Oxley area, between Broken Hill and Menindee, and the Darling River. It has been recorded from Kinchega National Park and Nearie Lake Nature Reserve. Grows in occasionally flooded depressions with heavy soil, including level river floodplains of grey clay with Black Box and Old Man Saltbush, and open treeless plains with solonized brown soils.	PMST - May	Associated with PCTs 13, 15, 17, 24, 153, 160, 166.	**Moderate** Suitable habitat possible in waterlogged areas of Black Box and Oldman Saltbush mapped at the Project area.
Swainsona murrayana (Slender Darling Pea)	V	V	Found throughout NSW, it has been recorded in the Jerilderie and Deniliquin areas of the southern riverine plain, the Hay plain as far north as Willandra National Park, near Broken Hill and in various localities between Dubbo and Moree. The species has been collected from clay-based soils, ranging from grey, red, and brown cracking clays to red-brown earths and loams. Grows in a variety of vegetation types including bladder saltbush, black box and grassland communities on level plains, floodplains and depressions and is often found with *Maireana* species. Plants have been found in remnant native grasslands or grassy woodlands that have been intermittently grazed or cultivated.	BioNet – 239 PMST – Likely	Associated with PCTs 15, 28, 44, 45, 46, 157, 163, 164, 216.	**High** Suitable habitats including Black Box woodlands, **shrublands** and grasslands. Records within the Project area.
Swainsona pyrophila (Yellow Swainson-pea)	V	V	Occurs in the south-western plains regions of NSW and into Victoria and South Australia. The species is distributed in the south-eastern half of SA, along the Murray River valley into north-western Victoria, with isolated occurrences northward. Grows in mallee scrub on sandy or loamy soil, usually found only after fire.	PMST – May	-	**Low** Suitable habitat, including Mallee woodlands, not mapped withing the Project area.
Birds						
Aphelocephala leucopsis	V	-	The Southern Whiteface prefers the drier habitats of southern Australia. In NSW they are found east to about Tenterfield and south-west to the shale areas in the Sydney region. In Victoria they	PMST – Known BioNet - 15	No associated PCTs mapped within the Disturbance area.	**Moderate** Suitable habitat for the species mapped within the

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
(Southern Whiteface)			occur mostly in the drier foothills north of the Divide. Preferred habitats include dry open forests and woodland and inland scrubs of mallee, mulga and saltbush, especially areas with fallen timber or dead trees and stumps.			Project area, including saltbush scrubs. Records within the locality.
Botaurus poiciloptilus (Australasian Bittern)	E	E	Occurs from south-east Queensland to south-east South Australia, Tasmania and the southwest of Western Australia. The Australasian Bittern's preferred habitat is comprised of wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes, and reeds (e.g., Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, Bolboschoenus) or cutting grass (Gahnia) growing over a muddy or peaty substrate.	PMST - Known BioNet – 44	Brackish or freshwater wetlands. Associated with PCTs 11, 12, 17, 24, 160.	**High** Suitable habitat is present in areas of freshwater wetlands. Multiple records across the Project area.
Calidris acuminata (Sharp-tailed Sandpiper)	V		The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh, or other low vegetation; this includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans, and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries, or seashores, and swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. Sometimes they occur on rocky shores and rarely on exposed reefs.	PMST – May BioNet – 10	No associated PCTs mapped within the Disturbance area.	**High** Patches of preferred habitat within the Project area, particularly in areas of freshwater wetland with surrounding shrubland. Recent records in the locality.
Calidris ferruginea	CE	E	The Curlew Sandpiper is distributed around most of the Australian coastline (including Tasmania). It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater	PMST – Likely	Foraging – As per mapped areas.	**Moderate**

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
(Curlew Sandpiper)			wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes, and lagoons on the coast and sometimes inland.		Associated with PCT 24	Suitable habitats present in wetland areas for temporary migration. No records in the Project area
Climacteris picumnus victoriae (Brown Treecreeper) (south-eastern subspecies))	V	V	Endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains. Hollows in standing dead or live trees and tree stumps are essential for nesting.	PMST – May	No associated PCTs mapped within the Project area.	**Moderate** Project area may provide suitable semi-arid woodlands and Wetland habitats.
Falco hypoleucos (Grey Falcon)	V	V	Sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. 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.	PMST – Likely BioNet – 1	Associated with PCTs 11, 13, 15, 17, 24, 28, 44 ,45, 46, 153, 157, 160, 163, 164, 166, 216, 236	**Moderate** Project area may provide suitable semi-arid woodlands, grasslands and arid shrubland habitats. One record within the locality from 1960.
Gallinago hardwickii (Latham's Snipe)	V	-	Recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia. Occurs in permanent and ephemeral wetlands up to 2000 m above sea level (ASL). Non-breeding visitor to south-eastern Australia. Prefers permanent and ephemeral wetlands, usually open, freshwater wetlands with low,	PMST – May BioNet – 1	-	**Low** No preferred habitat within the Project area. Only one record within the locality from 1991.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
			dense vegetation. Sometimes occur in habitats that have saline or brackish water, such as saltmarsh, mangrove creeks, around bays and beaches, and at tidal rivers, although usually only during migration.			
Grantiella picta (Painted Honeyeater)	V	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria, and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema.	PMST – Likely	Mistletoes present at a density of greater than five mistletoes per hectare. Associated with PCTs 11, 13, 15, 28.	**Moderate** May provide suitable semi-arid woodland habitat.
Hirundapus caudacutus (White-throated Needletail)	V	-	The White-throated Needletail is widespread in eastern and south-eastern. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. Further south on the mainland, it is widespread in Victoria, though more so on and south of the Great Divide, and there are few records in western Victoria outside the Grampians and the south west. The White-throated Needletail is generally gregarious when in Australia, sometimes occurring in large flocks, comprising hundreds or thousands of birds, though they are occasionally seen singly, and occasionally occur in mixed flocks with other aerial insectivores. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Although they occur over most types of habitats, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. They also commonly occur over heathland, but less often over treeless areas, such as grassland or swamps. When flying above farmland, they are more often recorded above partly cleared pasture, plantations, or remnant vegetation at the edge of paddocks.	Included based on outcomes of preliminary site surveys which indicated potential suitable habitat.	No associated PCTs mapped within the Disturbance area.	**Moderate** Areas of suitable foraging and aerial habitat present. However, no records within the Project area and located outside of known range.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
Lathamus discolor (Swift Parrot)	CE	E	The swift parrot breeds in Tasmania during the summer and the entire population migrates north to mainland Australia for the winter. Whilst on the mainland the swift parrot disperses widely to forage on flowers and psyllid lerps in eucalypt species, with the majority being found in Victoria and NSW. In NSW they forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions tend to support larger numbers of birds when inland habitats are subjected to drought. Non-breeding birds preferentially feed in inland box-ironbark and grassy woodlands, and coastal swamp mahogany (*E. robusta*) and spotted gum (*Corymbia maculata*) woodland when in flower, otherwise often in coastal forests. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as *Eucalyptus robusta, Corymbia maculata, C. gummifera, E. sideroxylon,* and *E. albens*. Commonly used lerp infested trees include *E. microcarpa, E. moluccana* and *E. pilularis.*	PMST – May	Breeding - as per mapped areas. Associated with PCTs 11, 13, 15, 24.	**Moderate** Foraging habitat present, however no records within the Project area.
Leipoa ocellata (Malleefowl)	V	E	The stronghold for this species in NSW is the mallee in the southwest centred on Mallee Cliffs NP and extending east to near Balranald and scattered records as far north as Mungo NP. West of the Darling River a population also occurs in the Scotia mallee including Tarawi NR and Scotia Sanctuary and is part of a larger population north of the Murray River in South Australia. The population in central NSW has been significantly reduced through land clearance and fox predation and now occurs chiefly in Yathong, Nombinnie and Round Hill NRs and surrounding areas, though birds continue to survive in Loughnan NR. Further east, a population continues to persist in the Goonoo Forest near Dubbo, though the size of this population is unknown. Predominantly inhabit mallee communities, preferring the tall, dense, and floristically rich mallee found in higher rainfall (300-450 mm mean annual rainfall) areas. Utilises mallee with a spinifex understorey, but usually at lower densities than in areas with a shrub understorey. Less frequently found in other eucalypt woodlands,	PMST – May	-	**Low** Suitable habitat for the species was not recorded and species has not been recorded within the locality.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
			such as Inland Grey Box, Ironbark or Bimble Box Woodlands with thick understorey, or in other woodlands such dominated by Mulga or native Cypress Pine species. Prefers areas of light sandy to sandy loam soils and habitats with a dense but discontinuous canopy and dense and diverse shrub and herb layers.			
Lophochroa leadbeateri leadbeateri (Major Mitchell's Cockatoo (eastern))	E	V	Found across the arid and semi-arid inland, from south-western Queensland south to north-west Victoria, through most of South Australia. Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles, and cypress pines. Nesting, in tree hollows, occurs throughout the second half of the year; nests are at least 1 km apart, with no more than one pair every 30 km^2.	PMST – Known	Breeding – Hollow bearing trees, Living or dead tree with hollows greater than 10 cm diameter. No associated PCTs mapped within the Project area.	**Moderate** Suitable habitats present in woodlands and shrublands. Within known species range. However, no records within locality and no associated PCTs mapped within Project area.
Melanodryas cucullata cucullata (Hooded Robin (south-eastern))	E	V	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs, and a ground layer of moderately tall native grasses.	PMST – Likely	Associated with PCTs 11, 13, 15, 28.	**Moderate** Some suitable habitat is present; however, no records are present within the Project area.
Neophema chrysostoma (Blue-winged Parrot)	V	V	The Blue-winged Parrot inhabits a range of habitats from coastal, sub-coastal and inland areas, right through to semi-arid zones. Throughout their range, they favour grasslands and grassy woodlands. They are often found near wetlands both near the coast and in semi-arid zones. Blue-winged Parrots can also be seen in altered environments such as airfields, golf courses and paddocks.	PMST – Known BioNet – 2	No associated PCTs mapped within the Project area.	**High** Suitable habitat is present in wetlands areas, native grasslands, and woodlands, with few records in locality (2014 and 2022).
Pedionomus torquatus (Plains-wanderer)	CE	E	The vast majority (>99%) of records of Plains-wanderers in NSW over the past 30 years come from an area of the western Riverina bounded by Hay and Narrandera on the Murrumbidgee River in the north, the Cobb Highway in the west, the Billabong Creek in the south, and Urana in the east. Plains-wanderers live in semi-arid, lowland native grasslands that typically occur on hard red-brown soils. These grasslands support a high diversity of plant species,	BioNet – 7 PMST – Known	Breeding - as per mapped areas. Associated with PCTs 44, 46.	**Moderate** Few records within the locality, however Project area located outside key habitat range. May provide suitable grassland and arid shrubland habitats.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
			including a number of state and nationally threatened species. Habitat structure appears to play a more important role than plant species composition. Preferred habitat of the Plains-wanderer typically comprises 50% bare ground, 10% fallen litter, and 40% herbs, forbs, and grasses.			
Polytelis swainsonii (Superb Parrot)	V	V	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra, and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward, and Murrumbidgee Rivers where birds are present all year round. It is estimated that there are less than 5,000 breeding pairs left in the wild. Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds' nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South-West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box.	BioNet – 1 PMST – May	Breeding - Living or dead *E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta* with hollows greater than 5 cm diameter; greater than 4 m above ground or trees with a DBH of greater than 30 cm. Associated with PCTs 11, 13, 28, 45, 46.	**Moderate** One record within the locality from 2009, with suitable woodland habitats.
Rostratula australis (Australian Painted Snipe)	E	E	Most records are from the southeast, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. Prefers fringes of swamps, dams, and nearby marshy areas where there is a cover of grasses, lignum, low scrub, or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks, or reeds.	PMST – Known BioNet – 1	Associated with PCTs 11, 13, 17, 24, 160.	**Moderate** Suitable habitat for the species in its migratory route, however, only one record within locality from 1990.
Stagonopleura guttata (Diamond Firetail)	V	V	The Diamond Firetail is endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Not commonly found in coastal districts, though	PMST – Known	No associated PCTs mapped within the Project area.	**Moderate** Suitable habitat is present for the species in wooded areas. However, no records within Project area.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
			there are records from near Sydney, the Hunter Valley, and the Bega Valley. This species has a scattered distribution over the rest of NSW, though is very rare west of the Darling River. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, Mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.			
Tringa nebularia (Common Greenshank)	E	-	The Common Greenshank breeds in the Palaearctic regions and is widespread in Africa, Coastal Asia, the Indian subcontinent, the Philippines, and southern New Guinea. They are common throughout Australia in the summer. Common Greenshanks are found both on the coast and inland, in estuaries and mudflats, mangrove swamps and lagoons, and in billabongs, swamps, sewage farms and flooded crops. Greenshanks arrive in Australia in August and numbers increase slowly until September, with larger numbers arriving until November. Following their arrival, they normally remain in the same location with some local movements. Birds move north again in March and April.	PMST – Likely BioNet – 1	-	**Moderate** Potential patches of preferred habitat within the Project area, few records within the locality.
Mammals						
Nyctophilus corbeni (Corben's Long-eared Bat)	V	V	Overall, the distribution of the southeastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, bulloke (*Allocasuarina leuhmanni*) and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.	PMST – May	-	**Low** Minor areas of suitable habitat for the species present within the Project area. No records within the locality.
Amphibians						
Litoria raniformis	V	E	The Growling Grass Frog's range has declined over time with the most pronounced decline evident in NSW. In NSW and the ACT, the	PMST – Known BioNet – 762	Associated with PCTs 11, 13, 17, 24.	**High**

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
(Southern Bell Frog)			range of the species was centred on the Murray and Murrumbidgee River valleys and their tributaries. The species is currently widespread throughout the Murray River valley and has been recorded from six Catchment Management Areas in NSW: Lower Murray Darling, Murrumbidgee, Murray, Lachlan, Central West, and South East. This species is found mostly amongst emergent vegetation, including *Typha* sp. (bullrush), *Phragmites* sp. (reeds) and *Eleocharis* sp. (sedges), in or at the edges of still or slow-flowing water bodies such as lagoons, swamps, lakes, ponds and farm dams. This species occurs in clays or well-watered sandy soils; open grassland, open forest, and ephemeral and permanent non-saline marshes and swamps; montane eucalypt forest, dry sclerophyll forest in coastal Victoria; steep-banked water edges (like ditches and drains) and gently graded edges containing fringing plants; and formerly, areas of high altitudes.			Suitable habitat for the species is present in the wetlands, dams, creeks, and lakes of the Project area, particularly where emergent vegetation is present. Many records within the Project area
Reptiles						
Aprasia parapulchella (Pink-tailed Legless Lizard)	V	V	The Pink-tailed Legless Lizard is primarily known from the Central and Southern Tablelands and the South Western Slopes, with a confirmed outlier record on the Hay Plains north of Hay. There is a concentration of populations in the Canberra/Queanbeyan Region. Other populations have been recorded near Cooma, Yass, Bathurst, Albury, and West Wyalong. Inhabits sloping, open woodland areas with predominantly native grassy ground layers, particularly those dominated by Kangaroo Grass (*Themeda australis*). Sites are typically well-drained, with rocky outcrops or scattered, partially buried rocks. Not all sites are rocky. For instance, on the Hay Plains the species has been recorded from a disturbed ant's nest in chenopod shrubland and the West Wyalong population occurs in mallee woodland.	PMST – May	Associated with PCTs 157, 164, 216, 236.	**Low** No suitable habitats present, due to lack of rocky grasslands. No records within locality.
Hemiaspis damelii (Grey Snake)	E	E	The Grey Snake has a wide overall range from inland southern NSW to central Queensland, though the distribution is not continuous across this full range and consists of several isolated subpopulations. In NSW the species occupies five geographically discrete subpopulations, predominantly associated with the lower reaches of	PMST – Known BioNet – 5	No associated PCTs mapped within the Disturbance area.	**High** Suitable habitat mapped including permanent wetland areas of creeks,

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
			major westerly flowing rivers, including the Gwydir, Namoi, Castlereagh, Macquarie, Lachlan, and Murrumbidgee River systems. Some NSW subpopulations occur in protected areas including Yanga National Park and Gayini Nimmie-Caira, a property under the management and ownership of the Nari Nari Tribal Council in southern NSW. Subpopulations also occur in two internationally important wetlands, the Gwydir Wetlands, and the Macquarie Marshes, both of which are listed on the Ramsar Convention on Wetlands, as well as in the Great Cumbung Swamp, which is included in the Directory of Nationally Important Wetlands. Floodplains and ephemeral wetlands associated with heavy clay soils are key habitat features for the Grey Snake. In NSW, the Grey Snake's habitat includes the margins of ephemeral wetlands within River Red Gum (*Eucalyptus camaldulensis*) and Black Box (*E. largiflorens*) vegetation communities and Tangled Lignum (*Duma florulenta*) swamps			dams, and lakes. Several records within the locality.
Fish						
Bidyanus bidyanus (Silver Perch)	CE	V (FM Act)	The Silver Perch is a moderate to large, oval-shaped freshwater fish which inhabits the Murray-Darling River system. They are generally found in faster-flowing water including rapids and races, with some evidence suggesting that adults prefer submergent or emergent vegetation.	PMST – Known to occur Atlas of Living Australia (ALA) – 2021 Post-1980 (Lintermans 2023)	-	**High** Have been observed outside of but near the Project area in Tara Creek and Edward River as recently as 2021 (ALA 2024). Multiple observations in the Murrumbidgee River near the Project area since 1980 (Lintermans 2023). No observations recorded within Project area in BioNet. Unlikely to occur in the channels and ephemeral streams within the Disturbance area itself.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
Craterocephalus fluviatilis (Murray Hardyhead)	E	CE (FM Act)	Endemic to the mid and lower Murray-Darling River system in south-eastern Australia. Historically the species occurred as far upstream as Narrandera on the Murrumbidgee River, Wentworth on the lower Darling River, New South Wales; in multiple wetlands near Swan Hill and Mildura in Victoria; sections of the Murray River and its tributaries near Renmark, Swan Reach and the Lower Lakes near the Murray River mouth and lower reaches of Eastern Mount Lofty tributary streams, South Australia. Remnant populations now only occur in the Lower Murray Region and Lower Lakes Region of South Australia. In Victoria, until recently, the Murray Hardyhead is found in Round Lake, Woorinen North Lake, and Cardross Lakes, along with some salt lakes, irrigation channels and creeks in northern Victoria. No viable populations have been found in New South Wales for some time. The species has been recorded in freshwater wetlands in South Australia, although in Victoria, remnant populations of Murray Hardyhead occur in saline habitats. Murray Hardyhead school in open water habitats, preferring relatively salty fringing wetlands in floodplains and lakes. Historically they survived in isolated wetlands on floodplain fringes during dry seasons, dispersing out over the floodplain during wet seasons.	PMST – May occur	-	**Low** Murray Hardyhead have not been observed in the Murrumbidgee River since prior to 1980 (Lintermans 2023). No observations recorded in Murrumbidgee or its tributaries in ALA. No observations recorded in Project area in BioNet.
Galaxias rostratus (Flathead Galaxias)	CE	CE (FM Act)	Flathead Galaxias, also known as Murray jollytail, are a small native fish that are known from the southern part of the Murray Darling Basin. They have been recorded in the Macquarie, Lachlan, Murrumbidgee, and River Murrays in NSW. Despite extensive scientific sampling over the past 15 years there have been very few recorded sightings of Flathead Galaxias. They have not been recorded and are considered locally extinct in the lower Murray, Murrumbidgee, Macquarie, and Lachlan Rivers. The species is now only known from the upper River Murray near Tintaldra and wetland areas near Howlong. Flathead Galaxias are found in still or slow-moving water bodies such as wetlands and lowland streams. The species has been recorded forming shoals. They have been associated with a range of habitats including rock and sandy bottoms and aquatic vegetation.	PMST – May occur Post-1980 (Lintermans 2023)	-	**Low** No records within the Project area based on survey evidence and database searches. The species has predicted distribution within the Project area, however, it hasn't been recorded in 33 years has been suggested that the species is likely to be extinct in the Murrumbidgee catchment (Gillian 2005).

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
Maccullochella macquariensis (Trout Cod)	E	E (FM Act)	The Trout Cod is a riverine species, inhabiting a variety of flowing waters in the mid to upper reaches of rivers and streams. Trout Cod use river positions where large cover, in the form of woody debris and boulders, is present in high quantity, close to deeper water and high surface velocity, further from the riverbank. At present only a few potentially sustainable populations are known; including one in the mid-Murrumbidgee River that has been occasionally recoded breeding in the upper Murrumbidgee and Goulburn Rivers. The most recent recorded citizen observation of Trout Cod in the Murrumbidgee River was in 2023 at Darlington Point, approximately 300 km upstream of the project.	PMST – May occur Pre-1980 (Lintermans 2023)	-	**Low** Murrumbidgee River tributaries and traverse across the north regions of the Project area and provides suitable habitat for the species. However, Trout Cod have been primarily observed well upstream of the Project area.
Maccullochella peelii (Murray Cod)	V	-	The Murray Cod occurs naturally in the waterways of the Murray-Darling Basin (ACT, SA, NSW, and Vic) and is known to live in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers and billabongs.	PMST – Known to occur ALA – 2010, 2019, 2024 Post-1980 (Lintermans 2023)	-	**High** Has recently been observed in the vicinity of the Project area at Nimmie Creek (an anabranch of Murrumbidgee River 10 km from Project area) in 2019, in the Murrumbidgee in Hay in 2010 and 2024 (ALA 2024).
Macquaria australasica (Macquarie Perch)	E	E (FM Act)	The Macquarie Perch is a riverine species that prefers clear water and deep, rocky holes with abundant cover such as aquatic vegetation, large boulders, debris, and overhanging banks. In Victorian parts of the Murray-Darling, only small natural populations remain in the upper reaches of the Mitta Mitta, Ovens, Broken, Campaspe and Goulburn Rivers; translocated populations occur in the Yarra River and Lake Eildon. In NSW, natural inland populations are isolated to the upper reaches of the Lachlan and Murrumbidgee Rivers. Populations of the eastern form are confined to the Hawkesbury-Nepean and Shoalhaven River systems. Translocated populations in	PMST – May occur Pre-1980 (Lintermans 2023)	-	**Low** No recorded observations downstream of Gundagai since after 1980; nearest observations to the Project area are from the late 1800s/early 1900s. Preferred habitat (deep, rocky holes with abundant

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
			NSW are found in the Mongarlowe River, Queanbeyan River upstream of the Googong Reservoir and in Cataract Dam. In the ACT, it is restricted to the Murrumbidgee, Paddy's, and Cotter Rivers.			cover such as aquatic vegetation, large boulders, debris, and overhanging banks (NSW DPI 2016)) may be present in the Murrumbidgee River and Uara Creek, but outside of the Project area.
Migratory species						
Actitis hypoleucos (Common Sandpiper)	Migratory Wetlands	-	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper is wader/shorebird migrating to Australia in summer for its non-breeding period. The species breeds in a variety of habitats near water in Eurasia. When in Australia, the species is more common in the northern half of Australia. This species is widespread in small numbers and has been recorded in a variety of habitats including steep sided sewage ponds and dams, feeding in the shallow edges of inland wetlands, farm dams and lakes. With a preference for environments with standing water, it is noted that the proposed inundation regime will potentially improve and extend suitable foraging habitat for this species.	PMST – May	-	**Low** No preferred habitat within the Project area. No records within the locality.
Apus pacificus (Fork-tailed Swift)	Migratory Marine Bird	-	Recorded in all regions of NSW. The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 1000 m above ground and probably much higher, seldom recorded on the ground. The species occurs aerially over a wide range of habitats, which vary from rainforests to treeless plains.	PMST – Likely BioNet – 1	-	**Moderate** Potential patches of preferred habitat within the Project area, however, only one record within locality from 2023.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
Calidris acuminata (Sharp-tailed Sandpiper)	Migratory Wetlands, V	-	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh, or other low vegetation; this includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans, and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries, or seashores, and swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. Sometimes they occur on rocky shores and rarely on exposed reefs.	PMST – May BioNet – 10	-	**High** Patches of preferred habitat within the Project area. Recent records in the locality.
Calidris ferruginea (Curlew Sandpiper)	Migratory Wetlands, CE	E	In Australia, Curlew Sandpipers occur around the coasts of all states and are also quite widespread inland, though in smaller numbers. They occur in Australia mainly during the non-breeding period but also during the breeding season when many non-breeding one year old birds remain. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They generally roost on bare dry shingle, shell, or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh and in mangroves.	PMST – Likely	Foraging – as per mapped areas.	**Moderate** Suitable habitats present in wetlands areas for temporary migration. No records in the Project area.
Calidris melanotos	Migratory Wetlands	-	Breeds in northern North America and Siberia and migrates (from late June) to South America and to a lesser extent Australasia. In	PMST – Likely	-	**Moderate**

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
(Pectoral Sandpiper)			NSW, the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains, and artificial wetlands.			Potential patches of preferred habitat within the Project area, however, no records within Project area.
Gallinago hardwickii (Latham's Snipe)	Migratory Wetlands, V	-	Recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia. Occurs in permanent and ephemeral wetlands up to 2000 m ASL. Non-breeding visitor to south-eastern Australia. Prefers permanent and ephemeral wetlands, usually open, freshwater wetlands with low, dense vegetation. Sometimes occur in habitats that have saline or brackish water, such as saltmarsh, mangrove creeks, around bays and beaches, and at tidal rivers, although usually only during migration.	PMST – May BioNet – 1	-	**Low** No preferred habitat within the Project area. Only one record within the locality from 1991.
Gelochelidon nilotica (Gull-billed Tern)	Migratory		Salt marshes, estuaries, lagoons, and ploughed fields, less frequently along rivers, around lakes and in fresh-water marshes. Sandy seacoasts, islands, marshes, rivers, lakes, ploughed fields.	BioNet – 28	-	**High** Many records within the locality. Some suitable habitats within the Project area, more suitable within wider region.
Hirundapus caudacutus (White-throated Needletail)	Migratory	-	The White-throated Needletail is widespread in eastern and south-eastern. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. Further south on the mainland, it is widespread in Victoria, though more so on and south of the Great Divide, and there are few records in western Victoria outside the Grampians and the South West. The White-throated Needletail is generally gregarious when in Australia, sometimes occurring in large flocks, comprising hundreds or thousands of birds, though they are occasionally seen singly, and occasionally occur in mixed flocks with other aerial insectivores. In Australia, the White-throated Needletail is almost exclusively aerial,	-	-	**Moderate** Areas of suitable foraging and aerial habitat present. However, no records within the Project area and located outside of known range.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
			from heights of less than 1 m up to more than 1000 m above the ground. Although they occur over most types of habitats, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. They also commonly occur over heathland, but less often over treeless areas, such as grassland or swamps. When flying above farmland, they are more often recorded above partly cleared pasture, plantations, or remnant vegetation at the edge of paddocks.			
Hydroprogne caspia (Caspian Tern)	Migratory	-	Caspian Terns are found throughout Australasia, North America, Eurasia, and Africa. Caspian Terns are usually found near the coast, in extensive wetlands, on coastal and interior beaches and sheltered estuaries. The Caspian Tern lives equally well in fresh water and saline environments.	BioNet – 17	-	**Moderate** Some suitable habitats, however, not preferred. Multiple records within locality, most recently from 2021.
Motacilla flava (Yellow Wagtail)	Migratory Terrestrial	-	Rare but regular visitor around Australian coast, especially in the NW coast from Broome to Darwin. Found in open country near swamps, salt marshes, sewage ponds, grassed surrounds to airfields, bare ground, and occasionally on drier inland plains. Nearly all Australian records are coastal, with a few widely scattered inland records. Typically forages in damp grassland and on relatively bare open ground at edges of rivers, lakes, and wetlands, but also feeds in dry grassland and in fields of cereal crops.	PMST – May	-	**Low** No preferred habitat within the Project area. No records within the locality.
Myiagra cyanoleuca (Satin Flycatcher)	Migratory Terrestrial	-	Widespread in eastern Australia and vagrant to New Zealand. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.	PMST – May	-	**Low** No preferred habitat within the Project area. No records within the locality.
Tringa glareola (Wood Sandpiper)	Migratory	-	Breeds in bogs and marshes in open coniferous and mixed forests. Migrants and wintering birds occur in varied wetland habitats, especially with grassy and other vegetation cover. Walks in shallow water, picking with its bill	BioNet – 3		**Moderate** Suitable habitat surrounding dams, wetlands, and swamps.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
						Recent records within the locality (2020).
Tringa nebularia (Common Greenshank)	Migratory Wetlands, E	-	The Common Greenshank breeds in the Palaearctic regions and is widespread in Africa, Coastal Asia, the Indian subcontinent, the Philippines, and southern New Guinea. They are common throughout Australia in the summer. Common Greenshanks are found both on the coast and inland, in estuaries and mudflats, mangrove swamps and lagoons, and in billabongs, swamps, sewage farms and flooded crops. Greenshanks arrive in Australia in August and numbers increase slowly until September, with larger numbers arriving until November. Following their arrival, they normally remain in the same location with some local movements. Birds move north again in March and April.	PMST – Likely BioNet – 1	-	**Moderate** Potential patches of preferred habitat within the Project area, one record within the locality from 1989.
Marine Species						
Actitis hypoleucos (Common Sandpiper)	Marine	-	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper is wader/shorebird migrating to Australia in summer for its non-breeding period. The species breeds in a variety of habitats near water in Eurasia. When in Australia, the species is more common in the northern half of Australia. This species is widespread in small numbers and has been recorded in a variety of habitats including steep sided sewage ponds and dams, feeding in the shallow edges of inland wetlands, farm dams and lakes. With a preference for environments with standing water, it is noted that the proposed inundation regime will potentially improve and extend suitable foraging habitat for this species.	PMST – May	-	**Low** No preferred habitat within the Project area. No records within locality.
Apus pacificus (Fork-tailed Swift)	Overfly Marine	-	Recorded in all regions of NSW. The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 1000 m above ground and probably much higher, seldom recorded on the ground.	PMST – Likely BioNet – 1	-	**Moderate** Potential patches of preferred habitat within the Project area, however, only

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
			The species occurs aerially over a wide range of habitats, which vary from rainforests to treeless plains.			one record within the locality.
Bubulcus ibis (Cattle Egret)	Overfly Marine	-	The Cattle Egret is widespread and common according to migration movements and breeding localities surveys. The Cattle Egret occurs in tropical and temperate grasslands, woodlands, and terrestrial wetlands. It has occasionally been seen in arid and semi-arid regions however this is extremely rare.	PMST – May	-	**Low** No preferred habitat within the Project area. No records within locality.
Calidris acuminata (Sharp-tailed Sandpiper)	Marine, V	-	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh, or other low vegetation; this includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans, and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries, or seashores, and swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. Sometimes they occur on rocky shores and rarely on exposed reefs.	PMST – May BioNet – 10	-	**High** Patches of preferred habitat within the Project area. Recent records in the locality.
Calidris ferruginea (Curlew Sandpiper)	Overfly Marine, CE	E	In Australia, Curlew Sandpipers occur around the coasts of all states and are also quite widespread inland, though in smaller numbers. They occur in Australia mainly during the non-breeding period but also during the breeding season when many non-breeding one year old birds remain. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with	PMST - Likely	Foraging – as per mapped areas. Associated with PCT 24.	**Moderate** Suitable habitats present in wetlands areas for temporary migration. No records in the locality.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
			bare edges of mud or sand. They generally roost on bare dry shingle, shell, or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh and in mangroves.			
Calidris melanotos (Pectoral Sandpiper)	Overfly Marine	-	Breeds in northern North America and Siberia and migrates (from late June) to South America and to a lesser extent. In NSW, the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains, and artificial wetlands.	PMST - Likely	-	**Moderate** Potential patches of preferred habitat within the Project area, however, no records within the locality.
Chalcites osculans (Black-eared Cuckoo)	Overfly Marine	-	The Black-eared Cuckoo is widespread on mainland Australia, but avoids the wet, heavily forested areas on the east coast and the south-west corner of Western Australia. It is found in drier country where species such as mulga and mallee form open woodlands and shrublands	PMST - Known	-	**Moderate** Suitable habitat is present, however there are no records of the species within the locality.
Gallinago hardwickii (Latham's Snipe)	Overfly Marine	-	Recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia. Occurs in permanent and ephemeral wetlands up to 2000 m ASL. Non-breeding visitor to south-eastern Australia. Prefers permanent and ephemeral wetlands, usually open, freshwater wetlands with low, dense vegetation. Sometimes occur in habitats that have saline or brackish water, such as saltmarsh, mangrove creeks, around bays and beaches, and at tidal rivers, although usually only during migration.	PMST – May BioNet – 1	-	**Low** No preferred habitat within the Project area. Only one record within the locality from 1991.
Gelochelidon nilotica (Gull-billed Tern)	Marine	-	Salt marshes, estuaries, lagoons, and ploughed fields, less frequently along rivers, around lakes and in fresh-water marshes. Sandy seacoasts, islands, marshes, rivers, lakes, ploughed fields.	BioNet – 28		**High** Many records within the locality. Some suitable habitats within the Project

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
						area, more suitable within wider region.
Haliaeetus leucogaster (White-bellied Sea-Eagle)	Marine	V	The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea.	PMST - Known	Breeding - Living or dead mature trees within suitable vegetation within 1 km of a rivers, lakes, large dams or creeks, wetlands, and coastlines. Associated with PCT 24.	**High** Suitable terrestrial habitat exists, with several waterways running across or adjacent to the Project area.
Hirundapus caudacutus (White-throated Needletail)	Migratory	-	The White-throated Needletail is widespread in eastern and south-eastern. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. Further south on the mainland, it is widespread in Victoria, though more so on and south of the Great Divide, and there are few records in western Victoria outside the Grampians and the south west. The White-throated Needletail is generally gregarious when in Australia, sometimes occurring in large flocks, comprising hundreds or thousands of birds, though they are occasionally seen singly, and occasionally occur in mixed flocks with other aerial insectivores. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Although they occur over most types of habitats, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. They also commonly occur over heathland, but less often over treeless areas, such as grassland or swamps. When flying above farmland, they are more often recorded above partly cleared pasture, plantations, or remnant vegetation at the edge of paddocks.	-	-	**Moderate** Areas of suitable foraging and aerial habitat present. However, no records within the Project area and located outside of known range.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
Hydroprogne caspia (Caspian Tern)	Marine	-	Caspian Terns are found throughout Australasia, North America, Eurasia, and Africa. Caspian Terns are usually found near the coast, in extensive wetlands, on coastal and interior beaches and sheltered estuaries. The Caspian Tern lives equally well in fresh water and saline environments.	BioNet – 17	-	**Moderate** Some suitable habitats, however, not preferred. Multiple records within locality.
Lathamus discolor (Swift Parrot)	Overfly Marine, CE	E	The swift parrot breeds in Tasmania during the summer and the entire population migrates north to mainland Australia for the winter. Whilst on the mainland the swift parrot disperses widely to forage on flowers and psyllid lerps in eucalypt species, with the majority being found in Victoria and NSW. In NSW they forage in forests and woodlands throughout the coastal and western slopes regions each year. Coastal regions tend to support larger numbers of birds when inland habitats are subjected to drought. Non-breeding birds preferentially feed in inland box-ironbark and grassy woodlands, and coastal swamp mahogany (*E. robusta*) and spotted gum (*Corymbia maculata*) woodland when in flower, otherwise often in coastal forests. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as *Eucalyptus robusta, Corymbia maculata, C. gummifera, E. sideroxylon,* and *E. albens*. Commonly used lerp infested trees include *E. microcarpa, E. moluccana* and *E. pilularis.*	PMST – May	Breeding – as per mapped areas.	**Moderate** Foraging habitat present, however no records within the Project area.
Merops ornatus (Rainbow Bee-eater)	Overfly Marine	-	The Rainbow Bee-eater is distributed across much of mainland Australia and occurs on several near-shore islands. The species mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation.	PMST - May	-	**Moderate** Suitable habitat present, however no records within the locality.
Motacilla flava (Yellow Wagtail)	Overfly Marine	-	Rare but regular visitor around Australian coast, especially in the NW coast Broome to Darwin. Found in open country near swamps, salt marshes, sewage ponds, grassed surrounds to airfields, bare ground, occasionally on drier inland plains. Uncommon migratory wagtail. Nearly all Australia records are coastal, with a few widely scattered	PMST – May	-	**Low** No preferred habitat within the Project area. No records within the locality.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
			inland records. Typically forages in damp grassland and on relatively bare open ground at edges of rivers, lakes, and wetlands, but also feeds in dry grassland and in fields of cereal crops.			
Myiagra cyanoleuca (Satin Flycatcher)	Overfly Marine	-	Widespread in eastern Australia and vagrant to New Zealand. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.	PMST – May	-	**Low** No preferred habitat within the Project area. No records within the locality.
Neophema chrysostoma (Blue-winged Parrot)	Overfly Marine, V	-	The Blue-winged Parrot inhabits a range of habitats from coastal, sub-coastal and inland areas, right through to semi-arid zones. Throughout their range, they favour grasslands and grassy woodlands. They are often found near wetlands both near the coast and in semi-arid zones. Blue-winged Parrots can also be seen in altered environments such as airfields, golf courses and paddocks.	PMST – Known BioNet – 2	-	**High** Suitable habitat is present in wetlands areas, native grasslands, and woodlands, with two records in locality.
Rostratula australis (Australian Painted Snipe)	Overfly Marine, E	E	Most records are from the southeast, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. Prefers fringes of swamps, dams, and nearby marshy areas where there is a cover of grasses, lignum, low scrub, or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks, or reeds.	PMST – Known BioNet – 1	Associated with PCTs 24	**Moderate** Suitable habitat for the species in its migratory route, however, only one record within locality from 1990.
Tringa glareola (Wood Sandpiper)	Marine	-	Breeds in bogs and marshes in open coniferous and mixed forests. Migrants and wintering birds occur in varied wetland habitats, especially with grassy and other vegetation cover. Walks in shallow water, picking with its bill.	BioNet – 3	-	**Moderate** Suitable habitat surrounding dams, wetlands, and swamps. Recent records within the locality.
Tringa nebularia (Common Greenshank)	Overfly Marine, E	-	The Common Greenshank breeds in the Palaearctic regions and is widespread in Africa, Coastal Asia, the Indian subcontinent, the Philippines, and southern New Guinea. They are common throughout Australia in the summer. Common Greenshanks are found both on the coast and inland, in estuaries and mudflats, mangrove swamps and lagoons, and in billabongs, swamps, sewage farms and flooded crops. Greenshanks arrive in Australia in August and numbers	PMST – Likely BioNet – 1	-	**Moderate** Potential patches of preferred habitat within the Project area, one record within the locality.

Scientific Name (Common Name)	EPBC Act	BC Act	Distribution and Habitat Requirements	Data source	Habitat constraints and geographic limitations	Likelihood of occurrence
			increase slowly until September, with larger numbers arriving until November. Following their arrival, they normally remain in the same location with some local movements. Birds move north again in March and April.			

V = Vulnerable, E = Endangered, CE = Critically Endangered

Appendix B. Assessments of Significance

B.1 Threatened Ecological Communities

Table B.1.1 Natural Grasslands of the Murray Valley Plains (Critically Endangered)

Name of TEC	Natural Grasslands of the Murray Valley Plains

Ecology

The Natural Grasslands of the Murray Valley Plains ecological community is a type of natural temperate grassland that has semi-arid characteristics, due to the lower rainfall where it occurs across parts of NSW and Vic. The structure is an open grassland to forbland in which trees and tall shrubs are sparse to absent. The structure is an open grassland to forbland in which trees and tall shrubs are sparse to absent. It is currently estimated that the TEC covers across some 153,000-168,000 ha of land within NSW and Vic (TSSC 2012b).

The vegetation is dominated by the ground layer with range of perennial grasses, forbs, and small shrubs. Characteristic genera present typically include *Rytidosperma* (formerly *Austrodanthonia*), *Austrostipa, Chloris, Enteropogon, Arthropodium, Bulbine, Calotis, Chrysocephalum, Leptorhynchos, Minuria, Ptilotus, Rhodanthe, Sida, Swainsona, Atriplex* and *Maireana* (DSEWPaC 2012). Past and present grazing pressure as well as drought and rainfall patterns influence the composition of the community, and as such, some species may not always be evident above-ground, but instead exist in the seedbank (TSSC 2012b).

Most occurrences of the community are associated with Quaternary alluvial sediments on heavy-textured grey, brown and red clay soils (TSSC 2012b).

The community has reduced in extent significantly since pre-European settlement. In NSW, it has reduced in extent from about 500,000 hectares (ha) to about 120,000 ha, or in the order of 76% (TSSC 2012b). Australia wide (NSW and Vic), it is estimated to have reduced from about 1,227,000 ha to about 153,000-168,000 ha, a decline of about 86 to 87.5% across its range (TSSC 2012b). However, it is likely the extent which is in good condition is considerably lower with the actual extent approaching a reduction of 90% or more. It is estimated between 20-73% of the associated PCTs have been cleared within the Riverina bioregion.

The current mapped distribution of this critically endangered ecological community (CEEC) is situated towards the southern extent of the Project area and extends further south into the Riverina. There is marginal crossover between mapped grassland areas and the fringes of the community's distribution towards the south of the Project area. These several small patches of Riverine Plain Grassland are consistent with the listing criteria of the Natural Grasslands of the Murray Valley Plains CEEC and corresponds to the following Plant Community Types (PCTs):

- Forb-rich Speargrass - Windmill Grass - White Top grassland of the Riverina Bioregion (PCT 44)
- Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion (PCT 45)
- Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion (PCT 46).

As such, whilst patches of these associated PCTs are located across the northern portions of the Project area, are not considered consistent with this community as they occur well outside its known distribution.

All patches of grassland have been exposed to historical and ongoing grazing pressures, with the degree of disturbance varying across the Project area. However, a combination of the current grazing regime and favourable climatic factors have resulted with a near intact grassland condition across the landscape with no to minimal perennial weed cover.

Name of TEC	Natural Grasslands of the Murray Valley Plains

The CEEC is considered present if it meets the key diagnostic characteristics and condition thresholds in the listing advice (TSSC 2012b). In November and December 2023, Jacobs' ecologists undertook preliminary vegetation assessments to determine the overall condition of vegetation across the Project area. Vegetation assessments were conducted using rapid data collection points, recording the number of diagnostic native plant species found at a sample point across the Project area. Grassland broad condition states were delineated into three categories, moderate to good, low to moderate and low using criteria from the listing advice (TSSC 2012b) to determine listing status of the CEEC. This assessment found that most of the Riverine Plain Grassland is in moderate to high condition in the Project area.

At the time of writing this assessment no comprehensive plot-based surveys had been conducted. Based on preliminary mapping, the justification of the community is provided in **Table B.1.1.1,** as defined by the requirements of Section 5 "Key Diagnostic Characteristics and Condition Thresholds" in the Approved Conservation Advice (TSSC 2012b).

Table B.1.1.1 Justification against the Key Diagnostic Characteristics and Condition Thresholds framework

Condition	Assessment
Step 1: key diagnostic characteristics to identify if the ecological community is present	
Distribution is primarily in the Riverina Bioregion and the Wimmera plains of the Murray Darling Depression Bioregion. Other outlying occurrences are also in the Murray Darling Depression Bioregion and the NSW South Western Slopes Bioregion. The approximate northern limit of the ecological community is in the Murrumbidgee subregion (IBRA RIV2), approximately near the northern boundary of the Murray Catchment Management Authority (CMA) in NSW.	The Project area is within the Riverina Bioregion and the Murrumbidgee subregion.
It typically occurs on a landscape of flat alluvial lowland plains with heavy-textured grey, brown and red clays	The Project area comprises flat alluvial lowland plains with heavy-textured grey, brown and red clay soils
The ecological community is typically dominated by a range of perennial grasses and/or forbs or co-dominated by small shrubs. Sites are not necessarily dominated by any particular plant species. Characteristic genera present typically include *Rytidosperma, Austrostipa, Chloris, Enteropogon, Arthropodium, Bulbine, Calotis, Chrysocephalum, Leptorhynchos, Minuria, Ptilotus, Rhodanthe, Sida, Swainsona, Atriplex* and *Maireana*	Although plot-based surveys have not been completed, preliminary vegetation mapping and observations have noted species including *Rytidosperma, Austrostipa, Chloris, Enteropogon, Ptilotus, Rhodanthe, Sida, Swainsona, Atriplex* and *Maireana* in the patches.
Trees and large shrubs (>1 m tall) are generally absent to sparse, amounting to less than 10% projective foliage cover for emergent trees or shrubs. Where tree and large shrub species are present, they may often include *Acacia oswaldii* (umbrella wattle), *A. pendula* (weeping myall, boree), *Allocasuarina luehmannii* (buloke) and *Eucalyptus spp.* from intergrading communities. Where woodlands overlap or adjoin with the ecological community, they are not included as part of the Natural Grasslands of the Murray Valley Plains. The outer boundary for these adjacent ecological communities should be defined as two times the canopy width of the dominant tree species.	Although plot-based surveys have not been completed, preliminary vegetation mapping and observations have noted sparse to absent tree cover across grassland areas.
In addition to the vegetation and other characteristics, above, presence of the ecological community may also be indicated by the presence or past records of 'diagnostic' indicator fauna species in the patch, such as the plains-wanderer, striped legless lizard, hooded scaly-foot or curl snake.	No diagnostic fauna species were observed during field surveys; however, desktop-based database searches and previous records have indicated a moderate likelihood of Plains Wanderer (*Pedionomus torquatus*) across the Project area.
Step 2: Determine condition of the ecological community	
For all patches of the ecological community: ▪ The percentage cover of native vascular plants (annual and perennial) in the patch is greater than the percentage cover of perennial exotic species; and	Although plot-based surveys have not been completed, preliminary vegetation mapping and observations have noted high native cover and few weeds.

Name of TEC	Natural Grasslands of the Murray Valley Plains
▪ Either category A or category B thresholds are met as below.	
<u>Category A: For patches with high diversity or that are relatively undisturbed.</u> This recognises that many patches of the ecological community can maintain their diversity despite the highly fragmented nature of the community or small patch sizes: Ground layer diversity and lack of disturbance: ▪ *A1:* 15 or more native vascular plant species are present in the patch; and ▪ *A2:* The patch contains one or more indicator species in Table 2 (for the full list, refer to (TSSC 2012b), characteristic of sites that are relatively undisturbed (e.g. have little to no history of cultivation); and Patch size: ▪ *A3.* The size of the grassland patch is at least 0.04 ha or more in size (i.e., at least 400 m^2 or a 20 m x 20 m square or equivalent area in any shape).	Although plot-based surveys have not been completed, preliminary observations have noted that it is possible some patches may have a diversity of 15 vascular plants or more. Patches estimated to be greater than 400 m^2.
<u>Category B: For larger patches that have good ground layer diversity</u> This applies where patches of the ecological community do not meet the high diversity or lack of disturbance criteria in Category A, but still retain sufficient elements of their natural diversity. Ground layer diversity: ▪ *B1:*10 or more native vascular plant species are present in the patch; and Patch size: ▪ *B2:* The size of the grassland patch is at least 1ha or more in size (i.e., at least 10,000 m^2 or a 100 m x 100 m square or equivalent area in any shape).	Although plot-based surveys have not been completed, preliminary observations have noted that it is likely most patches would have a diversity of 10 vascular plants or more. Patches are at least 1 ha.
Conclusion	
Although plot-based surveys have not been completed, preliminary vegetation mapping and observations indicate that it is highly likely the vegetation meets the requirements of the Natural Grasslands of the Murray Valley Plains ecological community. As such, it has been assumed for the purpose of this assessment that vegetation located in the southern extent of the Project area (south of Sturt Highway) currently mapped as PCT 44, 45 and 46, in all conditions, are consistent with this TEC. However, whilst patches of this TEC are likely present across southern portions of the Project area, as the Disturbance area has been designed to avoid mapped TECs, the overall impact to this TEC is considered to be negligible.	
1. Reduce the extent of an ecological community	
In NSW, this TEC has reduced in extent from about 500,000 ha to about 120,000 ha, or in the order of 76% (TSSC 2012b). Australia wide (NSW and Vic), it is estimated to have reduced from about 1,227,000 ha to only 153,000-168,000 ha, a decline of about 86 to 87.5% across its range (TSSC 2012b). However, it is likely the extent which is in good condition is considerably lower with the actual extent approaching a reduction of 90% or more. Given the relatively small extent of the community across the Project area, and as the Disturbance area has been designed to avoid impacts on the TEC, an overall reduction in extent on a local or regional scale is not expected.	
2. Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	
Patches of the community exist amongst a fragmented landscape between cropping and irrigated land. Within the Project area, patches of the community are relatively sparse towards the southern portions, where	

Name of TEC	Natural Grasslands of the Murray Valley Plains

the associated PCTs meet the condition requirements for the TEC listing. The Disturbance area has been designed to avoid areas of the TEC and as such the Project would not result in fragmentation of any substantial patches of the community, nor will it increase fragmentation in the landscape.

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

Habitat critical to the survival of the community comprises flat alluvial lowland plains with heavy-textured grey, brown and red clays within the Riverina Bioregion and the Wimmera plains of the Murray Darling Depression Bioregion (TSSC 2012b). Critical habitat for the survival of the community also includes areas that contain the floristic structure and patch size requirements in the listing (TSSC 2012b).

Whilst the mapped areas within the Project area meet condition requirements for consideration as critical habitat, the Disturbance area has been designed to avoid mapped TECs and given the limited coverage of this community across the Project area, critical habitat would not be affected.

4. 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 construction of access roads across the Project area to facilitate construction activities and operational maintenance may alter the hydrology of the surrounding landscapes. Although designs of the roads are not yet developed, it is has been assumed for the purpose of this assessment that they will be elevated in some areas to avoid flooding and support accessibility in high rainfall events. This may change the hydrology of the Project area by increasing water runoff from hard stand areas and increasing flooding in lower areas bound by elevated roads. However, the potential impacts are expected to be localised and, due to the topography, are not considered to cause substantial alteration of surface water drainage patterns.

Additionally, drainage structures will be included to prevent large scale changes. The impact and threat of changed hydrology is briefly mentioned in the conservation advice (DSEWPaC 2012, TSSC 2012b), however not discussed in detail. As such, the potential impacts of changed hydrology are unknown.

Furthermore, within the Project area this community comprises a very small percentage of the total area, and in addition is located outside of primary construction areas. As such, whilst the development of access roads within and across the Project area may impact surface water drainage patterns, it is unlikely to have an impact on the TEC based on distance of the community from works and Project design which avoids known TECs.

5. 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 Project is not expected to cause a substantial change in the species composition of grassland vegetation. The Disturbance area has been designed to avoid known areas of the TEC, as such will not require any direct vegetation clearance. As a grassland, species composition would not be directly altered in areas outside the Disturbance area, as the community does not have a tree canopy, and the infrastructure will not cause substantial shading and negative impacts on ground cover plant species.

As such, the Project is not considered to have a significant impact on species composition of the Natural Grasslands of the Murray Valley Plains.

6. Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
    a. assisting invasive species, that are harmful to the listed ecological community, to become established, or

Name of TEC	Natural Grasslands of the Murray Valley Plains
b. 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.	

As discussed above, the construction of access roads has the potential to alter the hydrology of the community due to increased runoff and flooding and as a result, the increased risk of weed incursion beyond road corridors and verges. Additionally, if future changes to the surrounding land use occur, particularly if cropping and grazing is increased, it may amplify movement of weeds and pollutants across the landscape.

During construction and operation, the movement of vehicles and equipment has the potential to introduce weeds and pathogens to the Project area, however given current movement of livestock and machinery across the Project area, this is considered low during construction and a negligible risk during operation due to the level of vehicle movement existing within the Project area.

7. Interfere with the recovery of an ecological community

There is no federal recovery plan for the community. The conservation advice (DSEWPaC 2012) sets out recommended priority recovery and threat abatement actions to support the recovery of the community. Relevant to the Project, the following recovery actions would be impacted:

- Protect and conserve remnants of the ecological community. Further clearance, disturbance and fragmentation of this ecological community should be avoided.
- Identify remnants of high conservation priority, with a focus on small scale linkages and habitat connectivity as many grassland fauna and flora are unable to move across larger landscape-scale barriers.
- Ensure infrastructure works, maintenance activities (e.g., road works) or development activities involving substrate or vegetation disturbance in areas where the Natural Grasslands of the Murray Valley Plains ecological community occurs do not adversely impact on known occurrences.
- Manage any changes to natural hydrology that may adversely impact on the ecological community.

The current turbine layout is generally in a standard linear arrangement, however, has been adapted to avoid impacts to mapped TECs within the Disturbance area.

As such, given distance from primary construction activities, and footprint designs which limit incursion on mapped TECs to the Project area, the Project is not considered likely to interfere with the recovery of the community.

Conclusion

The current Project design would not require the removal of vegetation within the community, as the Disturbance area has avoided mapped areas of this CEEC.

While the construction of permanent access roads throughout Project area has the potential to cause indirect impacts including changes to hydrology and increased weed incursion, given the distance of the mapped areas of CEEC from primary construction activities and connection of the community to larger landscape patches outside the Project area, the Project is not considered to have a significant impact on this CEEC.

Table B.1.2 Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions (Endangered BC Act, currently under assessment for EPBC Act listing)

Name of TEC	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions

Ecology

Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions TEC typically occupies red-brown loamy sands with alkaline sub-soils on the alluvial plain of the Murray River and its tributaries, and on parts of the sandplain in south-western NSW. Sandhill Pine Woodland is characterised by an open tree canopy dominated by *Callitris glaucophylla*, with a sometimes sparse, but highly variable ground layer dominated by grasses and herbs, sometimes with scattered shrubs and/or small trees. The structure and species composition of the community varies depending on disturbance history and temporal variability in rainfall (NSW TSSC 2011).

Characteristic genera present typically include *Atriplex semibaccata*, Austrostipa spp, *Crassula* spp, *Allocasuarina luehmannii*, *Erodium crinitum*, *Paspalidium constrictum*, *Sida corrugate*, *Senecio quadridentatus.* The structure of the community varies depending on past and current disturbances, particularly clearing, logging, grazing and soil erosion (NSW TSSC 2011).

Sandhill Pine Woodland has been recorded in the far south-western portion of the NSW South Western Slopes bioregion near Urana, extending through the Riverina bioregion, from the Urana – Narranderra district in the east, into the southern part of the Murray-Darling Depression bioregion, as far west as the South Australian border (NSW TSSC 2011).

All patches of potentially associated PCTs are located within the southern portions of the Project area and have been exposed to historical and ongoing grazing pressures. Several PCTs are associated with this TEC, one of which was recorded within the Project area:

- White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone (PCT 28)

In November and December 2023, Jacobs' ecologists undertook preliminary vegetation assessments to determine the overall condition of vegetation across the Project area. Vegetation assessments were conducted using rapid data collection points, recording the number of diagnostic native plant species found at a sample point across the Project area. Results of the preliminary surveys confirmed the presence of PCT 28 within the Project area, however targeted plot based surveys to confirm TEC presence have not yet been completed. Whilst this TEC is not currently listed under the EPBC Act, it has been nominated by the TSSC for endangered listing within the current October 2023 FPAL. As such, has been included within this assessment pending final decision for listing on 30 April 2025.

Patches of this TEC are likely present across southern portions of the Project area and within the Disturbance area, the overall impact to PCTs associated with this TEC is approximately 12.79 ha.

1. Reduce the extent of an ecological community

Sandhill Pine Woodland has undergone a large reduction in its geographic distribution as a consequence of clearing for cropping and pasture improvement, with a likely reduction in distribution by 40-75% and fragmentation of remaining stands (NSW TSSC 2011). Most of the remaining stands of Sandhill Pine Woodland are degraded by overgrazing, which has resulted in simplification of community structure, changes in species composition, invasion of weeds and soil erosion.

Given the relatively small extent of the community across the Project area, and as the Disturbance area has been designed to largely avoid impacts on TECs, despite clearance of approximately 12.79 ha of PCTs consistent with this community, an overall reduction in extent on a local or regional scale is not expected.

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

Name of TEC	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions

Patches of the community exist amongst a fragmented landscape between cropping and irrigated land. Within the Project area, patches of the community are relatively sparse towards the southern portions, where the associated PCT 28 potentially meets the condition requirements for the TEC listing.

The Disturbance area has been designed to largely avoid areas of TECs, however would require the removal of approximately 12.79 ha. Given the relatively small area of clearance within the larger Disturbance area and suitable habitat in surrounding landscapes, the Project would not result in fragmentation of any substantial patches of the community, nor will it increase fragmentation in the landscape.

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

Throughout its distribution, the community typically occurs on red-brown sandy loams. In the Riverina and NSW South Western Slopes bioregions, these soils are associated with the beds of prior streams or source-bordering dunes adjacent to streams and lake beds, which are restricted and distinctive landforms on the extensive riverine plain and form critical habitat for the community (NSW TSSC 2011).

Critical habitat for the survival of the community also includes areas that contain the floristic structure and patch size requirements in the listing.

Whilst the mapped areas within the Project area meet condition requirements for consideration as critical habitat, given the limited coverage of this community across the Project area, critical habitat would not be affected.

4. 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 construction of access roads across the Project area to facilitate construction activities and operational maintenance may alter the hydrology of the surrounding landscapes. Although designs of the roads are not yet developed, it has been assumed for the purpose of this assessment that they will be elevated in some areas to avoid flooding and support accessibility in high rainfall events. This may change the hydrology of the Project area by increasing water runoff from hard stand areas and increasing flooding in lower areas bound by elevated roads. However, the potential impacts are expected to be localised and, due to the topography, are not considered to cause substantial alteration of surface water drainage patterns.

Additionally, drainage structures will be included to prevent large scale changes. As such, potential impacts of changed hydrology are unlikely.

Furthermore, within the Project area this community comprises a very small percentage of the total area, and in addition is located outside of primary construction areas. As such, whilst the development of access roads within and across the Project area may impact surface water drainage patterns, it is unlikely to have an impact on the TEC based on distance of the community from primary works.

5. 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 Project is not expected to cause a substantial change in the species composition of community vegetation. The Disturbance area has been designed to largely avoid known areas of the TEC, however, will require approximately 12.79 ha of direct vegetation clearance.

Due to the infrastructure consistent with a windfarm changes, installation of wind turbines is not considered likely to cause substantial shading and negative impacts on ground cover plant species. Additionally,

Name of TEC	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions

following the completion of the proposed development, regular clearance, burning or harvesting of flora is unlikely with remaining patches.

As such, the Project is not considered to have a significant impact on species composition of the Sandhill Pine Woodlands.

6. Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
    c. assisting invasive species, that are harmful to the listed ecological community, to become established, or
    d. 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.

During construction and operation, the movement of vehicles and equipment has the potential to introduce weeds and pathogens to the Project area, however considering the current movement of livestock on the property, this is considered a minor increased risk during construction and a negligible risk during operation due to the level of vehicle movement.

As discussed above, the construction of access roads has the potential to alter the hydrology of the community due to increased runoff and flooding and as a result, the increased risk of weed incursion beyond road corridors and verges. Additionally, if future changes to the surrounding land use occur, particularly if cropping and grazing is increased, it may amplify movement of weeds and pollutants across the landscape.

7. Interfere with the recovery of an ecological community

There is no federal recovery plan for the community. The current NSW final determination indicates clearing for cropping and pasture improvement as a major cause for the community's reduction in distribution and fragmentation.

As such, whilst the Project has potential to contribute to a KTP for the TEC, given footprint designs which have aimed to limit incursion on mapped TECs to the Project area, and small percentage of clearance within larger Disturbance area, the Project is not considered likely to interfere with the recovery of the community.

Conclusion

The current Project design would require the removal of approximately 12.79 ha of PCT 28, which is associated with this community. The construction of permanent access roads throughout Project area has the potential to cause indirect impacts including changes to hydrology and increased weed incursion.

However, given the distance from primary construction activities and connection of the community to larger landscape patches outside the Project area, the Project is not considered to have a significant impact on this EEC.

Additionally, to note, this community is not currently listed as a TEC under the EPBC Act, however, has been included within this assessment as is currently on the FPAL as nominated by the TSSC. The current assessment completion date for EPBC Act endangered community listing of the TEC is 30 April 2025. Based on outcomes of the listing decision, further assessment is potentially required to determine impacts of the proposed actions on this TEC.

B.2 Critically Endangered Species

Table B.2.1 Curlew Sandpiper (*Calidris ferruginea*)

Name of Threatened Species	Curlew Sandpiper (*Calidris ferruginea*)

Ecology

Curlew sandpiper is 18-23 cm long, have a wingspan of 38-41 cm, and weigh approximately 57 g. Their bill is long, black and decurved, with a finely pointed tip. Males and females appear similar; however, females are slightly larger and have a longer bill. In breeding plumage, females also have a slightly paler chestnut-coloured underbody, with more white feathers and darker barring. The species shows marked seasonal variation, and juveniles are distinctive from adults (DoE 2015c).

The Curlew Sandpiper is distributed around most of the Australian coastline (including Tasmania). It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes, and lagoons on the coast and sometimes inland.

Curlew sandpiper often feed in mixed flocks with other species of shorebirds, pecking at invertebrates on the surface of the mud or making shallow probes below its surface. They generally forage within mudflats and nearby shallow water. In non-tidal wetlands, they usually wade, mostly in water 15–30 mm, but up to 60 mm deep. In intertidal areas, they forage at the edge of shallow pools and drains, and along sandy shores, often following the receding tide to forage near the water edge. They also feed on part of the mudflats that have been exposed for a longer period, foraging in small groups. Occasionally they forage on wet mats of algae or waterweed, or on banks of beach cast seagrass or seaweed. At high tide, the species tends to forage among low sparse emergent vegetation such as saltmarsh, and sometimes within flooded paddocks or inundated salt flats (DoE 2015c).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). Within the Project area, these comprise PCT 24 for the Curlew Sandpiper. Overall, across the Disturbance area the impact to PCTs associated with this species is approximately 0.25 ha.

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

The Curlew Sandpiper first arrives in south-east Australia following the breeding season in late August, but the majority do not arrive until September. There are currently an estimated 40,100 mature individuals in the wild with a continuing declining trend (DoE 2015c), with a significant reduction in population numbers over the past three generations. Given the highly migratory nature of the species, the individuals which migrate from breeding grounds in Asia overland via the coast of China and south-east Asia to Australia are considered a single population.

During the non-breeding season, the Curlew Sandpiper forages and roosts across exposed sandy or soft mud substrates on intertidal flats and beaches as well as within inland wetlands when conditions are suitable. Based on current Project design, construction and operational activities are unlikely to impact suitable foraging and roosting habitat within the Disturbance area, especially given high quality habitat in surrounding areas.

However, given the migratory nature of the species and number of turbines to occupy the air area in which individuals would routinely traverse, there is potential for operating turbines to result in fatalities from blade collision. However, considering the low frequency and densities of the populations potentially utilising the Project area and the low chance of strike occurrences, the potential risk of collision impacts is considered low.

As such, the Project is not considered to lead to a long term decrease in the size of the population.

2. Reduce the area of occupancy of the species

The current area of occupancy (AOO) is estimated at 8,000 km^2 (DoE 2015c). Despite the continuing degradation of global wetland habitats, this AOO is considered stable.

Current Project design includes a buffer around existing wetlands, watercourses, and woodland habitats. As such, no waterbodies or wetlands would be impacted during construction phase of the Project. Minor areas of shrubland wetland and swamps could potentially be impacted during the development of access tracks or temporary set-down areas, however, would be minimal. Especially as these areas would not be preferred for access/storage, given seasonal inundation. In addition, majority of the wetlands and creeks within the Project area are connected to larger high quality water habitats including the Murrumbidgee River to the north, which provides additional suitable habitat for the Curlew Sandpiper.

As such, the Project is not considered to reduce the AOO of the species.

3. Fragment an existing populations into two or more populations

As mentioned above, given the migratory nature of the species, which involves the annual migration from Asia to Australia, these individuals are considered one population.

During operation, the location of turbines could potentially impact migratory route across the area, however, is not considered likely to fragment the existing population which migrates to Australia.

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

Habitat critical to the survival of the species, as outlined within the conservation advice (DoE 2015c), refers to areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal,
- For the long-term maintenance of the subspecies (including the maintenance of species essential to the survival of the Curlew Sandpiper, such as macrobenthos),
- To maintain genetic diversity and long-term evolutionary development, or
- For the re-introduction of populations or recovery of the species.

In Australia, a large network of sites is required during the non-breeding season for the species to cope with natural and human-driven environmental changes. Habitat critical to the survival of Curlew Sandpipers includes a mosaic of feeding and roosting habitat. The species may be highly selective about foraging environments due to its specialised feeding techniques.

No Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat.

As the Disturbance area has been developed to avoid areas of habitat potentially utilised by the species (i.e., waterways and wetlands), as such critical habitat is unlikely to be adversely affected by the Project.

5. Disrupt the breeding cycle of a population

The Curlew Sandpiper arrives in Australia following the breeding season, which occurs in Siberia and Asia, to forage and roost. As the Project will not impact any breeding grounds or habitats, there is considered to be a limited impact the breeding cycle of the population. However, suitable foraging and availability of foraging habitat is necessary to ensure a return migration to breeding grounds.

As the Project would not result in the removal of wetland habitat, or incursion on suitable habitat across the area, as well as availability of high-quality habitat in surrounding areas, the impact to breeding cycle is considered low.

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

Whilst the Disturbance area has been developed to avoid areas of habitat potentially utilised by the species, changes to surface hydrology in the surrounding Project areas (i.e., road and access track development, clearing of native vegetation), could potentially result in temporary impacts to water quality from sediment runoff and altered flood patterns.

However, the habitat provided by the Project area is not preferred, with inland wetlands only used when conditions are suitable. In addition, additional high quality wetland habitat is available in the surrounding area, from floodplains of the Murrumbidgee to the north and Ramsar wetlands further to the south.

As such, the Project is not considered likely to decrease the availability of quality habitat for the species to the extent that it is likely to decline.

7. 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 invasion of mudflats and coastal saltmarshes by mangroves and cordgrass (*Spartina alterniflora*) are considered key threats to populations of Curlew Sandpiper (DoE 2015c). Whilst the threat of cordgrass is most prevalent within mainland China, it has also become established in Australia and New Zealand. It generally grows seaward from the edge of marshes, facilitating the accumulation of sediment, and eventually replacing open tidal flats with dense, elevated *S. alterniflora* marshes. The prolific growth of *S. alterniflora* reduces the availability of foraging and roosting habitat for shorebirds and hinders their movement through the environment (DoE 2015c).

During construction and operation, the movement of vehicles and equipment has the potential to introduce weeds and pathogens to the Project area. This is considered to be a minor risk during construction and a negligible risk during operation due to the level of vehicle movement.

As discussed above, the construction of access roads has the potential to alter the hydrology of the Project area due to increased runoff and flooding and as a result, the increased risk of weed incursion beyond road corridors and verges. Additionally, if future changes to the surrounding land use occur, particularly if cropping and grazing is increased, it may amplify movement of weeds and pollutants across the landscape.

However, surrounding land use and weed management practices are unlikely to change following construction, with agricultural practices including invasive weed management strategies continued. As a result, the Project is unlikely to result in further establishment of invasive species.

8. Introduce disease that may cause the species to decline, or

Disease is not considered a key threat for the species. The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Project area, however, this is considered a minor risk.

9. Interfere with the recovery of the species.

There are no adopted or made recovery plans for the species. However, the conservation advice (DoE 2015c) lists the following primary conservation objectives:

- Minimise further loss of habitat critical to the survival of Curlew Sandpiper throughout Australia (including habitat predicted to become habitat critical in the future because of climate change).
- Prevent further declines in curlew sandpiper populations by working with relevant Range States to address threats in the East Asian-Australasian Flyway.

Additional conservation and management strategies have been detailed to address the key threats for the species, including habitat loss, climate change, severe weather impacts, human disturbance, and hunting. As

the Project would not result in the loss of suitable habitat for the species, the interference with the recovery of the species is not likely.

Conclusion

The Project would only result in the removal of approximately 0.25 ha of suitable foraging habitat for the Curlew Sandpiper, and as such no direct impacts are expected. The risk of turbine strike on the species is considered low and operational impacts would be monitored in an adaptive bird and bat monitoring program.

As such, the Project is not likely to have a significant impact on the Curlew Sandpiper.

Table B.2.2 Plains Wanderer (*Pedionomus torquatus*)

Name of Threatened Species	Plains Wanderer (*Pedionomus torquatus*)

Ecology

The Plains Wanderer is a small quail-like bird standing about 12-15 cm tall and weighing 40-95 g. They have straw-yellow legs and bills, and their plumage is mainly fawn with fine black rosettes. The female is larger and distinguished by a prominent white-spotted black collar above a rich rufous breast patch (DoE 2015b).

It occurs in scattered sites of 50 to 600 ha in central NSW, Victoria and south-west QLD, which encompass the core sites for the species (DoE 2015b). Most records are now in a single population within the Riverina. Its habitat comprises sparse, treeless, lowland native grasslands which usually occur on hard red-brown clay soils. It prefers a grassland structure with about 50% bare ground, 10% leaf litter and 40% herbs, forbs and grasses (DoE 2015b). Most vegetation less than 5cm in height and some widely spaced plants up to 30cm. It is occasionally recorded in nearby vegetation of low cereal crops and in low, sparse chenopod shrubland (DoE 2016).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). Within the Project area, these comprise PCTs 44 and 46 for the Plains Wanderer. Whilst suitable habitat PCTs are mapped within the Project area, the current known distribution and important habitat is located further to the east of the Project area. Overall, across the Disturbance area the impact to PCTs associated with this species is approximately 180.5 ha. However, no current known populations or important habitat are located within the Project area or Disturbance area.

As a ground dwelling bird, impacts of turbine strike and barotrauma are not considered relevant.

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

The Plains Wanderer within the broader Riverina region is considered to comprise a subpopulation of the species at about 800 birds, with possibly less than 250 in dry years (NSW Scientific Committee 2009). The extent of this population occupies suitable habitats of the greater Riverina region extending to the foothills of the Snowy Mountains north-west through the Murrumbidgee River catchment area to the flat dry inland plains of Hay and Carrathool (DoE 2015b).

Several records of the Plains Wanderer have been noted across the locality of the Project area, however, remain outside of mapped important habitat range. Areas of potential habitat (i.e., grasslands) will remain across the Project area following construction, largely to the southern and northern portions of the Project area. These suitable habitats are largely outside the Disturbance area, including below and around turbines and other infrastructure. Areas where suitable vegetation requires removal would result in direct impacts from habitat loss and a low expected increase in risk of vehicle strikes throughout the expected construction period.

The population size is susceptible to fluctuations associated with environmental conditions as no breeding may occur in years of drought and breeding success can also be very low in years of heavy rainfall (DoE 2016). Additionally, as the estimated generation length is three years (Garnett and Crowley 2000), the

Name of Threatened Species	Plains Wanderer (*Pedionomus torquatus*)

construction duration of approximately 3 years commencing in early 2028, may disturb breeding activities for three seasons, for low number of birds.

Considering the location of the proposed works well outside the mapped important habitat areas for the Plains Wanderer, it is considered that whilst possible Plains Wanderer may inhabit areas of suitable habitat across the Project area, works are unlikely to lead to change in population numbers in the region. Additionally, post construction, if present, the species is considered likely to persist in the Project area given the low impact activity associated with an operational wind farm.

2. Reduce the area of occupancy of the species

AOO represents the area of suitable habitat currently occupied by the species. The AOO is estimated at 330 km^2 (National Environmental Science Program Threatened Species Research Hub 2019). However, during very wet or dry years, the proportion of suitable habitat can drop considerably further (NSW NPWS 2002).

The Project would likely result in the clearance of patches of preferred habitat (grasslands) to the north of the Project area. This would remove habitat important for all stages of the species lifecycle (i.e., breeding, foraging). However, as grasslands located towards the southern extent of the Project area are likely consistent with the EPBC Act listed Natural Grasslands of the Murray Valley Plains TEC, impacts in these areas have been avoided by the Disturbance area. Additionally, it is important to note that habitat loss is associated with a series of small footprints over a large area, and the species is considered able to persist in the Project area given the low impact activity associated with an operational wind farm and the extent of habitat that will remain.

As such, the Project is not likely to reduce the AOO of the species.

3. Fragment an existing populations into two or more populations

As discussed above, the population is considered to comprise suitable habitats within the whole the Riverina region.

The Project would require the construction of extensive access tracks and easements across the Disturbance area. The access tracks would link the turbines and provide access from external roads. Permanent access tracks would generally have a trafficable width of about 6.5 m . Powerline easements would have lesser impact to grassland habitats, with clearing of about 10 m^2 at each power pole located 200-400 m apart.

As such, the works would not fragment the landscape to a degree in which would separate the population.

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

The National Recover Plan (DoE 2016) for the species specifies that "Habitat critical to the survival of the plains-wanderer includes:

- Any regions where the species is likely to occur; and
- Any newly discovered locations that extend the likely range of the plains-wanderer."

In the Riverina, this critical area comprises "the area bounded by the Cobb Highway between Deniliquin and Willandra National Park to the west, Narrandera and Urana to the east, and Billabong Creek to the south".

This comprises an area of about 25,000 km^2. The entire area of occurrence for the species in Australia is about 526,000 km^2 (National Environmental Science Program Threatened Species Research Hub 2019). The entirety of the Project area is located to the west of this critical habitat area. As such, the removal of any suitable vegetation would not impact critical habitat for the species.

5. Disrupt the breeding cycle of a population

Name of Threatened Species	Plains Wanderer (*Pedionomus torquatus*)

It is unknown how long individuals live in the wild, however in captivity they have been recorded at up to eight years of which they are capable of breeding in the first year (DoE 2016). Breeding success is often linked to environmental conditions in which they may be no breeding in years of drought years and success can also be very low in years of heavy rainfall (DoE 2016). A clutch of usually four eggs is laid in spring, with a second clutch laid in summer or autumn if summer rains fall with incubation taking 23 days (NSW Scientific Committee 2009). Additionally, the estimated generation length is three years (Garnett and Crowley 2000).

As such, with construction expected to commence in early 2028 and take about 3 years to complete it is possible that construction activities would temporarily disturb breeding activities for two seasons due to direct (vegetation clearing, excavations) and indirect impacts (e.g., noise, vibration, and dust).

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

The Project would potentially remove 180.36 ha of preferred habitat, primarily towards the northern extent of the Disturbance area. As the species inhabits grassland habitats, it is unlikely aerial components of the Project (i.e., transmission lines and turbine blades) would impact the species (except for the footings of the poles which is included in the vegetation removal estimation above).

Movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds and pathogens into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk.

However, it is important to note that the habitat loss is associated with a series of small footprints over a large area, and the species is considered likely to persist in the Project area over the long-term given the minimal impacts associated with an operational wind farm and the extent of habitat that will remain, especially beyond the boundaries of the Project area.

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

Foxes and cats are known to be present in the Project area and are considered to already be established. Within the grassland habitat of the Plains Wanderer, predation by foxes is considered to be a threat (DoE 2015b).

Additionally, movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk.

8. Introduce disease that may cause the species to decline, or

Disease is not considered a key threat for the species. The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Project area, however, this is considered a minor risk.

9. Interfere with the recovery of the species.

Strategies for the national recovery (DoE 2016) of the Plains wanderer are to:

- Develop and implement a robust, targeted conservation breeding strategy for the Plains Wanderer.
- Facilitate management of grazing regimes, and improve knowledge of appropriate burning regimes, to maintain suitable habitat for the Plains Wanderer.
- Enhance protection, improve the quality, and increase the extent of habitat suitable for the Plains Wanderer.

Name of Threatened Species	Plains Wanderer (*Pedionomus torquatus*)

- Identify the key factors that have contributed to the significant recent declines in the numbers of Plains Wanderers and develop mitigation measures to address these threats.
- Improve understanding of the distribution and population trends of the Plains Wanderer.
- Increase community participation in Plains Wanderer conservation and management.

Of these strategies and their associated actions, the Project would impact the strategy "Enhance protection, improve the quality and increase the extent of habitat suitable for the Plains Wanderer". However, as discussed above the clearance of suitable habitat would not consist of clearance of mapped important habitat areas or critical habitat for the species.

The Project would potentially require the removal of small, isolated patches of suitable habitat for the species. However, as grassland habitat within the southern portions of the Project area has been largely avoided by current Disturbance area design and location of the Project outside of critical and important habitat for the species, the works are not considered likely to interfere with the recovery of the species.

Conclusion

The Project would require the removal of approximately 180.36 ha of suitable grassland habitat for the species within the Disturbance area. This vegetation removal would also increase risk of vehicle strikes, and to a minor extent, predation, and the risk of weed and pathogen encroachment through movement of vehicles and machinery during construction.

These areas would be located predominantly across the northern ranges of the Disturbance area, which are widely connected to the broader landscape. Additionally, any habitat loss within the Disturbance area is associated with a series of small footprints over a large area. The species is considered likely to persist in the Project area over the long-term given the low impact activity associated with an operational wind farm and the extent of habitat that will remain.

As such, the Project is unlikely to have a significant impact on the Plains Wanderer.

Table B.2.3 Swift Parrot (*Lathamus discolor*)

Name of Threatened Species	Swift Parrot (*Lathamus discolor*)

Ecology

The Swift Parrot is a small bright green parrot around 25 cm long, with red around the bill, throat, and forehead. The species' crown is blue purple, with red patches under the wing and a distinctive, thin, dark red, 12 cm long tail (TSSC 2016b). The species occurs as a single migratory population, breeding in Tasmania during spring and summer and migrating north to Victoria, eastern NSW, and south-eastern Queensland during the winter months. In NSW, they forage in forests and woodlands throughout coastal and western slopes regions, with a higher concentration in coastal areas during periods of inland drought (Saunders and Tzaros 2011).

Key habitats in mainland Australia for the species include eucalypt forests and woodlands with species such as Mugga Ironbark, Swamp Mahogany, Grey Box, Yellow Box and Blackbutt – with limiting habitat factors including the production of lerp and nectar food resources. Swift parrots have been found to preferentially forage in large, mature trees (Saunders and Tzaros 2011).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). Within the Disturbance area, these comprise PCT 11, 13, 15 and 24 for the Swift Parrot. Overall, across the Disturbance area the impact to PCTs associated with this species is approximately 0.25 ha.

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

Name of Threatened Species	Swift Parrot (*Lathamus discolor*)

The Swift Parrot is considered to have a single population across Australia (Saunders and Tzaros 2011). The Swift Parrot is migratory, with the entire population travelling between Tasmania for breeding to mainland Australia in non-breeding periods.

No recent estimations of population size are available, with population estimates from 2010 indicating that the Swift Parrot has a population of about 2,000 individuals (TSSC 2016b).

There are no historical records of the Swift Parrot within the locality. There are no mapped important areas (NSW DCCEEW 2024a) for the species within the Disturbance area. The closest mapped areas are for the Swift Parrot are approximately 250 km to the east near Mangoplah and Wagga Wagga.

During construction, the Project would impact areas of PCT 24, however additional suitable foraging habitats including PCTs 11, 13 and 15 have been avoided in the current Project design. The species demonstrate high site fidelity and are known to regularly return to the same sites, however can move in repose to feeding resources (TSSC 2016a).

During operation, there is a risk of direct strikes to birds from the moving turbines. Flight heights of the Swift Parrot are unknown; however, they are assumed to fly most frequently below the Rotor Sweep Area (RSA) based on the follow reasoning. Firstly, other birds of a similar size and ecology are typically recorded only below the RSA, including Fuscous Honeyeater, Yellow-faced Honeyeater, Singing Honeyeater, Red-rumped Parrot and Blue Bonnet. Secondly, the maximum heights of canopy tree species in the Project area (*Eucalyptus camaldulensis* and *Eucalyptus largiflorens*) are 45 m. It has been assumed for the purpose of this assessment that movement between patches would be above the canopy, as such between about 50 m to 70 m.

As a migratory species often fly at high heights when traveling distances, the Swift Parrot has a higher collision risk to the higher turbines. Higher flying migratory routes and altitudes are unknown (Saunders and Tzaros 2011), however it is possible the Project area is not a highly trafficked migratory route as it is on the western extent of the species range. Nevertheless, estimations for modelling Swift Parrot risk to strikes at exiting windfarms, has suggested that at a 95% avoidance rate (the 'worst case scenario' which was modelled), strike rates are between 0.00002 to 0.019 strike related deaths per year (Smales et al. 2013). For context, cumulatively across all the 35 Australian windfarms modelled in 2005, about one bird would be killed every 10 years. Additionally, to date, no recorded collisions with Swift Parrot have occurred. As such, considering the low frequency and densities of the populations potentially utilising the Project area and the low chance of strike occurrences, the risk of potential risk of collision impacts is considered low.

As such, is it unlikely the Project would lead to a long-term decrease in the size of the Swift Parrot population.

2. Reduce the area of occupancy of the species

AOO represents the area of suitable habitat currently occupied by the species. The AOO for the Swift Parrot was estimates at between 18.5 km^2 to 355 km^2, which likely fluctuates between years based on the choice and availability of non-breeding foraging habitat (TSSC 2016a).

The Project design has been developed to avoid areas of wetland and woodland, which comprise suitable foraging habitat for the Swift Parrot, as such, whilst minor areas of suitable habitat require clearance (approximately 0.2 ha), impacts would occur in isolated patches and not expected to impact the AOO of the species.

3. Fragment an existing populations into two or more populations

As discussed above, the Swift Parrot is considered to consist of a single population across Australia. It is a highly mobile species, which migrates to the mainland annually from Tasmania.

The Project would require the clearance of predominantly chenopod shrubland vegetation for access tracks, turbines, and associated infrastructure. Access tracks would generally have a trafficable width of about 6.5 m

Name of Threatened Species	Swift Parrot (*Lathamus discolor*)

and be maintained permanently. Powerline easements would have lesser impact to grassland habitats, with clearing of about 10 m^2 at each power pole located 200-400 m apart.

As such, the works would not fragment the landscape to a degree in which would separate the populations.

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

Critical habitat for the Swift Parrot is defined as "areas with a level of site fidelity or possess phenological characteristics likely to be of importance to the Swift Parrot, or are otherwise identified by the recovery team" (Saunders and Tzaros 2011). The NSW Important Areas Map (NSW DCCEEW 2024a) has been used in here to identify these areas as the mapped areas are associated with high fidelity sites. The closest mapped areas are for the Swift Parrot about 250 km to the east near Mangoplah and Wagga Wagga. This information, supported by the lack of any historical records within the larger locality), suggests that the Project area does not provide critical habitat for the Swift Parrot.

As such, the Project would not adversely affect habitat critical to the survival of the species.

5. Disrupt the breeding cycle of a population

The Swift Parrot breeds on the east and south-east coast of Tasmania in the spring and summer (Saunders and Tzaros 2011). As such, the Project would not directly impact breeding activities of the species.

Potential indirect impacts to breeding involve the possible removal of isolated patches of suitable foraging habitat for the Swift Parrot in non-breeding times. However, as it has been identified that the Project area does not provide critical habitat for the species, it is unlikely that this extent of habitat loss would impact the non-breeding part of the species life cycle.

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

The Project has been designed to largely avoid woodland and wetland areas. The direct impacts are mostly located in shrubland areas which do not provide suitable habitat for the species. However, to facilitate development the Project would potentially require clearance of small patches of suitable foraging habitat for the Swift Parrot. In these areas, it has been assumed for the purpose of this assessment that all vegetation strata would be removed, including canopy trees. Additionally, as detailed above, the Disturbance area is not considered to contain critical habitat for the species.

Movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds and pathogens into habitat edges, however as the majority of construction and operation (maintenance) works would be located in shrubland areas, this is considered a negligible risk to habitat for the Swift Parrot.

As such, the Project is not likely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline.

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

Movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds and pathogens into habitat edges. However, as the majority of construction and operation (maintenance) works would be located in shrubland areas, this is considered a negligible risk to habitat for the Swift Parrot. Moreover, the proliferation of ground-storey weeds, would have little impact to the canopy feeding resources important to the species.

Competition of resources from aggressive birds is a threat to the species. Clearing of any patches of suitable woodland habitat may increase edge effects on already disturbed and small patches of woodland, thus potentially increasing the competitive pressures. Additionally, foxes and cats are known to be present in the

Name of Threatened Species	Swift Parrot (*Lathamus discolor*)

Disturbance area. The predation of cats is a known key threat to the Swift Parrot (Saunders and Tzaros 2011). However, the population of foxes and cats in the Project area are already considered established.

8. Introduce disease that may cause the species to decline, or

Psittacine Beak and Feather Disease (PBFD) is considered a threat to the Swift Parrot (Saunders and Tzaros 2011). The disease is present Australia wide with early reports dating back to the 1880s (Raidal and Peters 2018). The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Project area, however, it is unlikely that PBFD would be transported via equipment as direct bird contact is considered the main source of transmission (DoEE 2016).

As such, it is unlikely that the Project would introduce disease that may cause the species to decline.

9. Interfere with the recovery of the species.

Key actions for the recovery of the Swift Parrot comprise (Saunders and Tzaros 2011):

1. Identify the extent and quality of habitat.
2. Manage and protect Swift Parrot habitat at the landscape scale.
3. Monitor and manage the impact of collisions, competition, and disease.
4. Monitor population and habitat.
5. Increase community involvement in, and awareness of, the recovery program.
6. Coordinate, review, and report on recovery process

Of the above actions, 2 and 3 are relevant to the Project.

Action 2 includes a relevant measure (2.1a) to "Encourage and support the protection, conservation management and restoration of Swift Parrot nesting and foraging habitat through agreements with landowners, incentive programs and community projects….". Although this measure is directed at the conservation and protection of land, it is considered here in the context of habitat removal. The Project would potentially require minor clearance of small woodland patches which provide suitable foraging habitat for the Swift Parrot, however, is not considered critical habitat.

In Action 3, "collisions" refer to all collisions with human-made objects. The plan notes that collisions with wire netting or mesh fences windows and cars are a cause of mortality in urban areas and that "wind energy turbines may have implications for the conservation of the Swift Parrot where they are poorly sited". As detailed above, the Swift Parrot has a higher collision risk as it is migratory species. However, the presumed importance of the migratory path and the outcomes of previous impact modelling (Smales et al. 2013), indicated that the risk of direct strikes are low. One management measure (3.1a) requires to "Establish and maintain a database for all reported injuries and deaths". To be compliant with the measure of the Plan, an adaptive bird and bat monitoring program will be observed during operation in which recorded strikes will be reported to the Department of Agriculture, Water and the Environment (DAWE).

As such, with the implementation of an adaptive bird and bat monitoring program, the Project is consistent with the species Recovery Plan and would not interfere with the recovery of the species.

Conclusion

The Project would require the removal of approximately 0.25 ha of suitable foraging woodland and tall grassland habitat for the Swift Parrot. However, current Project layout has been designed to largely avoid woodland and wetland areas, with majority of works located on chenopod shrublands. The risk of turbine strike on the species is considered low and operational impacts would be monitored in an adaptive bird and bat monitoring program.

Name of Threatened Species	Swift Parrot (*Lathamus discolor*)
As such, the Project is not likely to have a significant impact on the Swift Parrot.	

Table B.2.4 Silver Perch (*Bidyanus bidyanus*)

Name of Threatened Species	Silver Perch (*Bidyanus bidyanus*)

Ecology

Silver Perch is a long-lived, medium to large-bodied fish. Silver Perch are omnivorous and a river channel specialist with spawning and movements linked to increasing flows. Silver Perch were once widespread across the lowland rivers of the Murray-Darling Basin (MDB); however, the species has suffered significant declines in range and abundance. The mid-Murray River downstream of the Yarrawonga Weir supports the highest relative abundance, but abundances have still declined significantly in this reach.

Silver Perch have not been recorded in the Project area but have been observed in the Murrumbidgee River downstream of the Project, and further downstream in the Murray River. Suitable habitat for Silver Perch may be present in the Fiddlers Creek and Uara Creek, which are partially within the Project area but do not intersect within the disturbance area.

The Silver Perch is found across a variety of habitats in perennial, flowing rivers from large fast flowing river reaches to slower flowing, turbid lowland areas. It can also be found in impoundments and floodplain lakes, but breeding is low in these environments, as the species requires perennial flowing water to complete its life cycle. This species is often found where there are rapids and races. There is some evidence to suggest that the species is associated with submergent or emergent vegetation, but juveniles prefer open water. The species is considered highly mobile throughout all life stages. All life stages are thought to rarely utilise the floodplain.

Spawning occurs in spring and summer following an upstream migration. Spawning is associated with increased water temperatures (>18^{o}C) and may also be associated with increases in discharge or river level. During breeding Silver Perch form schools and are broadcast spawners. It is presumed that eggs then float downstream, and juveniles are dispersed across the catchment downstream of the spawning site (McDowall 1996, SKM 2003, Lintermans 2009, Gilligan 2019a, Koehn 2020).

Key threats to Silver Perch include:

- Barriers to migration and recolonisation.
- Thermal pollution below large dams, which has been demonstrated to impact on growth and survival and may impact spawning cues.
- Altered flow regimes, in particular a reduction in the magnitude and frequency of spring floods which enhance dispersal, food availability and survival, particularly for juvenile fish, and may impact spawning cues.
- Altered hydraulics (lack of water movement) which may cause increased egg mortality.
- Loss of eggs, larvae, and juveniles through irrigation diversions.
- Reduction in habitat quality, primarily via the loss of submergent macrophytes and increased siltation.
- Predation and competition with exotic species.
- Epizootic Haematopoietic Necrosis Virus (EHNV) disease carried by Redfin Perch. Epizootic Ulcerative Syndrome (EUS, or red spot disease) and *Lernaea* often affect a high proportion of individuals within populations (Gillian 2005).
- Genetic integrity may be compromised by the accidental or deliberate release of domesticated strains into natural populations.

Name of Threatened Species	Silver Perch (*Bidyanus bidyanus*)

- Fish-kills associated with poor water quality, including blackwater events (DoE 2013b, Gilligan 2019a, Koehn 2020).

Silver Perch have not been recorded in the Project area but have been observed in the Murrumbidgee River downstream of the Project, and further downstream in the Murray River. Suitable habitat for Silver Perch may be present in the Fiddlers Creek and Uara Creek, which are partially within the Project area but not within the Disturbance area of turbines and access roads.

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

The primary risk to Silver Perch associated with the construction of the wind farm is reduced habitat quality in the Murrumbidgee River downstream of the Project through siltation of the permanent and ephemeral creeks within the Disturbance area. The construction of the wind farm may involve vegetation clearing, shallow excavations for installation of the turbines and transmission lines, and construction of vehicle crossings over minor waterways. These activities may have a deleterious impact on downstream water quality by increasing sedimentation. Sedimentation may by caused by an increased particulate load in stormwater runoff due to de-vegetation and damage to banks due to vehicle crossing. Additionally, the unintentional release of construction-related chemicals to waterways may impact downstream water quality.

Works would be undertaken in accordance with standard sediment and erosion controls to manage and minimise further siltation and construction-related chemicals will be bunded to reduce the risk of leaks entering waterways. Provided these standard practices are maintained throughout the construction of the proposal, it is unlikely that increased sedimentation of the waterways would occur.

As such, the Project is not considered to lead to a long-term decrease in the size of the population of Silver Perch.

2. Reduce the area of occupancy of the species

As discussed above, Silver Perch habitat is unlikely to occur within the Project area other than small sections of the Uara Creek and Fiddlers Creek, which are each at least a kilometre from any construction works. The primary risk is siltation of downstream habitats, which is unlikely with implementation of standard sediment and erosion controls.

As such, the Project is not considered to reduce the AOO of Silver Perch.

3. Fragment an existing population into two or more populations

Silver Perch are unlikely to occupy most of the Project area other than the northern section, which includes Fiddlers Creek and Uara Creek. The Project does not include works in waterways which would obstruct fish passage for Silver Perch.

As such, fragmentation of an existing population into two or more populations is not anticipated from the Project.

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

No Critical Habitat for Silver Perch as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat. As discussed above, the Disturbance area mostly intersects with canals and ephemeral waterways unlikely to provide habitat to Silver Perch. Construction works will not be performed near the larger waterways within and near the Project area.

As such, the Project is not considered to adversely affect habitat critical to the survival of Silver Perch.

5. Disrupt the breeding cycle of a population

Name of Threatened Species	Silver Perch (*Bidyanus bidyanus*)

Silver Perch are unlikely to occupy most of the Disturbance area other than the northern section which includes small portions of Fiddlers Creek and Uara Creek. Silver Perch have been recorded spawning and migrating in the Murrumbidgee River; however, no barriers to fish passage are to be constructed as part of the Project and no changes to spawning cues, such as alterations of flood regimes or temperature will occur as part of the Project.

As such, the Project is not considered to disrupt the breeding cycle of Silver Perch.

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

Silver Perch are unlikely to occupy most of the Disturbance area other than the northern section, which includes Fiddlers Creek and Uara Creek. As discussed above, the highest risks to habitat associated with the Project construction are temporary increases in sedimentation downstream of the Project due to vegetation clearing and establishment of access tracks , which would be mitigated by standard sediment and erosion control standards.

As such, the Project is not considered to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that Silver Perch is likely to decline.

7. 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 Project is not anticipated to introduce any aquatic invasive species to the Disturbance area or surrounds. However, several invasive species, such as Common Carp (*Cyprinus carpio*), Eastern Gambusia (*Gambusia holbrooki*), and Redfin Perch (*Perca fluviatilis*) are already recorded in Uara Creek and the Murrumbidgee River near, upstream, and downstream of the Project. Invasive species such as Common Carp are more tolerant of low water quality and may outcompete Silver Perch in waterways with increased sedimentation. However, standard sediment and erosion controls would prevent adverse effects to water quality.

As such, the Project is not considered to result in further establishment of invasive species.

8. Introduce disease that may cause the species to decline, or

Silver Perch are vulnerable to diseases such as EHNV, red spot disease, and *Lernaea* parasitism. However, the Project is not anticipated to introduce any aquatic diseases to the Disturbance area or surrounds or increase the population of known carriers such as Redfin Perch.

As such, the Project is not considered to result in the introduction of diseases that may cause Silver Perch to decline.

9. Interfere with the recovery of the species.

There is no established national recovery plan for Silver Perch. However, the conservation advice (DoE 2013b) refers to the NSW Silver Perch Recovery Plan (NSW DPI 2006), which outlines the following objectives:

- Increase awareness of the current status of silver perch throughout its range.
- Increase scientific knowledge of the current distribution, ecological and habitat requirements and population genetics of silver perch.
- Protect and enhance remaining natural populations of Silver Perch.
- Ameliorate the impacts of known major threats to Silver Perch.
- Minimise any fishing impacts on natural populations through enhanced compliance with fishing regulations and involvement of recreational fishers.

Name of Threatened Species	Silver Perch (*Bidyanus bidyanus*)

- Improve management of aquaculture and stocking programs.
- Encourage and support the involvement of indigenous communities in the implementation of recovery actions.
- Establish a program to monitor the status of silver perch and evaluate the effectiveness of recovery actions.

As the Project is unlikely to reduce habitat quality or reduce the Silver Perch population, it unlikely to interfere with the recovery objectives listed above.

Conclusion

The Project will not degrade habitat quality, disrupt the breeding cycle, or reduce the population of Silver Perch, and as such the Project is not likely to have a significant impact on Silver Perch.

B.3 Endangered Species

Table B.3.1 *Austrostipa wakoolica*

Name of Threatened Species	*Austrostipa wakoolica*

Ecology

Austrostipa wakoolica is a densely tufted, perennial spear-grass that grows to 1 m tall. The leaves are flattened or rolled, 1.5–2.5 mm wide at their bases, slightly to strongly ribbed, and densely hairy. The flower-heads are spreading and moderately dense, to 36 cm long, comprising gaping spikelets 11–15 mm long (excluding the awn). The awn (bristle) is twice bent and 3.5–6 cm long (DoE 2014).

Austrostipa wakoolica is confined to the floodplains of the Murray River tributaries of central-western and south-western NSW, with localities including Manna State Forest, Matong, Lake Tooim, Merran Creek, Tulla, Cunninyeuk and Mairjimmy State Forest (now part of South-West Woodland Nature Reserve). Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine Forest on low sandy range; and a low, rocky rise (DoE 2014).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). Within the Project area, these comprise PCTs 17 and 28 for *Austrostipa wakoolica*. Overall, across the Disturbance area the impact to PCTs associated with this species is approximately 158.01 ha.

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

Populations are considered to occur around the Riverina region. Populations of the species are considered to be nationally important due to their size, and thus breeding potential and genetic diversity (DoE 2014). Additionally, due to the proximity of the potential population and the suitable habitat present within the Disturbance area, it is also considered moderately likely to occur.

The Project would require the removal of approximately 158.01 ha of potential habitat for this species and could lead to a long-term decrease in the size of an important population, especially if suitable habitat or breeding conditions are poor in years following construction. Nevertheless, as the area of vegetation impact is likely only a proportionally small section of the larger Project area and it is likely that the population extends into other areas of suitable habitat beyond the boundaries of the Project, the long-term survival of the whole population would not be threatened.

2. Reduce the area of occupancy of the species

Name of Threatened Species	*Austrostipa wakoolica*

Whilst the Project will result in the removal of patches of associated vegetation, would consist of only a small area of the entire Project area, with additional suitable habitat extending beyond the Project boundaries. As such, the Project is not considered to reduce the AOO of the species.

3. Fragment an existing populations into two or more populations

The population of *Austrostipa wakoolica* as discussed above is expected to extend within the locality of the Hay Shire and Edward River areas, as suitable habitat extends considerably beyond the Project boundary.

The pollination of *Austrostipa wakoolica* is dispersed mainly by wind, rain and flood events (DoE 2014). Due to the narrow nature of the access tracks (would generally have a trafficable width of about 6.5 m) and small isolated patches of potential habitat clearance, alongside the possible nature of dispersal (via insect pollination and wind), the Project would not result in fragmentation of individual plants within the Disturbance area.

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

No critical habitat has been identified for these species. However, as populations within the wider Riverina area have been previously recorded and there are associated vegetation communities present for species within the Project area, it has been assumed for the purpose of this assessment that the Project area provides critical habitat for the local populations.

As such, whilst the Project would likely require the clearance of patches of suitable habitat for the species, given the lack of records within the locality and availability of habitat across the broader landscape, this is not considered a considerable impact to the habitat in the locality.

5. Disrupt the breeding cycle of a population

Little is known about the reproductive ecology of the species. Construction is expected to commence in early 2028 and take about 3 years to complete, as such construction activities may disturb two or three reproductive seasons. This degree of impact would vary depending on construction staging (i.e., if most vegetation clearing is undertaken in the first year or staggered over multiple years).

However, as the suitable habitat is present across the majority of the Project area, pollination of other individuals would still be possible. As such, the works are unlikely to impact the breeding cycle of *Austrostipa wakoolica*.

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

The Project would likely require the clearance of suitable habitat for species for the establishment of access roads as well as during the construction of wind turbines, substations, and temporary construction facilities. Impacts to suitable habitat would largely be isolated to periods of vegetation clearing. If population numbers are decreased during the construction phase and poor environmental conditions follow in the years after construction, these species have the potential to decline in the short and long-term.

The extent of operational impacts due to elevated access roads is unknown. Although designs of the roads are not yet developed, it has been assumed for the purpose of this assessment that they will be elevated to avoid flooding in high rainfall events. This may change the hydrology of the habitat by increasing water runoff from hard stand areas and increasing flooding in lower areas bound by elevated roads.

The extent of this impact is uncertain, however may be positive as the species appears to thrive in years of increased rain, yet increased flooding may increase weed spread. Given the relatively small areas of clearance with suitable habitat outside of primary construction zones and availability of high-quality habitat beyond the Project boundary, it is unlikely to result in an overall decrease in the availability of quality habitat to the extent that the species is likely to decline.

Name of Threatened Species	*Austrostipa wakoolica*
7. 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 movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds into habitat edges. However, considering the current movement of livestock on the property, this is considered a minor increased risk. Nevertheless, if elevated access roads are constructed, the hydrology of the habitat may be altered by increasing flooding in lower areas bound by elevated roads. The extent of this impact is uncertain; however, it may increase weed spread. As such, given the long-term agricultural use of the land, and regular movement of livestock and machinery across the Project area the opportunity for invasive species establishment has likely already been established. Therefore, it is not considered likely that the Project will lead to the establishment of additional invasive species.	
8. Introduce disease that may cause the species to decline, or	
Disease is not considered a key threat for the species. The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Project area, however, this is considered a minor risk.	
9. Interfere with the recovery of the species.	
Austrostipa wakoolica does not currently have an approved recovery plan, with the management actions for the species focused on increasing knowledge of the species ecology and threats. However, habitat destruction, physical damage and altered hydrology are noted as a key threats to the species (DoE 2014). Nevertheless, as the conservation of these species are in preliminary stages and the Project area is not specifically noted as an area of high conservation importance, the Project is not considered to interfere substantially with the recovery of these species.	
Conclusion	
Much of the habitat in the Disturbance area is unlikely to be important habitat for this plant species. The species is sensitive to grazing pressure and the Project area has had a long grazing history. As a result, these habitats are unlikely to support an ecologically significant proportion of the population of these species. The Project will require the removal of approximately 158.01 ha of suitable habitat for the species across the Disturbance area. Nevertheless, due to the extensive suitable habitat beyond the Project area, the Proposed action is not likely to have a significant impact on *Austrostipa wakoolica.*	

Table B.3.2 *Lepidium monoplocoides* (Winged Peppercress)

Name of Threatened Species	*Lepidium monoplocoides* (Winged Peppercress)
Ecology Erect annual herb or perennial forb growing to 15-20 cm high, with angular and striped stems roughened with small warts. The Winged Peppercress is widely distributed on the inland plains of south-eastern Australia, occurring from northern NSW to western Victoria. The species occurs in the Murray Darling Depression, Riverina, Darling Riverine Plains and Cobar Peneplain Bioregions (Mavromihalis 2010b). The Winged Peppercress occurs in open, sparsely vegetated sites in a range of habitats on heavy clay or clay-loam soils, usually on sites that are seasonally flooded or prone to waterlogging, in arid to semi-arid areas with an average rainfall range of 200–450 mm per year. Vegetation communities in which the species occurs include grasslands, wetlands and floodplain woodlands dominated by *Eucalyptus coolabah* and *Eucalyptus*	

Name of Threatened Species	*Lepidium monoplocoides* (Winged Peppercress)

largiflorens, and chenopod shrublands dominated by *Atriplex*, *Maireana* and/or *Nitraria* species (Mavromihalis 2010b).

Numbers of adult plants fluctuate from year to year and, like many annual species occurring in dry environments, some seed probably remains dormant in the soil for several years. During extended wet periods, the species can behave like a short-lived perennial plant (Mavromihalis 2010b).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). Within the Project area, these comprise PCTs 13, 15, 24, 45, 46, 153, 160, 163 and 216 for *Lepidium monoplocoides*. Overall, across the Disturbance area the impact to PCTs associated with this species is approximately 640.39 ha.

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

Populations of the species are considered to occur around the Riverina region, with few records within the Project area and locality. Populations of species are considered to be nationally important due to their size, and thus breeding potential and genetic diversity (Mavromihalis 2010b). Additionally, due to the proximity of the potential population and the suitable habitat present within the Project area, it is also considered moderately likely to occur.

The Project would require the removal of approximately 640.39 ha of suitable habitat for these species and could lead to a long-term decrease in the size of an important population, especially if suitable habitat or breeding conditions are poor in years following construction.

Nevertheless, as the area of vegetation impact is likely only a proportionally small section of the larger Project area and it is likely that the population extends into other areas of suitable habitat beyond the boundaries of the Project, the long-term survival of the whole population would not be threatened.

2. Reduce the area of occupancy of the species

AOO represents the area of suitable habitat currently occupied by these species. It is difficult to quantify the AOO for these species, given the seasonal nature of their habitat (Mavromihalis 2010b).

However, given the suitable habitat and associated PCTs located across the Project area, and required clearing of these habitats, a reduction of the AOO is predicted.

3. Fragment an existing populations into two or more populations

The populations of *Lepidium monoplocoides* as discussed above are expected to extend within the locality of the Hay Shire and Edward River areas, as suitable habitat extends considerably beyond the Project boundary.

The pollination of *Lepidium monoplocoides* is largely unknown. Due to the narrow nature of the access tracks (would generally have a trafficable width of about 6.5 m) and small isolated patches of potential habitat clearance, alongside the possible nature of dispersal (via insect pollination and wind), the Project would not result in fragmentation of individual plants within the Disturbance area.

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

No critical habitat has been identified for the species. However, as populations within the wider Riverina area have been previously recorded, record within the Project area, and associated vegetation communities present for species within the Project area, it has been assumed for the purpose of this assessment that the Project area provides critical habitat for the local populations.

As the Project would likely result in the removal of critical habitat for these species, there is potential for the Project to impact the survival of the species within the Disturbance area, however, is not considered to result in adverse impacts to the survival of the species across the locality.

5. Disrupt the breeding cycle of a population

Name of Threatened Species	*Lepidium monoplocoides* (Winged Peppercress)

Little is known about the reproductive ecology of the species. However, as the suitable habitat is present across the majority of the Project area, and clearance of suitable vegetation communities likely, disruption of pollination would still be possible.

Construction is expected to commence in early 2028 and take about 3 years to complete, as such construction activities may disturb two or three reproductive seasons. This degree of impact would vary depending on construction staging (i.e., if most vegetation clearing is undertaken in the first year or staggered over multiple years). However, as the suitable habitat is present across the majority of the Disturbance area, pollination of other individuals would still be possible. Yet, if poor, dry conditions follow years of construction, reproduction within the Disturbance area may be considerably impacted.

As such, the works would potentially impact the breeding cycle of an important population, however the degree of which is unknown.

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

The Project would likely require the removal of suitable habitat for the species. This would largely be isolated to stages of vegetation clearing. If population numbers are decreased during the construction phase and poor environmental conditions follow in the years after construction, the species has the potential to decline in the short and long term.

The extent of operational impacts due to elevated access roads is unknown. Although designs of the roads are not yet developed, it has been assumed for the purpose of this assessment that they will be elevated to avoid flooding in high rainfall events. This may change the hydrology of the habitat by increasing water runoff from hard stand areas and increasing flooding in lower areas bound by elevated roads.

The extent of this impact is uncertain, however may be positive and/or negative as species appear to thrive in years of increase rain, yet increased flooding may increase weed spread. As suitable habitat is located across the majority of the Disturbance area and situated within key development areas there is potential for the Project to result in a decrease in quality and extent of habitat for the species.

7. 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 movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds into habitat edges. However, considering the current movement of livestock on the property, this is considered a minor increased risk.

Nevertheless, if elevated access roads are constructed, the hydrology of the habitat may be altered by increasing flooding in lower areas bound by elevated roads. The extent of this impact is uncertain; however, it may increase weed spread, especially given majority of are works to take place within associated habitats for the species.

8. Introduce disease that may cause the species to decline, or

Disease is not considered a key threat for the species. The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Project area, however, this is considered a minor risk.

9. Interfere with the recovery of the species.

Lepidium monoplocoides does not have an approved recovery plan, with the management actions for these species focused on increasing knowledge of the species ecology and threats. However, habitat destruction, physical damage and altered hydrology are noted as a key threats to the species (Mavromihalis 2010b). Nevertheless, as the conservation of these species are in preliminary stages and the Project area is not

Name of Threatened Species	*Lepidium monoplocoides* (Winged Peppercress)

specifically noted as an area of high conservation importance, the Project is not considered to interfere substantially with the recovery of these species.

Conclusion

The Project will require the removal of approximately 640.39 ha of suitable habitat for this flora species. These species have extensive suitable habitat within the Disturbance area, requiring clearance for development of access tracks, turbine installation and infrastructure construction.

As a result, the Project has **potential to have a significant impact** on this species as there is a chance or possibility that it will seriously disrupt the lifecycle and habitat of an ecologically significant proportion of their population.

Table B.3.3 Australasian Bittern (*Botaurus poiciloptilus*)

Name of Threatened Species	Australasian Bittern *(Botaurus poiciloptilus)*

Ecology

The Australasian Bittern is a large, stocky, thick-necked, heron-like bird present throughout parts of Australia. The species grows to a length of 66-76 cm and has a wingspan of 1,050-1,180 cm. The average male weighs approximately 1,400 g and the average female weighs approximately 900 g. The upper parts of the body are brown and dark brown to black, mottled and buff, in complex patterns that aid the bird's concealment in swamp vegetation. The under-parts of the body are streaked and scalloped, brown, and buff. The species has a prominent black-brown stripe running down the side of the neck, the eyebrow is pale, and the chin and upper throat are white. The bill is straight, pointed, and straw yellow to buff in colour with a dark grey ridge. The legs and feet are pale green to olive and the eyes are orange-brown or yellow (TSSC 2019b).

In Australia, the Australasian Bittern occurs from south-east Queensland throughout NSW to south-east South Australia as far as the Adelaide Region, southern Eyre Peninsula, Tasmania and in the southwest of Western Australia. The population can be divided into two sub-populations, the south-eastern and south-western sub-populations (TSSC 2019b). In NSW, it occurs along the coast and is also frequently recorded in the Murray Darling Basin, notably in floodplain wetlands of the Murray, Murrumbidgee, Lachlan, Macquarie and Gwydir Rivers (TSSC 2019b).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). Within the Project area, these comprise PCTs 11, 13, 17, 24 and 160 for the Australasian Bittern. Overall, Disturbance area the impact to PCTs associated with this species is approximately 462.03 ha including critical habitat.

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

Current population estimates, as of 2010, suggest less than 1,000 mature individuals within the Australian population (Garnett et al. 2011), which has likely declined since. Several records exist within the Disturbance area and across the larger locality and given the variety of suitable habitat present within the Disturbance area, it is considered highly likely to occur.

The Project would require the removal of approximately 462.03 ha of suitable habitat for the species. Nevertheless, as the area of vegetation impact only a proportionally small section of the larger Disturbance area and areas of woodland and wetland have been intentionally avoided by the current Project design it is unlikely that the works would negatively affect the long-term survival of the whole population. Additionally, it is likely that the population extends into other areas of suitable habitat beyond the Project boundaries which would not be impacted by the proposed works.

Name of Threatened Species	Australasian Bittern *(Botaurus poiciloptilus)*

As such, the Project is not considered to lead to a long-term decrease in the population of Australasian Bittern.

2. Reduce the area of occupancy of the species

AOO represents the area of suitable habitat currently occupied by these species. In Australia, the AOO is thought to have declined by 70% between 1977 and 2008 (TSSC 2019b). Based on the suitable habitat available within this extent, the current AOO is estimated to be approximately 1,150 km^2 (TSSC 2011). Whilst the species' distribution is fragmented across Australia, the naturally dispersive nature of the species allows an ongoing exchange of genetic material between these fragmented populations.

The Project would require the removal of suitable habitat for the species. Nevertheless, as the area of vegetation impact only a proportionally small section of the larger Disturbance area and areas of woodland and wetland have been intentionally avoided by the current Project design it is unlikely that the works would negatively affect the AOO for the species. Additionally, it is likely that the population, and AOO extends considerably beyond the Project boundaries which would not be impacted by the proposed works.

As such, the Project is not considered reduce the AOO for the Australasian Bittern.

3. Fragment an existing populations into two or more populations

Within the Australian population, there are considered to be two distinct populations. The south-western population and the south–eastern population are likely to have little to no genetic exchange given the large distance between these populations. However, as previously mentioned the naturally dispersive nature of the species allows an ongoing exchange of genetic material within these populations, which can often be fragmented over regions.

As such, whilst the Project requires the removal of minor patches of suitable habitat, clearance in woodland and wetland habitats has been avoided wherever possible by the current Disturbance area. In addition, due to the narrow nature of the access tracks (would generally have a trafficable width of 6.5 m) and continued ability of the Australian Bittern to move across the landscape the Project would not result in fragmentation of the population within the Project area.

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

Given that the Australasian Bittern is presumed to have undergone a severe reduction in numbers, resulting from historic habitat loss and degradation, all natural habitat in which the Australasian Bittern is known or likely to occur is considered critical to the survival of the species (TSSC 2019b).

Given the records within the Project area and wider locality, it is likely that the species is present across the wetland habitats in the Project area. Whilst areas or wetland and woodland have been avoided by current footprint design, minor areas of clearance in surrounding vegetation are potentially required. Additionally, given the potential for changes in the Project area's surface hydrology, a temporary impact nearby waterbodies is possible.

However, given distance from primary work areas, including turbine construction and substation development, and Project designs which aim to avoid suitable habitat for the species, critical habitat would not be affected to the extent that the survival of the species is threatened.

5. Disrupt the breeding cycle of a population

The Australasian Bittern breeds from October to February in solitary pairs. However, sometimes several nests may be placed in close proximity to each other (Marchant 1990). The species nests adjacent to relatively deep, densely vegetated freshwater swamps and pools, building its nests under dense cover over shallow water (Marchant 1990).The species prefers to nest in vegetation that is up to 2.5 m tall and the nests are placed about 30 cm above the water level (Marchant 1990).

Name of Threatened Species	Australasian Bittern *(Botaurus poiciloptilus)*

Construction is expected to commence in early 2028 and take about 3 years to complete, as such construction activities may disturb two or three reproductive seasons. This degree of impact would vary depending on construction staging (i.e., if most vegetation clearing is undertaken in the first year or staggered over multiple years). However, as preferred wetland breeding and foraging grounds are located outside of key development areas, direct impacts would be limited.

In addition, as the Australasian Bittern is known to be capable of moving between habitats as suitability changes and given availability of high-quality habitat in surrounding areas, where no impacts are expected, the works are not considered likely to impact the breeding cycle of the population.

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

The Project would potentially require the removal of small patches of suitable habitat for the species. However, would be isolated to small patches as current Disturbance area designs have intentionally aimed to avoid areas of woodland and wetland across the Project area.

However, the extent of operational impacts due to construction of elevated access roads is unknown. Although designs of the roads are not yet developed, it has been assumed for the purpose of this assessment that they will be elevated to avoid flooding in high rainfall events. This may change the hydrology of the habitat by increasing water runoff from hard stand areas and increasing flooding in lower areas bound by elevated roads. Given the species reliance on wetland habitats, indirect impacts to water quality from changes surface hydrology could potentially result in changes to habitat suitability and quality in the Project area.

Movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds and pathogens into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk. However, it is important to note that potential habitat loss is likely restricted to small footprints over a large area, and the species is considered likely to persist in the Project area over the long-term given the low impact activity associated with an operational wind farm and the extent of habitat that will remain, especially beyond the boundaries of the Project area.

Despite potential changes to habitat conditions across the Project area, the availability of connected habitat in surrounding areas, and ability of the Australasian Bittern to move successfully between suitable habitats indicates that the works are unlikely to modify existing habitats to the extent that the species is likely to decline.

7. 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 predation of Australasian Bittern eggs and juveniles by foxes and cats is well established (Garnett and Crowley 2000). Foxes are known to predate on ground-nesting birds and young chicks across their range. Foxes and cats are known to be present in the Disturbance area and are considered to already be established within their habitats.

Additionally, movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk.

8. Introduce disease that may cause the species to decline, or

Disease is not considered a key threat for the species. The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Project area, however, this is considered a minor risk.

9. Interfere with the recovery of the species.

Name of Threatened Species	Australasian Bittern *(Botaurus poiciloptilus)*

The national recovery plan for the Australasian Bittern (DCCEEW 2022c) lists the following key strategies to achieve objectives of the recovery plan:

1. Implement management actions that mitigate or reduce threats to Australasian Bittern and their habitat.
2. Enhance the quality, extent, and protection of suitable habitat for the Australasian Bittern.
3. Undertake research and monitoring to improve knowledge of the biology, ecology, and population trends of Australasian Bittern.
4. Increase stakeholder participation in Australasian Bittern conservation and management.
5. Coordinate, review, and report on recovery progress.

The Project works could interfere with objectives 1 and 2, as development potentially requires the clearance small, isolated patches of potentially suitable habitat for the species. As suitable wetland habitat has been largely avoided by current Disturbance area design and given the considerable availability of suitable habitat beyond Project boundaries in which the species can access, the works are not considered likely to interfere with the recovery of the species.

Conclusion

The Project would require the removal of approximately 462.03 ha of suitable grassland/shrubland habitat for the species. The Project has been intentionally designed to avoid areas of high habitat value, including permanent wetlands and woodland wetlands and will ensure that suitable wetland habitats remain available for the species with the Project area. Several species records exist across the Project area and wider locality, however given the mobility of the species, is easily able to move between high quality habitat patches outside the Project area.

As such, the Proposed action is not likely to have a significant impact on the Australasian Bittern.

Table B.3.4 Major Mitchell's Cockatoo (eastern subspecies) (*Lophochroa leadbeateri leadbeateri*)

Name of Threatened Species	Major Mitchell's Cockatoo (eastern subspecies) (*Lophochroa leadbeateri leadbeateri)*

Ecology

The eastern Major Mitchell's Cockatoo occurs from western NSW to north-west Victoria and west to eastern South Australia. It is a small, white, and pink cockatoo with a long, forward pointing, scarlet and yellow-banded crest. Birds are mostly white, washed salmon pink on sides of the head, grading to white on the lower belly. The crest appears white when folded and shows broad red and yellow bands through the centre when raised and spread. The narrow yellow band varies individually and between sexes. Adults weigh around 365-480 g and have a body length of 39 cm (DAWE 2022b).

The subspecies occur in the Murray-Darling, Eyre, and Bulloo River basins, from Isisford and Roma in the north, through western NSW to north-west Victoria and west to eastern South Australia. The eastern Major Mitchell's Cockatoo lives in arid and semi-arid woodlands dominated by mulga (*Acacia aneura*), mallee and box eucalypts, slender cypress pine (*Callitris gracilis*) or belah (*Casuarina cristata*). Within these vegetation types, the subspecies main requirements are fresh surface water, and trees with suitable nesting hollows. Suitable nesting hollows are found in trees that are large and tall relative to the typical structure of arid and semi-arid woodlands. Remnant vegetation surrounding agricultural land has also been used for nesting (DAWE 2022b).

Based on the associated PCTs listed within the BioNet threatened species description for the species (NSW DCCEEW 2024b), no corresponding PCTs are mapped within the Disturbance area. However, suitable

Name of Threatened Species	Major Mitchell's Cockatoo (eastern subspecies) (*Lophochroa leadbeateri leadbeateri)*

vegetation communities are likely present in the surrounding area, with likely movement of the species within and across the Disturbance area.

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

The Project has potential to modify the available airspace on occasions when this species is foraging or dispersing through the Disturbance area. The birds prefer to feed in or close to wooded areas, and they also use wooded areas for travel between feeding areas and nesting or roosting sites. In fragmented landscapes, the birds tend to travel along vegetated corridors to move between nesting and feeding sites, including roadside remnants (DAWE 2022b). As such, as the turbines are located primarily in open shrubland landscapes, are unlikely to interfere with flight paths of the species when moving around its habitat.

The native vegetation within the Disturbance area is predominantly shrublands and grasslands, with scattered patches of White Cypress Pine woodland. Nesting hollows in Eucalypt woodlands along creek lines are outside the Disturbance area and any hollow-bearing scattered trees have been prioritised to be avoided by the Project, therefore the Project is unlikely to lead to a long-term decrease in the population of the species.

2. Reduce the area of occupancy of the species

The current AOO for the species is estimated at 225,000 km^2 and it has been assumed for the purpose of this assessment that 20–30% of the subspecies range is still occupied (DAWE 2022b).

The Project is unlikely to reduce the AOO for this species, as portions of woodland habitat have been intentionally avoided by current Project design. As woodland habitats act as foraging, roosting and dispersing habitats, the species AOO is unlikely to overlap with primary construction areas within the Disturbance area.

As the Project would not impact on suitable breeding habitat such as hollows in eucalypt woodland, and unlikely to reduce used airspace at locations of turbines, a reduction to the AOO of the species is unlikely.

3. Fragment an existing population into two or more populations

This species is highly mobile with broad dispersal extent. Suitable habitats for the species extend beyond the Project boundaries to surrounding landscapes and remain largely well connected.

Whilst the operational wind farm has potential to alter the airspace of the Disturbance area, as the species primarily uses wooded corridors to travel between habitats, it is unlikely to be impacted by turbine operation.

As such, the Project would not fragment existing habitats or an important population of this species into to two or more populations.

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

The Project would not impact suitable breeding habitat such as hollows in eucalypt woodlands in the Project area and the Disturbance area avoids all breeding areas. . It is unlikely that the habitat critical to the survival of the species would be adversely affected.

5. Disrupt the breeding cycle of a population

The Project would not impact suitable breeding habitat such as hollows in eucalypt woodlands in the Project area and the Disturbance area avoids all breeding areas. It is unlikely that the Project disrupts the breeding cycle of the population.

6. 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 has potential to modify the available airspace on occasions when this species is foraging or dispersing through the Disturbance area. However, the species primarily uses woodland corridors and high

Name of Threatened Species	Major Mitchell's Cockatoo (eastern subspecies) (*Lophochroa leadbeateri leadbeateri)*

tree cover areas to move across the landscape. As these areas would not be impacted by the current Project design and are not to contain operational turbines, this risk is considered low.

The Project would not impact on suitable breeding habitat such as hollows in eucalypt woodland in the Project area and avoids all breeding areas in the Disturbance area. 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.

7. Result in invasive species that are harmful to an endangered species becoming established in the vulnerable species' habitat

The Project is unlikely to result in invasion species harmful to this species becoming established in the in the Disturbance area.

8. Introduce disease that may cause the species to decline, or

The Project is unlikely to introduce disease that may cause decline to this species in the Disturbance area.

9. Interfere with the recovery of the species.

The main threat causing the decline of the subspecies is habitat loss and degradation. A major aspect of habitat loss is the loss of large hollow-bearing trees which provide nest sites (DAWE 2022b). The Project is unlikely to result in the clearance of suitable eucalypt woodland habitat or the removal of nesting hollow bearing trees.

Additionally, the risk of turbine strike is low, as the species commonly transits within woodland corridors and unlikely to enter airspace occupied by the wind turbines. However, the number of individuals using the airspace in the Disturbance area is currently unknown and further bird surveys need to be undertaken to assess this risk and outlined within an adaptive bird management plan.

As such, the Project is unlikely to interfere in the recovery of this species.

Conclusion

Although the available airspace may be modified for the species, the Project has avoided the removal of suitable woodland breeding habitat for the species. As such, no direct impacts are expected. The risk of turbine strike on this species is considered low and operational impacts would be monitored in an adaptive bird and bat monitoring program.

As such, the Project is not likely to have a significant impact on the Major Mitchell's Cockatoo (eastern subspecies).

Table B.3.5 Australian Painted Snipe (*Rostratula australis*) and Common Greenshank (*Tringa nebularia*)

Name of Threatened Species	Australian Painted Snipe (*Rostratula australis*) and Common Greenshank (*Tringa nebularia*)

Ecology

Australian Painted Snipe (*Rostratula australis*)

The Australian Painted Snipe is a small stocky waterbird, approximately 240–300 mm in length, with a wingspan of 500–540 mm and weighing 125–130 g (Marchant 1990). The adult female is more colourful and larger than the male. It has a chocolate-brown head with chestnut patch in the nape, a comma-shaped white marking around the eye and metallic green back and wings, barred olive and black. A diagnostic white 'harness marking' runs from the mantle onto the breast. It has a brown eye, white belly, bluish-green legs and long pink-orange bill darkening towards the tip. The male is smaller than the female and has a duller head pattern. It has a mottled grey-brown head and neck, with a buff stripe down the centre of the crown and through the eyes. Wings and back are spotted black, buff, and white, and the breast has a broad black band (DSEWPaC 2013).

The Australian Painted Snipe occurs in shallow freshwater (occasionally brackish) wetlands, both ephemeral and permanent, such as lakes, swamps, claypans, inundated or waterlogged grassland/saltmarsh, dams, rice crops, sewage farms and bore drains, generally with a good cover of grasses, rushes and reeds, low scrub, *Muehlenbeckia* spp. (lignum), open timber or samphire (Marchant 1990). It has been recorded at wetlands in all states and territories and is most common in eastern Australia (DSEWPaC 2013).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). Within the Project area, these comprise PCT 11, 13, 17, 24 and 160 for the Australian Painted Snipe. Overall, across the Disturbance area the impact to PCTs associated with this species is approximately 462.03 ha.

Common Greenshank (*Tringa nebularia*)

Common Greenshanks are 30–35 cm long, have a wingspan of 55–65 cm, and weigh approximately 170 g. They are a large and heavily built wader with a long and slightly upturned bill. The species shows no sexual dimorphism but does exhibit some seasonal variation in plumage. Juveniles are distinct from adults (DCCEEW 2024b).

The Common Greenshank is widespread in coastal regions, occurs in all types of wetlands, and has one of the widest distributions of any shorebird in Australia. In NSW, the species is widespread west of the Great Dividing Range, especially between the Lachlan and Murray Rivers and the Darling-Baaka River drainage basin, including the Macquarie Marshes, and north-west regions. Inland, the species is known mostly in the west and in the Murray River Valley (DCCEEW 2024b).

The Common Greenshank forages at the edge of wetlands, in soft mud on mudflats, in channels, or within shallows around the edge of waterbodies. These locations are often situated near or among mangroves or other sparse, emergent, or fringing vegetation such as sedges or saltmarsh. The bird occasionally feeds amongst seagrass beds. Common Greenshanks roost both on the coast and inland, in estuaries and mudflats, mangrove swamps and lagoons, and in billabongs, swamps, sewage farms, and flooded crops (DCCEEW 2024b).

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

The Australian Painted Snipe is strongly affected by seasonal conditions and appears to depend on the Murray-Darling Basin for breeding; as such, these conditions could have a significant impact on the species (DSEWPaC 2013). Little is known on the dispersive nature of the species; however, it is likely that it is locally or regionally dispersive or migratory. Movements have been attributed to local conditions: to flooded areas; from drying to permanent wetlands; away from areas affected by drought (DCCEEW 2022a).

Name of Threatened Species	Australian Painted Snipe (*Rostratula australis*) and Common Greenshank (*Tringa nebularia*)

The Common Greenshank migrates to Australia during the non-breeding season, with a current population estimated at 27,000 mature individuals, though considered a steadily declining population (DCCEEW 2024b).

Suitable shrubland wetland habitat exists across the Project area, and potentially requires minor clearance during development. However, areas of permanent wetland and woodland have been largely avoided in the current Project design, with turbines placed outside buffer areas.

As such, given the local migratory nature of the Australian Painted Snipe and largescale migratory patterns of the Common Greenshank alongside the number of turbines to occupy the surrounding airspace, there is potential for operating turbines to result in fatalities from blade collision. However, considering the low frequency and densities of the populations likely utilising the Project area and the low chance of strike occurrences, the potential risk of collision impacts is considered low.

As such, the Project is not considered likely to lead to a decrease in the size of the population of either species.

2. Reduce the area of occupancy of the species

The current AOO of the Australian Painted Snipe is estimated at 2,000 km^2, however is likely largely fluctuating dependent on rainfall (DSEWPaC 2013). The Common Greenshank has an estimated AOO of 13,000 km^2, and is considered stable (DCCEEW 2024b).

Current Project design includes a buffer around existing watercourses, and woodland habitats. As such, no waterbodies would be impacted during construction phase of the Project. Minor areas of shrubland wetland and swamps would be impacted during the development of access tracks or temporary set-down areas, however, would be minimal. Especially as these areas would not be preferred for access/storage, given seasonal inundation. In addition, majority of the wetlands and creeks within the Project area are connected to larger high quality water habitats including the Murrumbidgee River to the north, which provides additional suitable habitat for the species.

As such, the Project is not considered to reduce the AOO of these species.

3. Fragment an existing populations into two or more populations

It is estimated that the current population of the Australian Painted Snipe is 2,500 mature individuals, with a widespread distribution (DSEWPaC 2013). Given the widely dispersive native of the Common Greenshank and significant opportunity for genetic exchange amongst individuals, the global population is considered one population (DCCEEW 2024b).

As previously mentioned, given the potential highly dispersive or migratory nature of the two species, especially in response to local conditions, it is unlikely that the works would result in the fragmentation of populations of either species.

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

Critical habitat for the Australian Painted Snipe is largely determined by a combination of environmental factors, including the composition of plants, animals, water depth, geology, landforms, and climate that is relevant to a geographical unit. Any habitat critical to survival exists as a mosaic of wetland habitats, with carrying capacity fluctuating with seasonal or episodic floods and effects of threats (DCCEEW 2022a).

Habitat critical to the survival of the Common Greenshank refers to areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal,
- For the long-term maintenance of the species (including the maintenance of species essential to the survival of the common greenshank, such as macrobenthos),

Name of Threatened Species	Australian Painted Snipe (*Rostratula australis*) and Common Greenshank (*Tringa nebularia*)

- To maintain genetic diversity and long-term evolutionary development; or
- For the re-introduction of populations or recovery of the species.

Habitat critical to the survival of Common Greenshank includes a mosaic of feeding and roosting habitat. Common Greenshank frequents a variety of freshwater, marine, and artificial wetlands. The species has been recorded within swamps, open muddy or rocky shores of lakes and large rivers, sewage farms, saltworks, inundated rice-fields, ponds, reservoirs, flooded grasslands, saltmarshes, sandy or muddy coastal flats, mangroves, estuaries, lagoons, pools on tidal reefs, or in areas of exposed coral (DCCEEW 2024b). No Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat.

As the Disturbance area has been developed to avoid areas of habitat potentially utilised by the species (i.e., waterways and permanent wetlands), any critical habitat is unlikely to be adversely affected by the Project.

5. Disrupt the breeding cycle of a population

Inland wetlands are an important habitat for the breeding population of the Australian Painted Snipe. However, the distribution and movement of the Australian Painted Snipe is not well understood, beyond the fact it is largely resource and condition dependent (DCCEEW 2022a). As the Project would not result in the removal of permanent wetland habitat, as well as availability of high-quality habitat in surrounding areas, the impact to breeding cycle is considered low.

The Common Greenshank does not breed within Australia, migrating to the mainland in August from China, Korea, Japan and Europe (DCCEEW 2024b). As such, the Project is unlikely to disrupt the breeding cycle of the population.

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

Whilst the Disturbance area has been developed to avoid areas of habitat potentially utilised by the two species, changes to surface hydrology in the surrounding area (i.e., road and access track development, clearing of native vegetation), could potentially result in temporary impacts to water quality from sediment runoff and altered flood patterns.

However, the species are both highly mobile across the landscape, with certain areas only used when conditions are suitable. In addition, additional high quality wetland habitat is available in the surrounding area, from floodplains of the Murrumbidgee to the north and Ramsar wetlands further to the south. As such, whilst minor temporary impacts may potentially occur across suitable habitat in the Project area, the availability of habitats would not be impacted to the extent that the species are likely to decline.

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

A known threat to both populations is the replacement of native wetland vegetation with invasive species. In particular, *Parkinsonia aculeata* has been identified as a key invasive weed species across the Australian Painted Snipe's range and frequently utilised habitats of the Common Greenshank (DSEWPaC 2013, DCCEEW 2024b).

During construction and operation, the movement of vehicles and equipment has the potential to introduce weeds and pathogens to the Disturbance area. This is considered to be a minor risk during construction and a negligible risk during operation due to the level of vehicle movement.

As discussed above, the construction of access roads has the potential to alter the hydrology of the Disturbance area due to increased runoff and flooding and as a result, the increased risk of weed incursion beyond road corridors and verges. Additionally, if future changes to the surrounding land use occur,

Name of Threatened Species	Australian Painted Snipe (*Rostratula australis*) and Common Greenshank (*Tringa nebularia*)

particularly if cropping and grazing is increased, it may amplify movement of weeds and pollutants across the landscape.

However, surrounding land use and weed management practices are unlikely to change following construction, with agricultural practices including invasive weed management strategies continued. As a result, the Project is unlikely to result in further establishment of invasive species.

8. Introduce disease that may cause the species to decline, or

Disease is not considered a key threat for either species. The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Disturbance area, however, this is considered a minor risk.

9. Interfere with the recovery of the species.

The recovery plan for the Australian Painted Snipe (DCCEEW 2022a) outlines the following strategies required to achieve key objectives in the recovery of the Australian Painted Snipe:

1. Manage and protect known Australian Painted Snipe habitat at the landscape scale.
2. Develop and apply techniques to measure changes in population trajectory in order to measure the success of recovery actions.
3. Reduce, or eliminate threats at breeding and non-breeding habitats.
4. Undertake research to improve knowledge of the habitat requirements, biology and behaviour of Australian Painted Snipe.
5. Engage community stakeholders to improve awareness of the conservation of Australian Painted Snipe.
6. Coordinate, review and report on recovery progress.

There is no recovery plan developed for the Common Greenshank, however the conservation advice (DCCEEW 2024b) outlines the following primary conservation objectives:

- Minimise further loss of habitat critical to the survival of Common Greenshank throughout Australia (including habitat predicted to become habitat critical to the survival of the species in the future because of climate change).
- Prevent further declines in common greenshank populations by working with relevant Range States to address threats in the East Asian-Australasian Flyway.

The Project would not result in the loss of suitable habitat, or declines in population numbers for either species, and as such the interference with the recovery of the two species is not likely.

Conclusion

The Project would result in the removal of approximately 462.03 ha of suitable grassland/shrubland habitat for the Australian Painted Snipe. However, would not result in the removal of suitable woodland foraging or breeding habitat for either species, as such no direct impacts are expected. The risk of turbine strike on both species is considered low and operational impacts would be monitored in an adaptive bird and bat monitoring program.

As such, the Project is not likely to have a significant impact on the Australian Painted Snipe or Common Greenshank.

Table B.3.6 Hooded Robin (south-eastern) (*Melanodryas cucullata cucullata*)

Name of Threatened Species	Hooded Robin (south-eastern) (*Melanodryas cucullata cucullata*)

Ecology

Hooded robin (south-eastern) is a large Australian robin reaching 17 cm in length and occur in south-eastern Australia from far south-east Queensland to Yorke Peninsula, South Australia. The subspecies is now absent from many formerly occupied sites, particularly in the wetter areas of the south and east. The population is not severely fragmented, however, fragmented populations do occur in some areas, and these are assumed to be genetically isolated (DCCEEW 2023d).

The male is strikingly marked in black and white, with a bold black hood extending down a white breast. The back is black with distinct white shoulder and wing-bar. The tail is black, with prominent white side-panels. Females and immatures are duller, with light brownish-grey upperparts, but the same striking black and white wings (DCCEEW 2023d).

They prefer dry eucalypt and acacia woodlands and shrublands with an open understorey, some grassy areas and a complex ground layer. They avoid woodlands with tall trees or dense tree cover but sometimes occur in tall, dense heaths with scattered open areas (DCCEEW 2023d).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). Within the Disturbance area, these comprise PCT 11, 13, 15 and 28 for the Hooded Robin (south eastern). Overall, across the Disturbance area the potential impact to PCTs associated with this species is approximately 12.79 ha.

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

There are currently estimated to be 68,000 mature individuals in the wild with a declining trend (DCCEEW 2023d).

The Project has the potential to impact 12.79 ha of suitable cypress pine habitat for the species. This is a proportionally small section of the large Disturbance area, with large areas of woodland within and around the Disturbance area being intentionally avoided by the current Project design. The species is likely to utilise larger areas of suitable habitat outside the Disturbance area. It is unlikely the works would lead to a long-term decrease in the size of the population.

The Project has potential to modify the available airspace on occasions when this species is foraging and dispersing through the Disturbance area. However, the species is considered largely sedentary, with birds occupying territories within preferred habitats.

As such, the Project is largely avoiding clearance of vegetation within areas of preferred habitat and is unlikely to lead to a long-term decrease in the population.

2. Reduce the area of occupancy of the species

AOO represents the area of suitable habitat currently occupied by these species. The current AOO is approximately 30,000 km^2 (DCCEEW 2023d). Whilst largely sedentary, populations are known to move locally, between suitable habitats. As such, the regionally dispersive nature of the species allows an ongoing exchange of genetic material between fragmented areas.

The Project would potentially require the removal of suitable foraging habitat for the species. Nevertheless, as the area of vegetation impacts only a proportionally small section of the larger Disturbance area and large areas of suitable woodland habitat have been intentionally avoided by the current Project design it is unlikely that the works would negatively affect the AOO for the species. Additionally, it is likely that the population, and AOO extends considerably beyond the Project boundaries which would not be impacted by the proposed works.

Name of Threatened Species	Hooded Robin (south-eastern) (*Melanodryas cucullata cucullata*)

As such, whilst the Project has potential to reduce available airspace in the Disturbance area at locations of turbines, the Project is not considered reduce the AOO for the species.

3. Fragment an existing populations into two or more populations

Several genetically isolated populations exist across its range, given the largely sedentary nature of the species and fragmented habitat. However, as previously mentioned the ability to disperse in periods of unfavourable conditions allows an ongoing exchange of genetic material within the locality.

As such, whilst the Project potentially impacts suitable habitat, large-scale clearance of woodland habitat has been avoided wherever possible by current Project designs. In addition, due to the narrow nature of the access tracks (would generally have a trafficable width of about 6.5 m) and continued ability of the Hooded Robin (south-eastern)to move across the landscape, the Project would not result in fragmentation of the population within the Disturbance area.

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

Critical habitat for the survival of the species has been defined within the conservation advice (DCCEEW 2023d), and refers to:

- Areas that are necessary for activities such as foraging, breeding, roosting, or dispersal,
- Areas that are necessary 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),
- Areas that are necessary to maintain genetic diversity and long-term evolutionary development,
- Areas that are necessary for the reintroduction of populations or recovery of the species or ecological community,
- Areas of dry eucalypt and acacia woodlands and shrublands remnants with an open understorey, some grassy areas, and a complex ground layer, often in or near clearings or open areas,
- Areas of structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses,
- Areas of standing dead or live trees and tree stumps are also essential for nesting, roosting, and foraging,
- Areas of moderately deep to deep soils, rocks and fallen timber which provides essential foraging habitat.

Based on this criterion any habitat which is likely or known to support the species is considered critical habitat. However, no Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat for this species.

Given the records within the wider locality, it is likely that the species is present across the woodland and shrubland habitats in the Project area. Additionally, given the potential for changes in the Project area's surface hydrology, a temporary impact nearby waterbodies is possible.

However, given distance from primary work areas, including turbine construction and substation development, and Project designs which aim to avoid suitable woodland habitat for the species, critical habitat would not be affected to the extent that the survival of the species is threatened.

5. Disrupt the breeding cycle of a population

Hooded robins (south-eastern) generally form monogamous pairs and occupy territories during the breeding season (between July and November) and non-breeding season. Birds usually return to the same breeding

Name of Threatened Species	Hooded Robin (south-eastern) (*Melanodryas cucullata cucullata*)

site where they typically rear several broods each season. Nests comprise small, neat cups of bark and grasses bound with webs, and are situated in a tree fork or crevice, from less than 1 m to 5 m above the ground. A clutch size of two is typical. The incubation period is 14 days and only the female broods the eggs. Both sexes defend the nests with displays of injury-feigning, tumbling across the ground. Generation length is estimated at 3 years (DCCEEW 2023d).

Construction is expected to commence in early 2028 and take about 3 years to complete, as such construction activities may disturb two or three reproductive seasons. This degree of impact would vary depending on construction staging (i.e., if most vegetation clearing is undertaken in the first year or staggered over multiple years). However, as preferred woodland breeding and foraging grounds are located outside of key development areas, direct impacts would be limited.

In addition, as the species is known to be capable of moving between habitats as suitability changes and given availability of high-quality habitat in surrounding areas, where no impacts are expected, the works are not considered likely to impact the breeding cycle of the population.

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

The Project would potentially require the removal of approximately 12.79 ha of suitable cypress pine (PCT 28) habitat for the species. However, would be isolated to small patches as current Project designs have intentionally aimed to avoid areas of woodland across the Project area.

However, the extent of operational impacts due to construction of elevated access roads is unknown. Although designs of the roads are not yet developed, it has been assumed for the purpose of this assessment that they will be elevated to avoid flooding in high rainfall events (similar to other existing roads within the Disturbance area facilitating access to existing powerlines). This may change the hydrology of the habitat by increasing water runoff from hard stand areas and increasing flooding in lower areas bound by elevated roads. Given the species reliance on woodlands surrounding wetland habitats, indirect impacts to water quality from changes surface hydrology could potentially result in changes to habitat suitability and quality in the Project area.

Movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds and pathogens into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk. However, it is important to note that potential habitat loss is likely restricted to small footprints over a large area, and the species is considered likely to persist in the Project area over the long-term given the low impact activity associated with an operational wind farm and the extent of habitat that will remain, especially beyond the boundaries of the Project area.

Despite potential changes to habitat conditions across the Project area, the availability of connected habitat in surrounding areas, and ability of the species to move successfully between suitable habitats indicates that the works are unlikely to modify existing habitats to the extent that the species is likely to decline.

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

Invasive weeds are a known threat to the species, as invasives reduce the floristic and structural characteristics of preferred foraging habitat and alter resource availability (DCCEEW 2023d). The movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk.

Additionally, the degradation of shrub layer by European rabbits is an established threat to habitat for the Hooded Robin, as well as predation by cats and foxes (DCCEEW 2023d). However, it is recognised that rabbits, cats, and foxes are already considered established across the Disturbance area.

Name of Threatened Species	Hooded Robin (south-eastern) (*Melanodryas cucullata cucullata*)

The Project is unlikely to result in further invasive species harmful to this species becoming established in the disturbance area.

8. Introduce disease that may cause the species to decline, or

Disease is not considered a key threat for the species. The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Disturbance area, however, this is considered a minor risk.

9. Interfere with the recovery of the species.

No recovery plans have been developed for this species. Primary conservation outcomes for the species include establishing stable or increasing populations across the range (DCCEEW 2023d).

The Project works would potentially interfere with conservation and management priorities (DCCEEW 2023d), as development potentially requires the clearance small, isolated patches of critical habitat for the species. As suitable woodland habitat has been largely avoided by current Project design and given the considerable availability of suitable habitat beyond Project boundaries in which the species can access, the works are not considered likely to interfere with the recovery of the species.

Conclusion

The Project would potentially require the removal of approximately 12.79 ha of suitable habitat for the species. Whilst there is suitable woodland habitat available for the species, the Project has been intentionally designed to avoid areas of high habitat value, including watercourses and Eucalypt woodlands. Given the mobility of the species, is easily able to move between high quality habitat patches outside the Disturbance area. Additionally, the risk of turbine strike on the species is considered low and operational impacts would be monitored in an adaptive bird and bat monitoring program.

As such, the Project is not likely to have a significant impact on the Hooded Robin (south-eastern).

Table B.3.7 Grey Snake (*Hemiaspis damelii*)

Name of Threatened Species	Grey Snake (*Hemiaspis damelii*)

Ecology

The grey snake is a relatively small, venomous, front-fanged snake, which occurs in parts of NSW and QLD. The body colour is a uniform pale or dark grey to olive grey with the top of the head and a few scale rows on the nape being black in juveniles, and more of a crescent or absent in adults. Belly colour is white, cream, or pale yellow, often with darker flecks, and the skin between the scales is black. The eyes are large relative to other small snakes that share a similar habitat. Maximum total length is 600 mm and average snout vent length (SVL) in NSW is 426 mm (DCCEEW 2022b).

The species occurs from southern NSW to south-eastern Queensland as a series of fragmented subpopulations throughout NSW and Qld. In NSW, point location records indicate this species occurs as separate subpopulations, predominantly associated with the lower reaches of major westerly flowing rivers, including the Gwydir, Namoi, Castlereagh, Macquarie, Lachlan, and Murrumbidgee River systems. Most records in NSW and Queensland are from regions below 30 m ASL. In southern NSW, the grey snake has been recorded as active from October to February at temperatures above 15°C (DCCEEW 2022b).

The Grey Snake forages for floodplain frogs within soil cracks, in the open or beneath vegetation, typically during warm weather and especially after heavy rain or when soil cracks become inundated. Most frog species that occur in the Murray-Darling Basin and within the range of the grey snake breed in temporary rain-fed ponds or ephemeral wetlands, rather than in the main river channels, possibly explaining why the grey snake is associated with floodplain wetlands rather than along river channels (DCCEEW 2022b).

Name of Threatened Species	Grey Snake (*Hemiaspis damelii*)

Based on the associated PCTs listed within the BioNet threatened species description for the species (NSW DCCEEW 2024b), no corresponding PCTs are mapped within the Project area. However, suitable vegetation communities are likely present in the surrounding area, with potential movement of the species within and across the Project area.

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

Current distributions of the species consider each fragmented habitat range associated with major river systems a separate subpopulation, including the Murrumbidgee (DCCEEW 2022b). No snakes have been detected from dry phase wetlands, suggesting its detectability and activity patterns are likely related to wetland inundation regimes as well as suitable weather conditions. Grey snakes have not been detected when wetlands are in a summer dry phase or in other vegetation types adjacent to wetlands (DCCEEW 2022b).

Suitable lignum wetland habitat exists across the Project area and requires clearance during development. However, areas of permanent wetland and woodland have been largely avoided in the current Project design, with turbines and additional infrastructure placed outside buffer areas. Additionally, further suitable habitat is available in the surrounding area, outside the Project area.

As such, the Project is not considered to result in a long-term decrease in the size of the population.

2. Reduce the area of occupancy of the species

AOO represents the area of suitable habitat currently occupied by these species. The current estimated AOO for the grey snake is approximately 164 km^2, when using records from 2000 to 2022 (DCCEEW 2022b).

Current Disturbance area includes a buffer around existing watercourses, and woodland habitats. As such, no waterbodies or permanent wetlands would be directly impacted during construction phase of the Project. Minor areas of shrubland wetland vegetation requires clearance during the development of access tracks or temporary set-down areas, however, would be minimal. Especially as these areas would not be preferred for access/storage, given seasonal inundation. In addition, majority of the wetlands and creeks within the Project area are connected to larger high quality water habitats including the Murrumbidgee River to the north, which provides additional suitable habitat for the species.

As such, the Project is not considered to reduce the AOO of the species.

3. Fragment an existing population into two or more populations

Within the population, the individuals within the Murrumbidgee River system area are considered a distinct sub-population, given the widespread fragmentation of the species across NSW and Queensland.

As such, whilst the Project potentially requires the removal of minor patches of vegetation surrounding suitable wetland habitat, clearance in woodland habitats and direct impacts to waterways has been avoided wherever possible by current Disturbance area designs. In addition, due to the narrow nature of the access tracks (would generally have a trafficable width of about 6.5 m) and continued ability of the Grey Snake to move across the landscape the Project would not result in fragmentation of the population within the Project area.

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

No critical habitat has been identified for these species. However, as local populations are known and given historical records of the species in the surrounding area, particular to the north of the Project area, it has been assumed for the purpose of this assessment that the Project area provides critical habitat for the local populations.

Name of Threatened Species	Grey Snake (*Hemiaspis damelii*)

Areas of permanent wetland and woodland have been largely avoided in the current Project design, with turbines placed outside buffer areas. Additionally, further suitable habitat is available in the surrounding area, outside the Project area.

As such, it is not considered likely that the Project will adversely affect habitat critical to the survival of the species.

5. Disrupt the breeding cycle of a population

The Grey Snake is live bearing (viviparous) and gives birth to 4-16 young between January and March. Juvenile snakes are approximately 140 mm in length, males mature at around seven months of age and females mature at 12 months (DCCEEW 2022b).

Construction is expected to commence in early 2028 and take about 3 years to complete, as such construction activities may disturb two or three reproductive seasons. This degree of impact would vary depending on construction staging (i.e., if most vegetation clearing is undertaken in the first year or staggered over multiple years). However, as the Project would not result in the removal of suitable habitat within the Disturbance area, as well as availability of high-quality habitat in surrounding areas, the impact to breeding cycle is considered low.

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

Whilst the Disturbance area has been developed to avoid areas of habitat potentially utilised by the species, changes to surface hydrology in the surrounding area (i.e., road and access track development, clearing of native vegetation), could potentially result in temporary impacts to water quality from sediment runoff and altered flood patterns. Such impacts have potential to impact availability of food sources, including frogs, on which the species rely (DCCEEW 2022b).

However, the species is highly selective of habitats, with certain areas only used when conditions are suitable (DCCEEW 2022b). In addition, additional high quality wetland habitat is available in the surrounding area, from floodplains of the Murrumbidgee to the north and Ramsar wetlands further to the south. As such, whilst minor temporary impacts may potentially occur across suitable habitat in the Project area, the availability of habitats would not be impacted to the extent that the species is likely to decline.

7. 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 movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds into habitat edges. However, considering the current movement of livestock on the property, this is considered a minor increased risk.

Invasive species including cane toads (*Rhinella marina*) are a known threat to the Grey Snake, as ingestion of the cane toad causes poisoning and fatalities (DCCEEW 2022b). However, the cane toad's range has not extended as far south as the Project area, with Project activities unlikely to result in its establishment. In addition, foxes and cats are known to predate on reptiles, including snakes (DCCEEW 2022b). Foxes and cats are known to be present in the Disturbance area and are considered to already be established within their habitats.

8. Introduce disease that may cause the species to decline, or

Disease is not considered a key threat for these species. The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Disturbance area, however, this is considered a minor risk.

9. Interfere with the recovery of the species.

Name of Threatened Species	Grey Snake (*Hemiaspis damelii*)
No adopted or made recovery plans are currently available for the species. The management actions for these species are focused on the increased development of knowledge of the species ecology and threats. However, habitat destruction and land clearing are noted as key threats to species. Nevertheless, as the Project has been designed to largely avoid areas of suitable habitat for the species, the resulting impact to the grey snake and its environment is considered low, especially given the abundance of suitable habitat beyond the Disturbance area. As such, the Project is not considered to interfere substantially with the recovery of these species.	
Conclusion	
The Proposed action is not considered to result in a significant impact to the Grey Snake.	

B.4 Vulnerable Species

Table B.4.1 *Solanum karsense* (Menindee Nightshade)

Name of Threatened Species	*Solanum karsense* (Menindee Nightshade)

Ecology

Disturbance area***Solanum karsense* (Menindee Nightshade)**

Menindee Nightshade is a grey-green hairy herb or sub-shrub to 0.3 m high and densely covered with pale star-shaped hairs. It has firm pale spines to 15 mm long that are scattered along the stems. The leaves are rounded, 1.5–3 cm long, 1–2 cm wide, shallowly lobed along the edges and densely hairy. The flowers are purple, shallowly bell-shaped, 20–35 mm in diameter. The fruit are berries, about 7 mm in diameter (DEWHA 2008a).

Menindee Nightshade is known from the NSW south-western plains, and also occurs just over the NSW border in South Australia, 100 km north of Murray River. It extends up the Darling River to the Menindee and Wilcannia districts, mainly in the area between the Darling and Lachlan Rivers. It is common to locally abundant in most populations, ranging from several hundred plants to large spreading colonies found over an area of 20,000–30,000 acres. Menindee Nightshade occurs mainly in lake beds or floodplains of heavy grey clays with a highly self-mulching surface. It is also found on sandy floodplains and ridges and in calcareous soils, red sands, red-brown earths and loamy soils. The vegetation associated with this species includes Saltbush and Bluebush plains and Mallee associations (DEWHA 2008a).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). For *Solanum karsense,* the suitable vegetation types within the Disturbance area comprise PCTs 13, 15, 17, 24, 153, 160, and 166. Overall, across the Disturbance area the impact to PCTs associated with this species is approximately 585.08 ha.

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

The Project would require the removal of suitable habitat for the species. However, as the area of vegetation impact consists of only a proportionally small section of the larger Disturbance area, and likely continuation of the population into other areas of suitable habitat outside the Project area, the long-term survival of the whole population would not be threatened. There is no indication that there is an important population for the species in the Project area.

In addition, given the lack of historical records of the species within the locality, the likelihood of the Disturbance area containing an important population of the species is low.

2. Reduce the area of occupancy of an important population

AOO represents the area of suitable habitat currently occupied by the species. It is difficult to quantify the AOO of this species given the seasonal nature of their habitat (DEWHA 2008a, NSW Scientific Committee 2008). Whilst the Project will result in the removal of patches of associated vegetation, would consist of only a small area of the entire Project area, with additional suitable habitat extending beyond the Project boundaries. As such, the Project is not considered to reduce the AOO of an important population.

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

The extent of the population is discussed above and expected to extend within the locality, however given the lack of historical records within the locality is not likely considered an important population. The current population of the species is thought to have been previously isolated by large scale fragmentation of agricultural activities across the region (DEWHA 2008a, DEWHA 2008b).

Name of Threatened Species	*Solanum karsense* (Menindee Nightshade)

The pollination of the species is largely unknown. Due to the narrow nature of the access tracks (would generally have a trafficable width of about 6.5 m) and the possible nature of dispersal (via insect pollination), the Project would not result in fragmentation of individual plants within the Disturbance area.

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

No critical habitat has been identified for the species. However, as local populations are potentially present, and there are associated vegetation communities present within the Project area, it has been assumed for the purpose of this assessment that the Project area provides critical habitat for the local populations.

The Project would require the clearance of suitable grassland and shrubland habitat for the species. However, the removal of small patches of habitat required within the Disturbance area is unlikely to adversely affect critical habitat to the extent that the survival of either species is threatened.

5. Disrupt the breeding cycle of an important population

Little is known about the reproductive ecology of *Solanum karsense.*

Construction is expected to commence in early 2028 and take about 3 years to complete, as such construction activities may disturb two or three reproductive seasons. This degree of impact would vary depending on construction staging (i.e., if most vegetation clearing is undertaken in the first year or staggered over multiple years). However, as the suitable habitat is present across the majority of the Project area, pollination of other individuals would still be possible. As such, the works are unlikely to impact the breeding cycle of an important population.

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

The Project would require the removal of up to 585.08 ha of suitable habitat for *Solanum karsense*. If population numbers are decreased during the construction phase and poor environmental conditions follow in the years after construction, the species has the potential to decline in both the short and long term.

The extent of operational impacts due to elevated access roads is unknown. Although designs of the roads are not yet developed, it has been assumed for the purpose of this assessment that they will be elevated to avoid flooding in high rainfall events (similar to other existing roads within the Disturbance area facilitating access to existing powerlines). This may change the hydrology of the habitat by increasing water runoff from hard stand areas and increasing flooding in lower areas bound by elevated roads.

The extent of this impact is uncertain, however may be positive as the species appear to thrive in years of increased rain, yet increased flooding may increase weed spread. Given the relatively small areas of projected clearance within suitable habitat and availability of high-quality habitat outside the Project boundary, it is unlikely to result in an overall decrease in the availability of quality habitat to the extent that the species is likely to decline.

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

The movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds into habitat edges. However, considering the current movement of livestock on the property, this is considered a minor increased risk.

Nevertheless, if elevated access roads are constructed, the hydrology of the habitat may be altered by increasing flooding in lower areas bound by elevated roads. The extent of this impact is uncertain; however, it may increase weed spread.

As such, given the long-term agricultural use of the land, and regular movement of livestock and machinery across the Disturbance area the opportunity for invasive species establishment has likely already been

Name of Threatened Species	*Solanum karsense* (Menindee Nightshade)

established. Therefore, it is not considered likely that the Project will lead to the establishment of additional invasive species.

8. Introduce disease that may cause the species to decline, or

Disease is not considered a key threat for the species. The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Project area, however, this is considered a minor risk.

9. Interfere substantially with the recovery of the species.

Priority conservation actions for *Solanum karsense* (DEWHA 2008a) list the following:

1. Identify populations of high conservation priority.
2. Ensure activities involving vegetation removal in areas where Menindee Nightshade occurs do not adversely impact on known populations.
3. Investigate formal conservation arrangements such as the use of covenants, conservation agreements or inclusion in reserve tenure.
4. Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.
5. Minimise adverse impacts from the loss of habitat at known sites due to constant flooding.
6. Manage any changes to hydrology including any disruptions to water flows caused by the construction of the Cawndilla channel, including the potential for increased salinity.
7. Identify and remove weeds in the local area, which could become a threat to Menindee Nightshade, using appropriate methods. Potential problem species include Onion Weed (*Asphodelus fistulosus*), Paterson's Curse (*Echium spp.*), and Ward's weed (*Carrichtera annua*).

The management actions are focused on the increased development of knowledge of the species ecology and threats. However, habitat destruction is noted as a key threat to these species. Nevertheless, as the conservation of the species is in preliminary stages and the Project area is not specifically noted as an area of high conservation importance, the Project is not considered to interfere substantially with the recovery of the species.

Conclusion

There is no indication that there is an important population in the Project area, and the assessment is made on a precautionary approach. The Project would require the removal of approximately 585.08 ha of suitable habitat for *Solanum karsense*. Nevertheless, due to the extensive suitable habitat beyond the Project area and lack of records within the Project area, the above assessment determines the Project is not likely to have a significant impact.

Table B.4.2 *Brachyscome papillosa* (Mossgiel Daisy), *Maireana cheelii* (Chariot Wheels) and *Swainsona murrayana* (Slender Darling Pea)

Name of Threatened Species	*Brachyscome papillosa* (Mossgiel Daisy), *Maireana cheelii* (Chariot Wheels) *and Swainsona murrayana* (Slender Darling Pea)

Ecology

***Brachyscome papillosa* (Mossgiel Daisy)**

Name of Threatened Species	*Brachyscome papillosa* (Mossgiel Daisy), *Maireana cheelii* (Chariot Wheels) *and Swainsona murrayana* (Slender Darling Pea)

The Mossgiel Daisy is a perennial herb with multiple stems growing to 40 cm tall with woolly young shoots and stemless leaves up to 7 cm long. Leaf edges vary from being smooth-edged to deeply indented, with solitary mauve flower heads that have a yellow centre and are 6-11 mm in diameter. The species flowers between June and December and has a distinctive one seeded fruit that is important in confirming identification (DEWHA 2008c).

Endemic to NSW it occurs mainly within the Riverina Bioregion, from Mossgiel in the north, Murrumbidgee Valley National Park in the southwest and Urana in the southeast. It is present primarily on clay soils within Bladder Saltbush and Leafless Bluebush plains, as well as in Inland Grey Box – Cypress Pine woodland. It is recorded in variably sized populations (DEWHA 2008c).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). For *Brachyscome papillosa*, the suitable vegetation types within the Disturbance area comprise PCTs 13, 15, 24, 44, 45, 46, 153, 157, 160, 163, 164 and 216. Overall, across the Disturbance area, the impact to PCTs associated with this species is approximately 2,701.22 ha.

***Maireana cheelii* (Chariot Wheels)**

A perennial forb growing to around 20 cm high with slender striped woolly stems and a fleshy swollen taproot. The leaves (to 6 mm long) are hairless, narrow-cylindrical, and slender, flowers are solitary or in pairs in the leaf axils and the fruiting body is whitish, woolly, or cottony above with five distinctly wheel-like wings radiating up to 2.5 mm long (Mavromihalis 2010a).

The species occurs in western Victoria, south-western NSW (in the Riverina Region) and south-western QLD on roadsides or private land. Usually found on floodplains and chenopod shrubland, the species appears to prefer heavy brown to red-brown clay-loams, hard cracking clay and other heavy texture-contrast soils that support Bladder Saltbush (*Atriplex vesicaria*), *Maireana aphylla* and *Acacia homalophylla* shrubland communities. Flowering in Spring to Summer, it bears fruit mainly from September to November and appears in small, localised occurrences in scattered localities (Mavromihalis 2010a).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). For *Maireana cheelii*, the suitable vegetation types within the Disturbance area comprise PCTs 44, 46, 157, and 164. Overall, across the Disturbance area, the impact to PCTs associated with this species is approximately 2,060.83ha.

Swainsona murrayana (Slender Darling Pea)

Swainsona murrayana is a prostrate, ascending to erect perennial herb growing up to 25 cm tall with densely pubescent stems. Its distribution is across western NSW and into Victoria and South Australia (DEWHA 2008b). Within NSW there are at least 60 geographically distinct sub-populations (NSW Scientific Committee 2008).

The species often grows in heavy soils, especially depressions, and is also found on grey and red to brown clay and clay-loam soils in *Atriplex vesicaria* (Bladder Saltbush) herbland, *Eucalyptus largiflorens* (Black Box) woodland and grassland communities and is frequently associated with *Maireana* species (DEWHA 2008b). The species flowers in August to November, with flowering usually begins in late August to early September and finishes by the end of October (DEWHA 2008b).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). For *Swainsona murrayana*, the suitable vegetation types within the Project area comprise PCTs 15, 28, 44, 45, 46, 157, 163, 164 and 216. Overall, across the Disturbance area, the impact to PCTs associated with this species is approximately 2,332.41 ha.

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

Name of Threatened Species	*Brachyscome papillosa* (Mossgiel Daisy), *Maireana cheelii* (Chariot Wheels) *and Swainsona murrayana* (Slender Darling Pea)

These species are considered to occur in populations across the Riverina region in NSW (Mavromihalis 2010a) and are considered to be nationally important due to their size, and thus breeding potential and genetic diversity. Due to the close proximity of the potential populations, historical records within the Project area and the suitable habitat present within the Project area, they are considered highly likely to occur.

The Project would require the removal of up to 2,701.22 ha and 2,060.83 ha of suitable habitat for *Brachyscome papillosa* and *Maireana cheelii*, respectively, and as such the Project is considered likely to lead to a long-term decrease in the size of an important population of these species.

The population of *Swainsona murrayana* is considered to be focused around the Jerilderie area, roughly extending from Urana in the east, Conargo in the west and Coleamally to the north. This population is considered to be nationally important due to its size, and thus breeding potential and genetic diversity (DEWHA 2008b). The Project would require the removal of approximately 2,332.41 ha of suitable habitat for the species, and as such has potential to result in a long term decrease in the size of an important population.

2. Reduce the area of occupancy of an important population

AOO represents the area of suitable habitat currently occupied by the species. It is difficult to quantify the AOO for these species, given the seasonal nature of their habitat and lack of available data (TSSC 2012a). For *Swainsona murrayana*, the estimated AOO in NSW is 240 km^2, which is considered a conservative estimate (NSW Scientific Committee 2008).

As such, given the presence of suitable habitat across large portions of the Disturbance area, there is likely to be a reduction in the AOO of an important population.

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

The extents of the populations are discussed above and are expected to extend across the Project area and beyond within the locality.

The pollination of these species is largely unknown. However, one study found that *Swainsona murrayana* may only be pollinated by *Trichocolletes maximus*, a solitary, ground nesting bee (Morgan and Williams 2015). Due to the narrow nature of the access tracks (would generally have a trafficable width of about 6.5 m) and the possible nature of dispersal (via insect pollination), the Project would not result in fragmentation of individual plants within the Disturbance area.

As such, the Project is not considered to result in the fragmentation of the population of any of the species.

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

No critical habitat has been identified for these species. However, as local populations are highly likely and there are associated vegetation communities present for species within the Project area, it has been assumed for the purpose of this assessment that the Project area provides critical habitat for the local populations.

As the Project would result in the removal of critical habitat for these species, there is potential for the Project to impact the survival of the species within the Project area.

5. Disrupt the breeding cycle of an important population

Little is known about the reproductive ecology of *Brachyscome papillosa* and *Maireana cheelii*. *Swainsona murrayana* flowers from August to November, with seeds forming in October. *Swainsona murrayana* are largely renascent perennials, resprouting in suitable wet-cool conditions from a persistent rootstock (DEWHA 2008b). Given suitable habitat across the Disturbance area, and likely clearance required, there is potential for important populations to exist in the Project area.

Name of Threatened Species	*Brachyscome papillosa* (Mossgiel Daisy), *Maireana cheelii* (Chariot Wheels) *and Swainsona murrayana* (Slender Darling Pea)

Construction is expected to commence in early 2028 and take about 3 years to complete, as such construction activities may disturb two or three reproductive seasons. This degree of impact would vary depending on construction staging (i.e., if most vegetation clearing is undertaken in the first year or staggered over multiple years). However, as the suitable habitat is present across the majority of the Disturbance area, pollination of other individuals would still be possible. Yet, if poor, dry conditions follow years of construction, reproduction within the Disturbance area may be considerably impacted.

As such, the works would potentially impact the breeding cycle of an important population, however the degree of which is unknown.

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

The Project would require the removal of suitable grassland and shrubland habitat for these three species. This would largely be isolated to stages of vegetation clearing. If population numbers are decreased during the construction phase and poor environmental conditions follow in the years after construction, the species has the potential to decline in the short and long term.

The extent of operational impacts due to elevated access roads is unknown. Although designs of the roads are not yet developed, it has been assumed for the purpose of this assessment that they will be elevated to avoid flooding in high rainfall events (similar to other existing roads within the Disturbance area facilitating access to existing powerlines). This may change the hydrology of the habitat by increasing water runoff from hard stand areas and increasing flooding in lower areas bound by elevated roads.

The extent of this impact is uncertain, however may be positive and/or negative as species appear to thrive in years of increase rain, yet increased flooding may increase weed spread. As suitable habitat is located across the majority of the Disturbance area and situated within key development areas there is potential for the Project to result in a decrease in quality and extent of habitat for the species.

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

The movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds into habitat edges. However, considering the current movement of livestock on the property, this is considered a minor increased risk.

Invasive weeds including Onion Weed (*Asphodelus fistulosus*), Paterson's Curse (*Echium spp.*), and Ward's weed (*Carrichtera annua*) have been identified as threats for Menindee Nightshade (DEWHA 2008a). For Chariot wheels, problematic weeds species include pasture grasses such as *Avena* spp. and *Vulpia* spp. (Mavromihalis 2010a).

Nevertheless, if elevated access roads are constructed, the hydrology of the habitat may be altered by increasing flooding in lower areas bound by elevated roads. The extent of this impact is uncertain; however, it may increase weed spread, especially given majority of works to take place within associated habitats for the species.

8. Introduce disease that may cause the species to decline, or

Disease is not considered a key threat for these species. The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Disturbance area, however, this is considered a minor risk.

9. Interfere substantially with the recovery of the species.

Name of Threatened Species	*Brachyscome papillosa* (Mossgiel Daisy), *Maireana cheelii* (Chariot Wheels) *and Swainsona murrayana* (Slender Darling Pea)

The management actions for these species are focused on the increased development of knowledge of the species ecology and threats. However, habitat destruction and weed invasion are noted as key threats to these species (DEWHA 2008c, DEWHA 2008a, Mavromihalis 2010a).

A national recovery plan has been developed for *Maireana cheelii* (Mavromihalis 2010a), which lists the following specific objectives fort its recovery:

1. Determine distribution, abundance, and population structure.
2. Determine habitat requirements.
3. Ensure that important populations and their habitat are protected and managed.
4. Manage threats to populations.
5. Identify key biological functions.
6. Determine growth rates and viability of populations.
7. Build community support for conservation.

Similar priority conservation actions have been outlined for *Brachyscome papillosa* (DEWHA 2008c), including:

1. Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.
2. Identify populations of high conservation priority.
3. Ensure road widening and maintenance activities or other infrastructure or development activities involving substrate or vegetation disturbance in areas where Mossgiel Daisy occurs do not adversely impact on known populations.
4. Investigate formal conservation arrangements such as the use of covenants, conservation agreements or inclusion in reserve tenure.
5. Minimise adverse impacts from land use at known sites.
6. Manage known sites on private property to ensure appropriate cattle and/or sheep grazing regimes are conducted outside the growing season, i.e., when plants are not fertile.
7. Prevent grazing pressure at known sites through exclusion fencing or other barriers.

There is currently no recovery plan for *Swainsona murrayana,* however the SPRAT profile (DAWE 2022a) outlines the following key threat abetment and recovery actions:

1. Maintain grassland vegetation in a relatively open state so that the species is not suppressed by more competitive plants (particularly perennial tussock grasses such as *Austrodanthonia* and *Austrostipa* species and annual exotics like *Avena, Bromus*, *Vulpia* and *Lolium* species).
2. Control rabbits and goats at sites where that are having a deleterious impact.
3. Ensure that surveys are undertaken during the flowering season.
4. Where grazing occurs in suitable habitat, ensure that it is light, intermittent grazing occurs rather than heavy grazing.
5. Research the ecology and impacts of disturbances on the species.

Name of Threatened Species	*Brachyscome papillosa* (Mossgiel Daisy), *Maireana cheelii* (Chariot Wheels) *and Swainsona murrayana* (Slender Darling Pea)

Based on the above conservation and recovery actions, the Project has potential to interfere with the local recovery of these species through vegetation clearance and habitat disturbance.

Conclusion

The Project will require the removal of approximately 2,701.22 ha and 2,060.83 ha of suitable habitat for *Brachyscome papillosa* and *Maireana cheelii*, respectively as well as approximately 2,332.41 ha of suitable habitat for *Swainsona murrayana*. These species have extensive suitable habitat within the Disturbance area, likely requiring clearance for development of access tracks, turbine installation and infrastructure construction.

As a result, the Project has **potential to have a significant impact** on these species as there is a chance or possibility that it will seriously disrupt the lifecycle and habitat of an ecologically significant proportion of their population.

Table B.4.3 *Austrostipa metatoris*

Name of Threatened Species	*Austrostipa metatoris*

Ecology

Austrostipa metatoris is a perennial spear-grass that grows in tussocks to 1 m tall in parts of NSW, also being recorded in south-eastern South Australia. The leaves are tightly rolled, 2–4 mm wide, strongly ribbed, densely hairy on the upper surface and the margins are rough. The flower-heads are spreading and branched, 15– 25 cm long and comprise numerous spikelets, 16–20 mm long with awns (bristles) weakly twice-bent and 5.5–6.5 cm long (DEWHA 2008d).

Austrostipa metatoris occurs in NSW, along the Murray Valley near Balranald and the central-western slopes near Lake Cargelligo and is recorded as locally frequent or dominant only in scattered patches. This species occurs within the Lachlan, Murrumbidgee and Murray (NSW) Natural Resource Management Regions (DEWHA 2008d). *Austrostipa metatoris* grows in sandy mallee areas of the Murray Valley. Habitat includes sandhills, sand ridges, undulating plains, and flat open mallee country, with red to red-brown clay-loam to sandy-loam soils. Associated species include the trees and shrubs Bimble Box (*Eucalyptus populnea*), Gum Coolibah (*E. intertexta*), White Cypress Pine (*Callitris glaucophylla*), Belah (*Casuarina cristata*), Sweet Quandong (*Santalum acuminatum*), Sticky Hopbush (*Dodonaea viscosa*), *Hakea ivoryi*, and the grasses *Austrostipa drummondii* and *A. eremophila* (DEWHA 2008d).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). For *Austrostipa metatoris*, the suitable vegetation types within the Disturbance area comprise PCT 28. Overall, across the Disturbance area, the impact to PCTs associated with this species is approximately 12.79 ha.

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

Sites where the species occur in NSW include Condobolin, Goolgowi, Cunninyeuk Station, Stony Crossing, Kyalite State Forest, Lake Cargelligo, south-west of Nymagee, and a ridge above Lake Benanee. Whilst not specifically mentioned, given the abundance of suitable habitat across the area, populations of the species are considered to occur around the Riverina region. Nevertheless, given the suitable habitat present within the Disturbance area, it is considered moderately likely to occur.

The Project would remove potential habitat for these species and as such it is possible that works could lead to a decrease in the size of local populations, especially if suitable habitat or breeding conditions are poor in years following construction. Nevertheless, as the area of vegetation impact is only a proportionally small section of the larger Disturbance area (12.79 ha of suitable habitat clearance within the 3,158.75 ha

Name of Threatened Species	*Austrostipa metatoris*

Disturbance area) and it is likely that the population extends into other areas of suitable habitat beyond the boundaries of the Project, the long-term survival of the whole population would not be threatened.

2. Reduce the area of occupancy of an important population

AOO represents the area of suitable habitat currently occupied by the species. The AOO for the species is currently not quantified, given the seasonal nature of their habitat and lack of available data.

Whilst the Project will result in the removal of patches of associated vegetation, would consist of only a small area of the entire Project area, with additional suitable habitat extending beyond the Project boundaries. As such, the Project is not considered to reduce the AOO of an important population.

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

The known extent of the population is discussed above and are expected to extend within the locality of the Disturbance area.

The pollination of these species is largely unknown. Due to the narrow nature of the access tracks (would generally have a trafficable width of about 6.5 m) and the possible nature of dispersal (via insect pollination), the Project would not result in fragmentation of individual plants within the Disturbance area.

As such, the Project is unlikely to further result in the fragmentation of the population.

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

No critical habitat has been identified for these species. However, as local populations are likely and there are associated vegetation communities present for species within the Disturbance area, it has been assumed for the purpose of this assessment that the Disturbance area provides critical habitat for the local populations.

As such, the Project would likely require the removal of habitat for these species, which comprises portions of the AOO. However, given the extent of suitable habitat available across the larger area this is not considered a considerable impact to the habitat in the locality to the extent that the survival of the species is threatened.

5. Disrupt the breeding cycle of an important population

Little is known about the reproductive ecology of the species. Construction is expected to commence in early 2028 and take about 3 years to complete, as such construction activities may disturb two or three reproductive seasons. This degree of impact would vary depending on construction staging (i.e., if most vegetation clearing is undertaken in the first year or staggered over multiple years).

However, as the suitable habitat is present across the majority of the Disturbance area, pollination of other individuals would still be possible. As such, the works are unlikely to impact the breeding cycle of an important population.

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

The Project would require the removal of approximately 12.79 ha of suitable habitat for these species. This would largely be isolated to stages of vegetation clearing. If population numbers are decreased during the construction phase and poor environmental conditions follow in the years after construction, the species has the potential to decline in the short and long term.

The extent of operational impacts due to elevated access roads is unknown. Although designs of the roads are not yet developed, it has been assumed for the purpose of this assessment that they will be elevated to avoid flooding in high rainfall events (similar to other existing roads within the Disturbance area facilitating access to existing powerlines). This may change the hydrology of the habitat by increasing water runoff from hard stand areas and increasing flooding in lower areas bound by elevated roads.

Name of Threatened Species	*Austrostipa metatoris*

The extent of this impact is uncertain, however may be positive as the species appears to thrive in years of increased rain, yet increased flooding may increase weed spread. Given the relatively small areas of projected clearance within suitable habitat outside of primary construction zones and availability of high-quality habitat outside the Project boundary, it is unlikely to result in an overall decrease in the availability of quality habitat to the extent that the species is likely to decline.

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

The movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds into habitat edges. However, considering the current movement of livestock on the property, this is considered a minor increased risk.

Nevertheless, if elevated access roads are constructed, the hydrology of the habitat may be altered by increasing flooding in lower areas bound by elevated roads. The extent of this impact is uncertain; however, it may increase weed spread.

As such, given the long-term agricultural use of the land, and regular movement of livestock and machinery across the Disturbance area the opportunity for invasive species establishment has likely already been established. Therefore, it is not considered likely that the Project will lead to the establishment of additional invasive species.

8. Introduce disease that may cause the species to decline, or

Disease is not considered a key threat for these species. The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Disturbance area, however, this is considered a minor risk.

9. Interfere substantially with the recovery of the species.

The management actions for these species are focused on the increased development of knowledge of the species ecology and threats. However, habitat destruction is noted as a key threat to species. Whilst there are no made or adopted recovery plans for the species, several local priority actions have been developed to support its recovery (DEWHA 2008d), these include:

1. Control access routes to suitably constrain public access to known sites on public land.
2. Suitably control and manage access on private land.
3. Minimise adverse impacts from land use at known sites.
4. Protect populations of the listed species through the development of conservation agreements and/or covenants.
5. Manage known sites on private property to ensure appropriate cattle or sheep grazing regimes are conducted outside the growing season, i.e., when plants are not fertile.
6. Prevent grazing pressure at known sites on leased crown land through exclusion fencing or other barriers.
7. Control introduced pests, such as rabbits to manage threats at known sites.

Nevertheless, as the conservation of these species are in preliminary stages and the Disturbance area is not specifically noted as an area of high conservation importance the Project is not considered to interfere substantially with the recovery of these species.

Conclusion

Name of Threatened Species	*Austrostipa metatoris*

The Project will require the removal of approximately 12.79 ha of suitable habitat for this flora species, for the development of access tracks, installation of turbines and construction of infrastructure.

However, these species are sensitive to grazing pressure and the Disturbance area has had a long grazing history. As a result, these habitats are unlikely to support an ecologically significant proportion of the population of these species. Therefore, due to the extensive suitable habitat beyond the Disturbance area and ability to avoid and minimise impacts through alternative design routes, the above assessment the Project is not likely to have a significant impact on *Austrostipa metatoris*.

Table B.4.4 Sharp-tailed Sandpiper (*Calidris acuminata*)

Name of Threatened Species	Sharp-tailed Sandpiper (*Calidris acuminata*)

Ecology

Sharp-tail Sandpipers are approximately 17 – 22 cm long, have a wingspan of 36 – 43 cm, and weigh around 65 g. They are a small to medium sized sandpiper, with a potbelly and rather drawn-out rear end. They have a small, flat head on top of a short neck. Both sexes appear similar but show marked seasonal variation in plumage. Juveniles are distinct from adults (DCCEEW 2014).

During the non-breeding season, approximately 91% of the East Asian-Australasian population migrates to Australia and New Zealand. Sharp-tailed sandpipers occur within all states of Australia. They are found mostly in the south-east and are widespread in both inland and coastal locations. The species also occurs in both freshwater and saline habitats. The species is widespread in most regions of NSW and Victoria, especially in coastal areas. The species utilises fresh and hypersaline environments, feeding along the edge of water on mudflats, coastal and inland wetlands, and sewage ponds. After rainfall events, the species may also feed on areas of agricultural pasture (DCCEEW 2014).

Based on the associated PCTs listed within the BioNet threatened species description for the species (NSW DCCEEW 2024b), no corresponding PCTs are mapped within the Disturbance area. However, suitable vegetation communities are likely present in the surrounding area, with likely movement of the species within and across the Disturbance area.

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

There are currently estimated to be 71,000 mature individuals in the wild with a continuing declining trend (DCCEEW 2014). Given the highly migratory nature of the species, individuals which migrate from breeding grounds in Asia overland via the coast of China and south-east Asia to Australia are considered a single population.

The species utilises fresh and hypersaline environments, feeding along the edge of water on mudflats, coastal and inland wetlands, and sewage ponds. After rainfall events, the species may also feed on areas of agricultural pasture (DCCEEW 2014). Based on current Project design, construction and operational activities are unlikely to impact suitable foraging and roosting habitat within the Disturbance area, especially given high quality habitat in surrounding areas.

However, given the migratory nature of the species and number of turbines to occupy the air area in which individuals would routinely traverse, there is potential for operating turbines to result in fatalities from blade collision. However, considering the low frequency and densities of the populations potentially utilising the Project area and the low chance of strike occurrences, the potential risk of collision impacts is considered low.

As such, the Project is not considered to lead to a long term decrease in the size of the population.

2. Reduce the area of occupancy of an important population

Name of Threatened Species	Sharp-tailed Sandpiper (*Calidris acuminata*)

The current AOO is estimated at 8,000 km^2 (DoE 2015c). Despite the continuing degradation of global wetland habitats, this AOO is considered stable.

Current Project design includes a buffer around existing watercourses, and woodland habitats. As such, no waterbodies or permanent wetlands would be impacted during construction phase of the Project. Minor areas of shrubland wetland require clearance during the development, however, would be minimal. In addition, majority of the wetlands and creeks within the Project area are connected to larger high quality water habitats including the Murrumbidgee River to the north, which provides additional suitable habitat for the Sharp-tailed Sandpiper.

As such, the Project is not considered to reduce the AOO of the species.

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

As mentioned above, given the migratory nature of the species, which involves the annual migration from Asia to Australia, these individuals are considered one population.

During operation, the location of turbines could potentially impact migratory route across the area, however, is not considered likely to fragment the existing population which migrates to Australia.

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

Habitat critical to the survival of the species, as outlined within the conservation advice (DCCEEW 2014), refers to areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal;
- For the long-term maintenance of the species (including the maintenance of species essential to the survival of the sharp-tailed sandpiper, such as macrobenthos);
- To maintain genetic diversity and long-term evolutionary development; or
- For the re-introduction of populations or recovery of the species.

In Australia, a large network of sites is required during the non-breeding season for the species to cope with natural and human-driven environmental changes. Habitat critical to the survival of Sharp-tailed Sandpipers includes a mosaic of feeding and roosting habitat. The species may be highly selective about foraging environments due to its specialised feeding techniques.

As the Disturbance area has been developed to avoid areas of habitat potentially utilised by the species (i.e., waterways and watercourses), as such critical habitat is unlikely to be adversely affected by the Project.

5. Disrupt the breeding cycle of an important population

The Sharp-tailed Sandpiper arrives in Australia following the breeding season, to forage and roost. As the Project will not impact any breeding grounds or habitats, there is considered to be a limited impact the breeding cycle of the population. However, suitable foraging and availability of foraging habitat is necessary to ensure a return migration to breeding grounds.

As the Project would not result in the removal of permanent wetland habitat, as well as availability of high-quality habitat in surrounding areas, the impact to breeding cycle is considered low.

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

Whilst the Disturbance area has been developed to avoid areas of habitat potentially utilised by the species, changes to surface hydrology in the surrounding area (i.e., road and access track development, clearing of

Name of Threatened Species	Sharp-tailed Sandpiper (*Calidris acuminata*)

native vegetation), could potentially result in temporary impacts to water quality from sediment runoff and altered flood patterns.

However, the habitat provided by the Disturbance area is not preferred, with inland wetlands only used when conditions are suitable. In addition, additional high quality wetland habitat is available in the surrounding area, from floodplains of the Murrumbidgee to the north and Ramsar wetlands further to the south.

As such, the Project is not considered likely to decrease the availability of quality habitat for the species to the extent that it is likely to decline.

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

The invasion of mudflats and coastal saltmarshes by cordgrass (*Spartina alterniflora*) are considered key threats to populations of Sharp-tailed Sandpiper (DCCEEW 2014). Whilst the threat of cordgrass is most prevalent within mainland China, it has also become established in Australia and New Zealand. It generally grows seaward from the edge of marshes, facilitating the accumulation of sediment, and eventually replacing open tidal flats with dense, elevated *S. alterniflora* marshes. The prolific growth of *S. alterniflora* reduces the availability of foraging and roosting habitat for shorebirds and hinders their movement through the environment (DoE 2015c).

During construction and operation, the movement of vehicles and equipment has the potential to introduce weeds and pathogens to the Project area. This is considered to be a minor risk during construction and a negligible risk during operation due to the level of vehicle movement.

As discussed above, the construction of access roads has the potential to alter the hydrology of the Disturbance area due to increased runoff and flooding and as a result, the increased risk of weed incursion beyond road corridors and verges. Additionally, if future changes to the surrounding land use occur, particularly if cropping and grazing is increased, it may amplify movement of weeds and pollutants across the landscape.

However, surrounding land use and weed management practices are unlikely to change following construction, with agricultural practices including invasive weed management strategies continued. As a result, the Project is unlikely to result in further establishment of invasive species.

8. Introduce disease that may cause the species to decline, or

Disease is not considered a key threat for the species. The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Disturbance area, however, this is considered a minor risk.

9. Interfere substantially with the recovery of the species.

There are no adopted or made recovery plans for the species. However, the conservation advice (DCCEEW 2014) lists the following primary conservation objectives:

- Minimise further loss of habitat critical to the survival of Sharp-tailed Sandpiper throughout Australia (including habitat predicted to become habitat critical in the future because of climate change).
- Prevent further declines in Sharp-tailed Sandpiper populations by working with relevant Range States to address threats in the East Asian-Australasian Flyway.

Additional conservation and management strategies have been detailed to address the key threats for the species, including habitat loss, climate change, severe weather impacts, human disturbance, and hunting. As the Project would not result in the loss of suitable habitat for the species, the interference with the recovery of the species is not likely.

Name of Threatened Species	Sharp-tailed Sandpiper (*Calidris acuminata*)
Conclusion	
The Project would not result in the removal of suitable foraging habitat for the Sharp-tailed Sandpiper, and as such no direct impacts are expected. The risk of turbine strike on the species is considered low and operational impacts would be monitored in an adaptive bird and bat monitoring program. As such, the Project is not likely to have a significant impact on the Sharp-tailed Sandpiper.	

Table B.4.5 Southern Whiteface (*Aphelocephala leucopsis*)

Name of Threatened Species	Southern Whiteface *(Aphelocephala leucopsis)*
Ecology	
The Southern Whiteface occurs across most of mainland Australia south of the tropics, from the north-eastern edge of the Western Australian wheatbelt, east to the Great Dividing Range. The northern boundary extends to about Carnarvon in the west, to the southern Northern Territory in central Australia, but is slightly further south in Queensland where the species is largely confined to the south-west of the Mitchell Grass Downs and along the southern Qld state border (DCCEEW 2023b). The Southern Whiteface is a small stocky thornbill-like bird with a brown dorsum, white belly, dark brown wings, and a black tail with narrow white tip. A grey wash on the belly is sometimes present, along with a grey or rufous tinge to the flanks. The species displays a white band across the forehead, with a darker streak along the top edge. Adult birds are approximately 11.5 cm in length with a cream-coloured eye, grey legs, and a stubby dark grey bill of finch-like appearance. Adults are sexually monomorphic, while juveniles are distinguishable due to a lack of black rear band on the face (DCCEEW 2023b). Southern Whitefaces live in a wide range of open woodlands and shrublands where there is an understorey of grasses or shrubs, or both. These areas are usually in habitats dominated by acacias or eucalypts on ranges, foothills and lowlands, and plains. Southern Whitefaces are considered sedentary; however, records indicate that individuals may move into wetter areas outside of their normal range during drought years (DCCEEW 2023b). Based on the associated PCTs listed within the BioNet threatened species description for the species (NSW DCCEEW 2024b), no corresponding PCTs are mapped within the Disturbance area. However, suitable vegetation communities are likely present in the surrounding area, with likely movement of the species within and across the Disturbance area.	
1. Lead to a long-term decrease in the size of an important population of a species	
Current population estimates, as of 2021, indicate approximately 477,000 mature individuals in the wild, comprised of both subspecies (*Aphelocephala leucopsis castaneiventris* and *Aphelocephala leucopsis leucopsis*), with substantial rates of decline (DCCEEW 2023b). Several records exist across the larger locality and given the variety of suitable habitat present within the Disturbance area, it is considered moderately likely to occur. The Project would potentially require the removal of suitable habitat for the species. Nevertheless, as the area of vegetation impact only a proportionally small section of the larger Disturbance area and areas of woodland and permanent wetland have been intentionally avoided by the current Project design it is unlikely that the works would negatively affect the long-term survival of the whole population. Additionally, it is likely that the population extends into other areas of suitable habitat beyond the Project boundaries which would not be impacted by the proposed works. During operation, there is a risk of direct strikes to birds from the moving turbines. Flight heights of the Southern Whiteface are unknown; however, they are assumed to fly most frequently below the RSA. As the species is largely sedentary, and forage almost exclusively on the ground, favouring habitat with low tree	

Name of Threatened Species	Southern Whiteface *(Aphelocephala leucopsis)*

densities and an herbaceous understorey litter cover, are unlikely to interfere with airspace surrounding the operational turbines.

As such, the Project is not considered to lead to a long-term decrease in the population of the Southern Whiteface.

2. Reduce the area of occupancy of an important population

AOO represents the area of suitable habitat currently occupied by these species. The current AOO is known to be steadily declining, with current estimates of approximately 70,000 km^2 (DCCEEW 2023b). Whilst the species' distribution is broad across Australia, habitat fragmentation has resulted in regionally isolated populations. Additionally, as the species is largely sedentary, individuals are unlikely to disperse across the entirety of their known distribution. However, are known to move within their locality in the search of favourable conditions, allowing an ongoing exchange of genetic material between these fragmented populations.

The Project would potentially require the removal of suitable habitat for the species. Nevertheless, as the area of vegetation impact only a proportionally small section of the larger Disturbance area and areas of woodland have been intentionally avoided by the current Project design it is unlikely that the works would negatively affect the AOO for the species. Additionally, it is likely that the population, and AOO, extends considerably beyond the Project boundaries which would not be impacted by the proposed works.

As such, the Project is not considered reduce the AOO for the Southern Whiteface.

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

Several populations of the Southern Whiteface exist across its range, given the largely sedentary nature of the species. However, as previously mentioned the ability to disperse in periods of unfavourable conditions allows an ongoing exchange of genetic material within these populations, which can often be fragmented over regions.

As such, whilst the Project potentially requires the removal of minor patches of habitat utilised by the species, clearance in woodland habitats has been avoided wherever possible by current Project designs. In addition, due to the narrow nature of the access tracks (would generally have a trafficable width of about 6.5 m) and continued ability of the Southern Whiteface to move across the landscape the Project would not result in fragmentation of the population within the Disturbance area.

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

Critical habitat for the survival of the species has been defined within the conservation advice (DCCEEW 2023b), and refers to:

- Areas that are necessary for activities such as foraging, breeding, roosting, or dispersal,
- Areas that are necessary 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),
- Areas that are necessary to maintain genetic diversity and long-term evolutionary development.
- Areas that are necessary for the reintroduction of populations or recovery of the species or ecological community,
- Areas of relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs, or both,
- Areas of habitat with low tree densities and an herbaceous understory litter cover which provides essential foraging habitat,

Name of Threatened Species	Southern Whiteface *(Aphelocephala leucopsis)*

- Areas of living and dead trees with hollows and crevices which are essential for roosting and nesting.

Based on this criterion any habitat which is likely or known to support Southern Whiteface is considered critical habitat. However, no Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat for this species (DCCEEW 2023b).

Given the records within the wider locality, it is likely that the species is present across the woodland habitats in the Project area, however, no PCTs associated with the species are present within the Disturbance area.

Given distance from primary work areas, including turbine construction and substation development, and Project designs which aim to avoid potential habitat for the species, critical habitat would not be affected to the extent that the survival of the species is threatened.

5. Disrupt the breeding cycle of an important population

Breeding takes place from July to October throughout most of the species' range, however, the timing of breeding can be affected by rainfall in arid regions. Birds may breed outside of their usual season following sufficient rainfall or may not breed at all during drought. Birds build large bulky domed nest of grass, bark, and roots, usually in a hollow or crevice, although sometimes in low bushes. A clutch size of 3–4 eggs is typical. The length of the incubation period is unknown, but young fledge between 14–19 days after hatching. The generation length is estimated at 2.8 years (DCCEEW 2023b).

Construction is expected to commence in early 2028 and take about 3 years to complete, as such construction activities may disturb two or three reproductive seasons. This degree of impact would vary depending on construction staging (i.e., if most vegetation clearing is undertaken in the first year or staggered over multiple years). However, as preferred woodland breeding and foraging grounds are located outside of key development areas, direct impacts would be limited.

In addition, as the species is known to be capable of moving between habitats as suitability changes and given availability of high-quality habitat in surrounding areas, where no impacts are expected, the works are not considered likely to impact the breeding cycle of the population.

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

The Project would potentially require the removal of habitat utilised by the species. However, would be isolated to small patches as current Project designs have intentionally aimed to avoid areas of woodland across the Project area, with no PCTs associated with the species located within the Disturbance area.

However, the extent of operational impacts due to construction of elevated access roads is unknown. Although designs of the roads are not yet developed, it has been assumed for the purpose of this assessment that they will be elevated to avoid flooding in high rainfall events. This may change the hydrology of the habitat by increasing water runoff from hard stand areas and increasing flooding in lower areas bound by elevated roads. Given the species reliance on woodlands surrounding wetland habitats, indirect impacts to water quality from changes surface hydrology could potentially result in changes to habitat suitability and quality in the Project area.

Movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds and pathogens into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk. However, it is important to note that potential habitat loss is likely restricted to small footprints over a large area, and the species considered likely to persist in the Project area over the long-term given the low impact activity associated with an operational wind farm and the extent of habitat that will remain, especially beyond the boundaries of the Project area.

Despite potential changes to habitat conditions across the Project area, the availability of connected habitat in surrounding areas, and ability of the Southern Whiteface to move successfully between suitable habitats

Name of Threatened Species	Southern Whiteface *(Aphelocephala leucopsis)*

indicates that the works are unlikely to modify existing habitats to the extent that the species is likely to decline.

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

As habitats become increasingly fragmented, it is recognised that the predation by feral species becomes more prevalent as bird vulnerability increases (DCCEEW 2023b). Foxes and cats are known to be present in the Project area and are considered to already be established within their habitats.

Additionally, movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk.

8. Introduce disease that may cause the species to decline, or

Disease is not considered a key threat for the species. The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Disturbance area, however, this is considered a minor risk.

9. Interfere substantially with the recovery of the species.

No recovery plans have been developed for the species. Primary conservation outcomes have been outlined within the conservation advice (DCCEEW 2023b), as follows:

1. Establish stable population trends in both subspecies.
2. Understand the causes of current population declines.

The Project works would potentially interfere with conservation and management objectives, as development potentially requires the clearance of critical habitat for the species. However, as suitable woodland habitat has been largely avoided by current Project design and given the considerable availability of suitable habitat beyond Project boundaries in which the species can access, the works are not considered likely to interfere with the recovery of the species.

Conclusion

The Project has potential to remove small patches of suitable habitat for the species, however, the Project has been intentionally designed to avoid areas of high habitat value, including woodlands. Several species records exist across the wider locality, however given the mobility of the species, is easily able to move between high quality habitat patches outside the Disturbance area. Additionally, the risk of turbine strike on the species is considered low and operational impacts would be monitored in an adaptive bird and bat monitoring program.

As such, the Project is not likely to have a significant impact on the Southern Whiteface.

Table B.4.6 Brown Treecreeper (south-eastern subspecies) (*Climacteris picumnus victoriae*) and Painted Honeyeater (*Grantiella picta*)

Name of Threatened Species	Brown Treecreeper (south-eastern subspecies) (*Climacteris picumnus victoriae)* and Painted Honeyeater (*Grantiella picta*)

Ecology

Brown Treecreeper (south-eastern subspecies) (*Climacteris picumnus victoriae*)

The Brown Treecreeper (south-eastern), Australia's largest treecreeper, which extends across parts of south-eastern Australia is a grey-brown bird with black streaking on the lower breast and belly, and black bars on the undertail. Pale buff bands across the flight feathers are obvious in flight. The face is pale, with a dark line through the eye, and a dark crown. Sexes differ slightly in all plumages, with small patches of black and white streaking on the centre of the uppermost breast on males, while the females exhibit rufous and white streaking. Juveniles differ from adults mainly by the pattern of the under-body and by their pale bill and gape. Subspecies *victoriae* is distinguished from subspecies *picumnus* by colour differences on the face, body, and tail markings. The two subspecies grade into each other through central NSW (DCCEEW 2023e).

Brown Treecreepers (south-eastern) are endemic to south-eastern Australia from the Grampians in western Victoria, through central NSW to the Bunya Mountains in Queensland, and from the coast to the inland slopes of Great Dividing Range. In NSW, the western boundary of the range of runs approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell (DCCEEW 2023e).

Brown treecreepers (south-eastern) occupy dry open eucalypt forests and woodlands. The subspecies mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species. They also occur in mallee, forests, and woodlands subject to periodic inundation, (e.g., river red gum (*Eucalyptus camaldulensis*) woodlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses in the upper Murray River). The subspecies is not usually found in woodlands with a dense shrub layer, and it is absent from heavily degraded woodlands and steep rocky hills. Optimal habitat for brown treecreeper (south-eastern) must experience some kind of ongoing disturbance regime (historically Indigenous burning practices) to keep the ground layer from becoming too dense and uniform (DCCEEW 2023e).

Based on the associated PCTs listed within the BioNet threatened species description for the species (NSW DCCEEW 2024b), no corresponding PCTs are mapped within the Disturbance area. However, suitable vegetation communities are likely present in the surrounding area, with likely movement of the species within and across the Disturbance area.

Painted Honeyeater (*Grantiella picta*)

The Painted Honeyeater has black upperparts, white underparts, black spots on its flanks and yellow edges to the flight and tail feathers. The bill is a deep pink and the eye red. The females are smaller and browner on the back than the male, frequently with fewer streaks or spots on their breast and flanks (DoE 2015a).

The species is sparsely distributed from south-eastern Australia to north-western Queensland and eastern Northern Territory. The greatest concentrations and almost all records of breeding come from the inland slopes of the Great Dividing Range between the Grampians, Victoria and Roma, Queensland (DoE 2015a). The species inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands of black box and river red gum, box-ironbark-yellow gum woodlands, acacia-dominated woodlands, paperbarks, casuarinas, Callitris, and trees on farmland or gardens. The species prefers woodlands which contain a higher number of mature trees, as these host more mistletoes (DoE 2015a).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). Within the Disturbance area, these comprise PCTs 11, 13, 15 and 28 for the Painted Honeyeater. Overall, across the Disturbance area, the impact to PCTs associated with this species is approximately 12.79 ha.

Name of Threatened Species	Brown Treecreeper (south-eastern subspecies) (*Climacteris picumnus victoriae)* and Painted Honeyeater (*Grantiella picta*)

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

Current population estimates for the Brown Treecreeper subspecies, as of 2021, indicate approximately 68,000 mature individuals in the wild, with significant reduction in size in the past three generations (DCCEEW 2023e). Several records exist across the Project area and within larger locality and given the variety of suitable habitat present within the Disturbance area for both species, they are considered moderately likely to occur.

The Project would require the removal of suitable habitat for these species, in particular the Painted Honeyeater with an approximate 12.79 ha of suitable habitat within the Disturbance area. Nevertheless, as the area of vegetation impacts only a proportionally small section of the larger Disturbance area and areas of woodland and permanent wetland have been intentionally avoided by the current Project design it is unlikely that the works would negatively affect the long-term survival of the populations. Additionally, it is likely that the populations extend into other areas of suitable habitat beyond the Project boundaries which would not be impacted by the proposed works.

During operation, there is a risk of direct strikes to birds from the moving turbines. Flight heights of the two bird species are unknown; however, they are assumed to fly most frequently below the RSA. As the Brown Treecreeper subspecies is described as sedentary, and forage both on the ground and in mature live and dead trees, are unlikely to interfere with airspace surrounding the operational turbines. The Painted Honeyeater is relatively dispersive across its distribution, however, largely remain within woodlands is close proximity to mistletoes.

As such, the Project is not considered to lead to a long-term decrease in the population of the Brown Treecreeper (south eastern) or Painted Honeyeater.

2. Reduce the area of occupancy of an important population

AOO represents the area of suitable habitat currently occupied by these species. The current AOO for the subspecies is known to be steadily declining, with current estimates of approximately 30,000 km^2 (DCCEEW 2023e). Whilst the subspecies' distribution is relatively broad across eastern Australia, habitat fragmentation has resulted in regionally isolated populations. Additionally, as the species is largely sedentary, individuals are unlikely to disperse across the entirety of their known distribution and individuals typically occupy permanent territories.

The AOO for the Painted Honeyeater is estimated at approximately 1,000 km^2 (DoE 2015a), with a distribution that is not considered severely fragmented.

The Project would require the removal of up to 12.79 ha of suitable habitat for these species. However, as the area of vegetation impact only a proportionally small section of the larger Disturbance area and areas of woodland have been intentionally avoided by the current Project design it is unlikely that the works would negatively affect the AOO for the two species. Additionally, the population and AOO extends considerably beyond the Project boundaries which would not be impacted by the proposed works.

As such, the Project is not considered reduce the AOO for the Brown Treecreeper (south-eastern subspecies) or Painted Honeyeater.

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

Brown Treecreepers typically occupy permanent territories, with limited movements across the current distribution. Given the existing fragmentation of suitable habitat across the Disturbance area, the subspecies is likely to exist as isolated populations within the region.

The Painted Honeyeater is relatively dispersive, moving within its range to areas of preferred mistletoe habitat and as such, is considered to consist of one population (DoE 2015a).

Name of Threatened Species	Brown Treecreeper (south-eastern subspecies) (*Climacteris picumnus victoriae)* and Painted Honeyeater (*Grantiella picta*)

However, whilst the Project requires the removal of minor patches of suitable cypress pine (PCT 28) habitat, clearance in woodland habitats has been avoided wherever possible by current Project designs. In addition, due to the narrow nature of the access tracks (would generally have a trafficable width of about 6.5 m) and ability of the species to move across the landscape the Project would not result in fragmentation of the population within the Disturbance area.

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

Critical habitat has been defined within the conservation advice for the Brown Treecreeper (DCCEEW 2023e), and refers to:

- Areas that are necessary for activities such as foraging, breeding, roosting, or dispersal,
- Areas that are necessary 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),
- Areas that are necessary to maintain genetic diversity and long-term evolutionary development.
- Areas that are necessary for the reintroduction of populations or recovery of the species or ecological community,
- Areas that have relatively undisturbed grassy woodland with native understorey.
- Habitat structure should be quite open at ground level so that birds are able to feed on or near the ground and maintain vigilance against predators.
- The required degree of openness is mostly likely to be created by moderate levels of disturbance by fire and/or grazing.
- Areas that have large living and dead trees which are essential for roosting and nesting sites and for foraging,
- Areas that have fallen timber which provides essential foraging habitat; and
- Areas that have hollows in standing dead or live trees and tree stumps are also essential for nesting.

Based on this criterion any habitat which is likely, has potential to, or known to support the subspecies is considered critical habitat. However, no Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat for this subspecies (DCCEEW 2023b).

No critical habitat for the Painted Honeyeater has been described, however given specialist diets and reliance on mistletoe habitats, any areas of established woodland with mistletoe growth is considered critical habitat for the species.

Given the records within Disturbance area and the wider locality, it is likely that the species are present across the woodland and shrubland habitats in the Project area. Whilst areas of woodland have been largely avoided by current footprint design, minor areas of clearance for access tracks are potentially required. Additionally, given the potential for changes in the Project area's surface hydrology, a temporarily impact nearby waterbodies is possible.

However, given distance from primary work areas, including turbine construction and substation development, and Project designs which aim to avoid suitable habitat for the species, critical habitat would not be affected to the extent that the survival of the two species is threatened.

5. Disrupt the breeding cycle of an important population

Name of Threatened Species	Brown Treecreeper (south-eastern subspecies) (*Climacteris picumnus victoriae)* and Painted Honeyeater (*Grantiella picta*)

Brown Treecreepers (south-eastern) nest and roost in naturally occurring tree cavities in a variety of eucalypt species. Hollows in standing dead or live trees and tree stumps are essential for nesting. Typically, birds breed cooperatively with the breeding group consisting of a breeding pair and a few subordinate males. Building of the nest is undertaken by all members of the group over a period of 1–2 weeks. Breeding takes place from July to February across its range. Females typically lay 2–3 eggs. Pairs often have two broods during each breeding season. Immature females disperse but are reluctant to cross large tracts of open land.

Brown treecreepers (south-eastern) have higher breeding success in territories with lower densities of shrubs, moderate levels of ground cover, greater amounts of foraging substrate and greater invertebrate biomass and substantial volumes of fallen timber (DCCEEW 2023e).

Painted Honeyeater breeding occurs from October to March when mistletoe fruits are most available. The species builds a flimsy cup nest made of plant-fibre, spiders' webs, and rootlets in the outer foliage of trees anywhere from 3 m to 20 m above the ground. Usually, 2-3 eggs are laid and both parents incubate the nest, brood and feed young. The species appears to prefer mistletoe as a nest substrate and selects nest sites in habitats where mistletoe prevalence and parasitism rates are high (DoE 2015a).

Construction is expected to commence in early 2028 and take about 3 years to complete, as such construction activities may disturb two or three reproductive seasons. This degree of impact would vary depending on construction staging (i.e., if most vegetation clearing is undertaken in the first year or staggered over multiple years). However, as preferred woodland breeding and foraging grounds are located outside of key development areas, direct impacts would be limited.

In addition, as both species are known to be capable of moving between habitats as suitability changes and given availability of high-quality habitat in surrounding areas, where no impacts are expected, the works are not considered likely to impact the breeding cycle of the populations.

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

The Project would require the removal of up to 12.79 ha of suitable habitat for the species, specifically the Painted Honeyeater. However, would be isolated to small patches as current Project designs have intentionally aimed to avoid areas of woodland across the Project area.

However, the extent of operational impacts due to construction of elevated access roads is unknown. Although designs of the roads are not yet developed, it has been assumed for the purpose of this assessment that they will be elevated to avoid flooding in high rainfall events (similar to other existing roads within the Disturbance area facilitating access to existing powerlines). This may change the hydrology of the habitat by increasing water runoff from hard stand areas and increasing flooding in lower areas bound by elevated roads. Given the species reliance on woodlands surrounding wetland habitats, indirect impacts to water quality from changes surface hydrology could potentially result in changes to habitat suitability and quality in the Project area.

Movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds and pathogens into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk. However, it is important to note that potential habitat loss is likely restricted to small footprints over a large area, and the species is considered likely to persist in the Project area over the long-term given the low impact activity associated with an operational wind farm and the extent of habitat that will remain, especially beyond the boundaries of the Disturbance area.

Despite potential changes to habitat conditions across the Project area, the availability of connected habitat in surrounding areas, and ability of both species to move successfully between suitable habitats indicates that the works are unlikely to modify existing habitats to the extent that either species is likely to decline.

Name of Threatened Species	Brown Treecreeper (south-eastern subspecies) (*Climacteris picumnus victoriae)* and Painted Honeyeater (*Grantiella picta*)

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

The predation by feral species, as well as competition and exclusion by Noisy Miners are established threats to the survival of both species (DoE 2015a, DCCEEW 2023e). Foxes and cats are known to be present in the Disturbance area and are considered to already be established within their habitats.

Additionally, movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk.

8. Introduce disease that may cause the species to decline, or

Disease is not considered a key threat for either species. The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Disturbance area, however, this is considered a minor risk.

9. Interfere substantially with the recovery of the species.

No recovery plans have been developed for either species. The current primary conservation outcome for the Brown Treecreeper is establishing stable or increasing populations observed across the range (DCCEEW 2023b). Primary conservation actions, as outlined within the conservation advice (DoE 2015a), for the Painted Honeyeater include:

1. Establish stable population at key sites.
2. No further clearance of suitable habitat.
3. Ensure adequate number of mature trees and mistletoe populations across its distribution.

The Project works would potentially interfere with conservation and management priorities, as development potentially the clearance small, isolated patches of habitat for the species, in particular the Painted Honeyeater. However, as suitable woodland habitat has been largely avoided by current Project design and given the considerable availability of suitable habitat beyond Project boundaries in which the species can access, the works are not considered likely to interfere with the recovery of the species.

Conclusion

The Project requires the removal of approximately 12.79 ha suitable habitat for the Painted Honeyeater, however, no associated PCTs are present within the Disturbance area for the Brown Treecreeper (South-eastern). Whilst there are suitable woodland habitats available for these species, the Project has been intentionally designed to avoid areas of high habitat value, including woodlands. Several records exist across the Project and wider locality, however given the mobility of the two species, is easily able to move between high quality habitat patches outside the Disturbance area. Additionally, the risk of turbine strike on the two species is considered low and operational impacts would be monitored in an adaptive bird and bat monitoring program.

As such, the Project is not likely to have a significant impact on the Brown Treecreeper (south-eastern) or the Painted Honeyeater.

Table B.4.7 Grey Falcon (*Falco hypoleucos*)

Name of Threatened Species	Grey Falcon (*Falco hypoleucos*)

Ecology

The Grey Falcon is an elusive species endemic to mainland Australia. The Grey Falcon is a medium-sized raptor (400-500 g) that exhibits reversed sexual dimorphism in body mass, with females weighing on average about 30% more than males. The Grey Falcon is a compact, pale grey falcon with a heavy thick chest, long wings, and dark wing tips. The under-body is pale grey, and the tail has narrow blackish bars. The chin, throat and cheeks are white in colour; adults are pale grey with fine blackish streaks, and juveniles are white with heavy dark streaks. The legs and toes, eye-ring, cere and base of the bill are bright orange-yellow and the tip of the bill is black (TSSC 2020).

The species occurs in arid and semi-arid Australia, including the Murray-Darling Basin, Eyre Basin, central Australia, and Western Australia. The species is mainly found where annual rainfall is less than 500 mm, except when wet years are followed by drought, when the species might become marginally more widespread, although it is essentially confined to the arid and semi-arid zones at all times (TSSC 2020).

The species frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses. The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter (TSSC 2020).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). Within the Project area, these comprise PCTs 11, 13, 15, 17, 24, 28, 44, 45, 46, 153, 157, 160, 163, 164, 166, 216 and 236 for the Grey Falcon. Overall, across the Disturbance area, the impact to PCTs associated with this species is approximately 3,002.8 ha.

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

The species consists of a single population with an estimated total population size of less than 1,000 mature individuals (TSSC 2020). One record exists within locality and given the variety of suitable habitat present within the Project area, it is considered moderately likely to occur.

The Project would require the removal of approximately 3,002.8 ha of suitable foraging habitat for the species. Nevertheless, as areas of woodland roosting and breeding habitat have been intentionally avoided by the current Project design it is unlikely that the works would negatively affect the long-term survival of the whole population. Additionally, it is likely that the population extends into other areas of suitable habitat beyond the Project boundaries which would not be impacted by the proposed works.

The Project has potential to modify the available airspace on occasions when this species is foraging and dispersing through the Disturbance area. During operation, there is a risk of direct strikes to birds from the moving turbines. Flight heights of the species is largely unknown; however, given comparison with similar species, they are assumed to fly within the range of the RSA. As such, additionally given the routine movement of the species across the landscape, turbine strike is considered possible.

As such, despite uncertainties surrounding bird strike impacts resulting from an operational wind farm, given the lack of records within the Project area, and Disturbance area design which avoids clearance of vegetation within woodland areas, the Project is unlikely to result in the decrease in the size of an important population.

2. Reduce the area of occupancy of an important population

AOO represents the area of suitable habitat currently occupied by these species. The current AOO is known to be steadily declining, with current estimates of approximately 6,000 km^2 (TSSC 2020). Whilst the species' distribution is fragmented across Australia, the naturally dispersive nature of the species allows an ongoing exchange of genetic material between these fragmented areas.

Name of Threatened Species	Grey Falcon (*Falco hypoleucos*)

The Project would require the removal of approximately 3,002.8 ha of suitable grassland and shrubland habitat for the species. Nevertheless, as areas of woodland and wetland have been intentionally avoided by the current Project design it is unlikely that the works would negatively affect the AOO for the species. Additionally, it is likely that the population, and AOO extends considerably beyond the Project boundaries which would not be impacted by the proposed works.

As such, whilst the Project has potential to reduce available airspace in the Disturbance area at locations of turbines, the Project is not considered reduce the AOO for the species.

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

The Grey Falcon is considered to consist of a single population across its range. As previously mentioned, the ability to widely disperse allows an ongoing exchange of genetic material between individuals, which can often occupy fragmented habitat patches over regions.

As such, whilst the Project requires the removal of patches of suitable habitat, clearance in woodland habitats and watercourses has been avoided wherever possible by current Disturbance area designs. In addition, due to the narrow nature of the access tracks (would generally have a trafficable width of about 6.5 m) and continued ability of the species to move across the landscape the Project would not result in fragmentation of the population within the Project area.

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

No critical habitat has been identified for these species. However, as local populations are known and there are associated vegetation communities present for species within the Disturbance area, it has been assumed for the purpose of this assessment that the Project area provides critical habitat for the local populations.

Whilst areas of permanent wetland and woodland have been largely avoided by current footprint design, areas of clearance across associated PCTs are required. However, given distance from primary work areas, including turbine construction and substation development, lack of records within the Project area and Project designs which aim to avoid suitable habitat for the species, critical habitat would not be affected to the extent that the survival of the species is threatened.

5. Disrupt the breeding cycle of an important population

Breeding occurs from June to November. Clutch size can vary from 1-4 eggs. Eggs are laid in the old nests of other birds, particularly those of other raptors or corvids. The nests chosen are usually in the tallest trees along watercourses, particularly River Red Gum (*Eucalyptus camaldulensis*) and Coolibah (*E. coolabah*) but can also nest in telecommunication towers. The incubation period is 34–35 days and the nestling period is variously given between 41-52 days. Typically, young Grey Falcons and their parents will stay together for up to at least 12 months after fledging, even when the parents have a new brood (TSSC 2020).

Construction is expected to commence in early 2028 and take about 3 years to complete, as such construction activities may disturb two or three reproductive seasons. This degree of impact would vary depending on construction staging (i.e., if most vegetation clearing is undertaken in the first year or staggered over multiple years). However, as preferred woodland breeding and foraging grounds are located outside of key development areas, direct impacts would be limited.

In addition, as the species is known to be capable of moving between habitats as suitability changes and given availability of high-quality habitat in surrounding areas, where no impacts are expected, the works are not considered likely to impact the breeding cycle of the population.

6. 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 potentially require the removal of suitable grassland and shrubland habitat for the species.

Name of Threatened Species	Grey Falcon (*Falco hypoleucos*)

Movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds and pathogens into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk.

The Project also has potential to modify the available airspace on occasions when this species is foraging or dispersing through the Project area. As the incidence of blade strike is not well studied for this species, and there is potential for the Grey Flacon to utilise areas surrounding the operational turbines, the installation of such a high number of turbines has the potential to reduce the extent of airspace habitat.

However, given that only one historical record exists within the locality, and no records within the Project area, any reductions in airspace habitat are unlikely to impact the species to the extent that the species will decline.

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

The predation of chicks by feral cats is a well-established threat to the species, especially when Grey Falcons nest directly on the ground on low lying structures (TSSC 2020). Cats are known to be present in the Disturbance area and are considered to already be established within their habitats.

Additionally, movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk.

8. Introduce disease that may cause the species to decline, or

Disease is not considered a key threat for the species. The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Disturbance area, however, this is considered a minor risk.

9. Interfere substantially with the recovery of the species.

No recovery plan has been developed for the species. The primary conservation priorities for the species support initiatives to improve habitat management as well as cat and camel control in arid and semi-arid Australia. However, given understanding of threats is poor, these actions are tentative and may be subject to change in priority (TSSC 2020).

The Project works would potentially interfere with conservation and management priorities, as development potentially requires the clearance of patches of habitat for the species. The number of individuals using the airspace in the Disturbance area is unknown and there's a high level of uncertainty estimating the actual impacts on an ecologically significant proportion of their population.

However, given the avoidance of areas of woodland in the current Disturbance area designs and availability of high quality habitat in surrounding areas, the Project is unlikely to interfere with the recovery of the species.

Conclusion

The Project potentially require the removal of up to 3,002.8 ha of suitable foraging habitat for the species. There are uncertainties around the ongoing presence and number of individuals likely to use the airspace in the Disturbance area and uncertainties surrounding the impacts of blade collision an ecologically significant proportion of their population.

However, given the lack of previous records within the Project area, avoidance of key nesting woodland habitat by the current Disturbance area, and abundance of suitable habitat in the surrounding area, the Proposed action is unlikely to result in a significant impact to the Grey Falcon.

Table B.4.8 White-throated Needletail (Hirundapus caudacutus)

Name of Threatened Species	White-throated Needletail (*Hirundapus caudacutus*)

Ecology

The White-throated Needletail is a large swift widespread in eastern and south-eastern Australia, with a thickset, cigar-shaped body, stubby tail, and long pointed wings (20 cm in length and approximately 115–120 g in weight). Sexes are alike, with no seasonal variation in plumage. The adults have a dark-olive head and neck, with an iridescent gloss on the crown; the mantle and the back are paler, greyish; and the upper wings are blackish, sometimes with a greenish gloss, with a contrasting white patch at the base of the trailing edge; the upper tail is black with a greenish gloss. The face is dark olive with a narrow, white band across the forehead and lores and a white patch on the chin and throat. The underparts are generally dark olive except for a U-shaped band across the rear flanks, the vent and the undertail coverts, and the undertail is black with a greenish gloss. The underwing is black-brown with glossy grey-brown flight feathers. The bill is black, the eyes black-brown and the legs and feet are dark grey, sometimes with a pinkish tinge (TSSC 2019a).

In eastern Australia, the species is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Dividing Range and occasionally onto the adjacent inland plains. Further south on the mainland, it is widespread in Victoria, though more so on and south of the Great Dividing Range, and there are few records in western Victoria (TSSC 2019a).

In Australia, the White-throated Needletail is mostly aerial, from heights of less than 1 m up to more than 1000 m above the ground. Although they occur over most types of habitats, they are recorded most often above wooded areas, including open forest and rainforest, and may also fly below the canopy between trees or in clearings. When flying above farmland, they are more often recorded above partly cleared pasture, plantations, or remnant vegetation at the edge of paddocks. The species roosts in trees amongst dense foliage in the canopy or in hollows (TSSC 2019a).

Based on the associated PCTs listed within the BioNet threatened species description for the species (NSW DCCEEW 2024b), no corresponding PCTs are mapped within the disturbance area. However, suitable vegetation communities are likely present in the surrounding area, with likely movement of the species within and across the Disturbance area.

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

The Project would potentially require the removal of suitable habitat for the species. Nevertheless, as the area of vegetation impact only a proportionally small section of the larger Disturbance area and areas of woodland habitat and watercourses have been intentionally avoided by the current Project design it is unlikely that the works would negatively affect the long-term survival of the whole population. Additionally, it is likely that the population extends into other areas of suitable habitat beyond the Project boundaries which would not be impacted by the proposed works.

The Project has potential to modify the available airspace on occasions when this species is foraging or dispersing through the Disturbance area. However, given the lack of information around the level of blade strike risk for this species, the proportion of individuals that fly at RSA height is generally unknown. However, given typically migrating heights of the species, interactions with the airspace surrounding turbines are likely.

However, given the avoidance of potential breeding areas and woodland habitats, the Project is unlikely to lead to a long-term decrease in the population.

2. Reduce the area of occupancy of an important population

AOO represents the area of suitable habitat currently occupied by these species. The current AOO is known to be steadily declining, with current estimates of approximately 18,000 km^2 (TSSC 2019a). Whilst the species' distribution is fragmented across Australia, the naturally dispersive nature of the species allows an ongoing exchange of genetic material between these fragmented areas.

Name of Threatened Species	White-throated Needletail (*Hirundapus caudacutus*)

The Project would potentially require the removal of habitat utilised by the species, however no PCTs associated with the species is present within the Disturbance area. Nevertheless, as the area of vegetation impact only a proportionally small section of the Disturbance area and areas of woodland and permanent wetland have been intentionally avoided by the current Project design it is unlikely that the works would negatively affect the area of AOO for the species. Additionally, it is likely that the population, and AOO extends considerably beyond the Project boundaries which would not be impacted by the proposed works.

As such, whilst the Project has potential to reduce available airspace in the Disturbance area at locations of turbines, the Project is not considered reduce the AOO for the species.

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

The species is a highly mobile bird with a broad dispersal extent. As previously mentioned, the ability to widely disperse allows an ongoing exchange of genetic material between individuals, which can often occupy fragmented habitat patches over regions.

As such, whilst the Project potentially requires the removal of minor patches of suitable habitat, clearance in woodland and permanent wetland habitats has been avoided wherever possible by current Project designs. In addition, due to the narrow nature of the access tracks (would generally have a trafficable width of about 6.5 m) and continued ability of the species to move across the landscape the Project would not result in fragmentation of the population within the Disturbance area.

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

No critical habitat has been identified for species. However, as local populations are known and there are associated vegetation communities present for species within the Project area, it has been assumed for the purpose of this assessment that the Project area provides critical habitat for the local populations.

Whilst areas of woodland and watercourses have been largely avoided by the current Disturbance area, minor areas of clearance for access tracks are potentially required. Additionally, given the potential for changes in the Project area's surface hydrology, a temporarily impact nearby waterbodies is possible.

However, as the Project area is outside of breeding and roosting ranges, critical habitat would not be affected to the extent that the survival of the species is threatened.

5. Disrupt the breeding cycle of an important population

The species does not breed in Australia. The White-throated Needletail lays eggs from late May to early June in their breeding grounds in the Northern Hemisphere. The species breeds in wooded lowlands and sparsely vegetated hills, as well as mountains covered with coniferous forests in eastern Siberia, north-eastern China, the Korean Peninsula and Japan. The species leaves the breeding grounds between late August and October, flying singly or in scattered flocks to Australia to spend the non-breeding season (TSSC 2019a).

As the Disturbance area is outside the breeding range for this species, the Project is unlikely to disrupt the breeding cycle of an important population.

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

The Project would potentially require the removal of suitable foraging habitat for the species. However, would be isolated to small patches as current Project designs have intentionally aimed to avoid areas of woodland and permanent wetland across the Project area. The Project has potential to modify the available airspace on occasions when this species is foraging and dispersing through the Disturbance area. Given the lack of information around the level of blade strike risk for this species, the proportion of individuals that fly at RSA height is generally unknown.

Name of Threatened Species	White-throated Needletail (*Hirundapus caudacutus*)

Movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds and pathogens into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk.

As such, the Project is not likely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

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

The Project is unlikely to result in invasion species harmful to this species becoming established in the Project area.

8. Introduce disease that may cause the species to decline, or

Disease is not considered a key threat for the species. The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Project area, however, this is considered a minor risk.

9. Interfere substantially with the recovery of the species.

Current conservation and management priorities are outlined within the Conservation Advice (TSSC 2019a), as follows:

- Work with governments in East Asia to minimise destruction of key breeding habitats
- Important habitats in Australia are identified and protected
- Habitat loss and modifications
- Seek the support of governments in East Asia to protect remaining old growth forests within the breeding range of the species
- Identify requirements of important habitat in Australia
- Support initiatives to improve habitat management at key sites in Australia.

The Project works would potentially interfere with objectives, as development potentially requires the clearance small, isolated patches of critical habitat for the species. In addition, blade strike collisions from wind farms are known threats to this species (TSSC 2019a). The number of individuals using the airspace in the Disturbance area is unknown and there's a high level of uncertainty estimating the actual impacts on an ecologically significant proportion of their population.

However, with the implementation of an adaptive bird and bat monitoring program, the Project is consistent with the species Recovery Plan and would not interfere with the recovery of the species.

Conclusion

The Project would potentially require the removal of small patches of suitable foraging woodland and tall grassland habitat for the species. However, current Project layout has been designed to largely avoid woodland and permanent wetland areas, with majority of works located on chenopod shrublands. There are uncertainties around the number of individuals likely to use the airspace in the Disturbance area and ability to estimate impacts on an ecologically significant proportion of their population. The risk of turbine strike on the species is considered low and operational impacts would be monitored in an adaptive bird and bat monitoring program.

As such, the Project is not likely to have a significant impact on the White-throated Needletail.

Table B.4.9 Blue-winged Parrot (*Neophema chrysostoma*)

Name of Threatened Species	Blue-winged Parrot (*Neophema chrysostoma*)

Ecology

The Blue-winged Parrot is a small bird present throughout areas of Australia. The Blue-winged Parrot grows up to 24 cm in length with a weight of less than 50 g, the blue-winged parrot is a slender parrot with an olive-green head and upper body, grading to light green on the fore-neck. The upper tail is green-blue, with yellow sides. The underparts are yellow, and there may be orange in the centre of the belly. A yellow facial patch extends back to the eye. A narrow, dark blue band runs from eye to eye across the forehead. The blue-winged parrot gets its name from the large, dark blue patch on the wings. The female is similar to the male, but with slightly duller colours (DCCEEW 2023c).

Blue-winged parrots breed on mainland Australia south of the Great Dividing Range in southern Victoria from Port Albert in Gippsland west to Nelson, and sometimes in the far south-east of South Australia, and the north-western, central, and eastern parts of Tasmania. A partial migrant, variable numbers of birds migrate across Bass Strait in winter, apparently making the flight non-stop based on the scarcity of records from the Bass Strait islands. During the non-breeding period, from autumn to early spring, birds are recorded from northern Victoria, eastern South Australia, south-western Queensland and western NSW, with some birds reaching south-eastern NSW and eastern Victoria, particularly on the southern migration (DCCEEW 2023c).

Blue-winged parrots inhabit a range of habitats from coastal, sub-coastal and inland areas, through to semi-arid zones. They tend to favour grasslands and grassy woodlands and are often found near wetlands both near the coast and in semi-arid zones. The species can also be seen in altered environments such as airfields, golf-courses, and paddocks. Pairs or small parties of blue-winged parrots forage mainly near or on the ground for seeds of a wide range of native and introduced grasses, herbs and shrubs (DCCEEW 2023c).

Based on the associated PCTs listed within the BioNet threatened species description for the species (NSW DCCEEW 2024b), no corresponding PCTs are mapped within the Disturbance area. However, suitable vegetation communities are likely present in the surrounding area, with likely movement of the species within and across the Disturbance area.

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

The Project would potentially require the removal of habitat utilised by the species, however no PCTS associated with the species are present within the Disturbance area. Nevertheless, as the area of vegetation impact only a proportionally small section of the larger Disturbance area and areas of woodland have been intentionally avoided by the current Project design it is unlikely that the works would negatively affect the long-term survival of the whole population. Additionally, it is likely that the population extends into other areas of suitable habitat beyond the Project boundaries which would not be impacted by the proposed works.

The Project has potential to modify the available airspace on occasions when this species is foraging or dispersing through the Disturbance area. However, given the lack of information around the level of blade strike risk for this species, the proportion of individuals that fly at RSA height is generally unknown. However, given typically migrating heights of the species, interactions with the airspace surrounding turbines are likely.

However, given the avoidance of potential breeding areas and woodland habitats, the Project is unlikely to lead to a long-term decrease in the population.

2. Reduce the area of occupancy of an important population

AOO represents the area of suitable habitat currently occupied by these species. The current AOO is known to be steadily declining, with current estimates of approximately 11,000 km^2 (DCCEEW 2023c). The naturally dispersive nature of the species allows an ongoing exchange of genetic material between these fragmented areas.

The Project would potentially require the removal of suitable foraging habitat for the species. Nevertheless, as the area of vegetation impact only a proportionally small section of the larger Disturbance area and areas

Name of Threatened Species	Blue-winged Parrot (*Neophema chrysostoma*)

of woodland and permanent wetland have been intentionally avoided by the current Project design it is unlikely that the works would negatively affect the AOO for the species. Additionally, it is likely that the population, and AOO extends considerably beyond the Project boundaries which would not be impacted by the proposed works.

As such, whilst the Project has potential to reduce available airspace in the Disturbance area at locations of turbines, the Project is not considered reduce the AOO for the species.

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

The species is a highly mobile bird with a broad dispersal extent. As previously mentioned, the ability to widely disperse allows an ongoing exchange of genetic material between individuals, which can often occupy fragmented habitat patches over regions.

As such, whilst the Project potentially requires the removal of minor patches of suitable habitat, clearance in woodland and permanent wetland habitats has been avoided wherever possible by current Project designs. In addition, due to the narrow nature of the access tracks (would generally have a trafficable width of about 6.5 m) and continued ability of the species to move across the landscape the Project would not result in fragmentation of the population within the Disturbance area.

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

Critical habitat for the species has been defined within the Conservation Advice (DCCEEW 2023c), as follows:

- Areas that are necessary for activities such as foraging, breeding, roosting, or dispersal;
- Areas that are necessary 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);
- Areas that are necessary to maintain genetic diversity and long-term evolutionary development; or
- Areas that are necessary for the reintroduction of populations or recovery of the species or ecological community.
- Areas that include foraging and staging habitats found from coastal, sub-coastal and inland areas, right through to semi-arid zones including grasslands, grassy woodlands and semi-arid chenopod shrubland with native and introduced grasses, herbs and shrubs.
- Areas that include wetlands both near the coast and in semi-arid zones used for foraging and staging.
- Areas that include Eucalypt forests and woodlands within the breeding range in Tasmania, coastal southeastern South Australia and southern Victoria.
- Areas that include live and dead trees and stumps with suitable hollows within the breeding range.

Additionally, as local populations are known and there are associated vegetation communities present for species within the Project area, it has been assumed for the purpose of this assessment that the Disturbance area provides critical habitat for the local populations.

Whilst areas of woodland have been largely avoided by current footprint design, clearance of areas in shrubland wetland and grassland wetland is required. Additionally, given the potential for changes in the Project area's surface hydrology, a temporarily impact nearby waterbodies is possible.

However, as the Project area is outside of breeding and roosting ranges, critical habitat would not be affected to the extent that the survival of the species is threatened.

5. Disrupt the breeding cycle of an important population

Name of Threatened Species	Blue-winged Parrot (*Neophema chrysostoma*)

Blue-winged parrots breed in Tasmania, coastal south-eastern South Australia and southern Victoria. During the breeding season (spring and summer), birds occupy eucalypt forests and woodlands. Blue-winged parrots form monogamous pairs. Nests are made in hollows, preferably with a vertical opening, in live or dead trees or stumps. Usually 4–6 eggs are laid on a bed of decaying wood. Birds migrate to the mainland for the non-breeding period where the forage in semi-arid chenopod shrubland and sparse grasslands (DCCEEW 2023c).

As the Project area is outside the breeding range for this species, the Project is unlikely to disrupt the breeding cycle of an important population.

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

The Project would potentially require the removal of suitable foraging habitat for the species. However, no PCTs associated with the species are present within the Disturbance area. The Project has potential to modify the available airspace on occasions when this species is foraging and dispersing through the Project area. Given the lack of information around the level of blade strike risk for this species, the proportion of individuals that fly at RSA height is generally unknown.

Movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds and pathogens into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk.

As such, the Project is not likely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

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

Invasive weeds are a known threat to the species, as invasives reduce the floristic and structural characteristics of preferred foraging habitat and alter resource availability (DCCEEW 2023c). The movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk.

Additionally, predation by cats and foxes is a threat to the parrot, given the species primarily forages on the ground. However, it is recognised that foxes and cats are already considered established across the Disturbance area.

The Project is unlikely to result in further invasive species harmful to this species becoming established in the Disturbance area.

8. Introduce disease that may cause the species to decline, or

BPFD is considered a threat to the Blue-winged Parrot (DCCEEW 2023c). The disease is present Australia wide with early reports dating back to the 1880s (Raidal and Peters 2018).

The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Disturbance area, however, it is unlikely that PBFD would be transported via equipment as direct bird contact is considered the main source of transmission (DoEE 2016). As such, it is unlikely that the Project would introduce disease that may cause the species to decline.

9. Interfere substantially with the recovery of the species.

Current conservation and management priorities are outlined within the Conservation Advice (DCCEEW 2023c), are as follows:

Name of Threatened Species	Blue-winged Parrot (*Neophema chrysostoma*)

- Cease all land clearing of habitat critical for the survival of blue-winged parrot.
- Establish new habitat patches in areas where native vegetation cover is lacking.
- Promote ecological management of woodland remnants on private and public land.
- Protect and enhance feeding and breeding habitat, including preparation of management plans for key habitat across the winter range.
- Develop a site-based fire management strategies with local authorities which considers the ecological needs of the species.
- Use climate modelling techniques to investigate the potential impact of climate change on the species and their habitat critical for survival.
- Restore degraded grasslands and grassy woodlands habitat to support the recovery of blue-winged parrot.
- Prevent intensive grazing in high value grasslands and grassy woodland habitats.
- Modify grazing management practices that will maintain or improve habitat values and still allow some grazing to occur at strategic times of the year.

The Project works would potentially interfere with objectives, as development potentially requires the clearance small, isolated patches of critical habitat for the species. The number of individuals using the airspace in the Disturbance area is unknown and there's a high level of uncertainty estimating the actual impacts on an ecologically significant proportion of their population.

However, with the implementation of an adaptive bird and bat monitoring program, the Project is consistent with the species Recovery Plan and would not interfere with the recovery of the species.

Conclusion

The Project would potentially require the removal of small patches of suitable foraging woodland and tall grassland habitat for the species. However, current Project layout has been designed to largely avoid woodland areas and watercourses, with majority of works located on chenopod shrublands. The risk of turbine strike on the species is considered low and operational impacts would be monitored in an adaptive bird and bat monitoring program.

As such, the Project is not likely to have a significant impact on the Blue-winged Parrot.

Table B.4.10 Superb Parrot (*Polytelis swainsonii*)

Name of Threatened Species	Superb Parrot (*Polytelis swainsonii*)

Ecology

The Superb Parrot is a medium-sized (36–42 cm long; 133–157 g weight) slender, long-tailed green parrot found in parts of NSW, Canberra and Victoria. Adult males are bright green above and below, with a bright yellow forehead, throat and cheeks, and a narrow red band separating the yellow throat from the green breast. Adult females are green all over, somewhat duller than the males, and lacking the male's yellow and red head and throat markings. Immature birds are similar to females, with young males being a slightly brighter green (TSSC 2016c).

The core range of the Superb Parrot is west of the Great Dividing Range in NSW from Canberra, ACT, Goulburn and as far west as Nyngan and Swan Hill. In Victoria, the species is now largely confined to Barmah forest area with sightings south to Shepparton and east to Wangaratta and Corryong along the Murray River (TSSC 2016c).

In the Riverina, the Superb Parrot nests in loose colonies in large, living or dead trees with many hollow branches, typically near a watercourse. On the inland slopes, they use at least six species of eucalyptus, but have a particular reliance on Blakely's red gum (*E. blakelyi*). Most nest sites are within 10 km of box-gum woodland and are sometimes within it. The same nest hollows are used in successive years, although it is not known if it is always by the same pair. After breeding, Superb Parrots use a variety of woodland types and other habitat types, including artificial habitats such as crops and recreation reserves. They mostly feed on the ground, where they take a variety of native and introduced seeds, but also in shrubs and trees on seeds and blossom (TSSC 2016c).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). Within the Disturbance area, these comprise PCTs 11, 13, 28, 45 and 46 for the Superb Parrot. Overall, across the Disturbance area, the impact to PCTs associated with this species is approximately 27.85 ha.

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

The Project has potential to modify the available airspace on occasions when this species is foraging and dispersing through the disturbance area.

No suitable breeding habitat such as hollows in eucalypt woodland would be impacted by the Project. Given the avoidance of potential breeding areas. As such, the Project is unlikely to lead to a long-term decrease in the Superb Parrot national population.

2. Reduce the area of occupancy of an important population

AOO represents the area of suitable habitat currently occupied by these species. The current AOO is currently approximately 5,360 km^2 (TSSC 2016c). The naturally dispersive nature of the species allows an ongoing exchange of genetic material between these fragmented areas.

The Project would require the removal of approximately 27.85 ha of suitable foraging habitat for the species. Nevertheless, as the area of vegetation impact only a proportionally small section of the larger Disturbance area and areas of woodland have been intentionally avoided by the current Project design it is unlikely that the works would negatively affect the AOO for the species. The Project would not impact on suitable breeding habitat such as hollows in eucalypt woodland. Additionally, it is likely that the population, and AOO extends considerably beyond the Project boundaries which would not be impacted by the proposed works.

As such, whilst the Project has potential to reduce available airspace in the Disturbance area at locations of turbines, the Project is not considered reduce the AOO for the species.

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

Name of Threatened Species	Superb Parrot (*Polytelis swainsonii*)

The species is a highly mobile bird with a broad dispersal extent. As previously mentioned, the ability to widely disperse allows an ongoing exchange of genetic material between individuals, which can often occupy fragmented habitat patches over regions.

As such, whilst the Project requires the removal of minor patches of suitable habitat, clearance in woodland habitats has been avoided wherever possible by current Project designs. In addition, due to the narrow nature of the access tracks (would generally have a trafficable width of about 6.5 m) and continued ability of the species to move across the landscape the Project would not result in fragmentation of the population within the Disturbance area.

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

No critical habitat has been identified for these species. However, as local populations are known and there are associated vegetation communities present for species within the Disturbance area, it has been assumed for the purpose of this assessment that the Disturbance area provides critical habitat for the local populations.

Whilst areas of woodland have been largely avoided by current footprint design, minor areas of clearance within suitable grassland and cypress pine habitat are required. Additionally, given the potential for changes in the Project area's surface hydrology, a temporarily impact nearby waterbodies is possible. The Project would not impact on suitable breeding habitat such as hollows in eucalypt woodland in the Project area and the Disturbance area avoids all breeding areas.

However, given distance from primary work areas, including turbine construction and substation development, and Project designs which aim to avoid suitable habitat for the species, critical habitat would not be affected to the extent that the survival of the species is threatened.

5. Disrupt the breeding cycle of an important population

Name of Threatened Species	Superb Parrot (*Polytelis swainsonii*)

There are three main breeding areas identified for the Superb Parrot (TSSC 2016c):

- An area of the south-west slopes bounded by Molong, Rye Park, Yass, Coolac, Cootamundra and Young (NSW);
- Along the Murrumbidgee River, between Wagga Wagga and Toganmain Station, and farther north at Goolgowi (NSW); and
- Along the Murray and Edward Rivers, from east of Barmah and Millewa State Forest to south of Taylors Bridge (NSW and Victoria). Local abundance outside the breeding season has a strong positive relationship with plant productivity, but this can vary from year to year.

Local abundance outside the breeding season has a strong positive relationship with plant productivity, but this can vary from year to year. Therefore, a general winter movement into northern NSW is not necessarily considered a regular migration (TSSC 2016c).

Construction is expected to commence in early 2028 and take about three years to complete, as such construction activities may disturb two or three reproductive seasons. This degree of impact would vary depending on construction staging (i.e., if most vegetation clearing is undertaken in the first year or staggered over multiple years). However, as preferred woodland breeding and foraging grounds are located outside of key development areas, direct impacts would be limited. The Project would not impact on suitable breeding habitat such as hollows in eucalypt woodland in the Project area and avoids all breeding areas in the disturbance area.

In addition, as the species is known to be capable of moving between habitats as suitability changes and given availability of high-quality habitat in surrounding areas, where no impacts are expected, the works are not considered likely to impact the breeding cycle of the population.

6. 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 has potential to modify the available airspace on occasions when this species is foraging and dispersing through the Disturbance area. 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. However, given the lack of information around the level of blade strike risk for this species, the proportion of individuals that fly at RSA height is generally unknown.

In addition, the Project would require the removal of approximately 27.85 ha of suitable foraging habitat for the species. However, would be isolated to small patches as current Project designs have intentionally aimed to avoid areas of woodland across the Project area.

Movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds and pathogens into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk.

Despite potential changes to habitat conditions across the Project area, the availability of connected habitat in surrounding areas, and ability of the species to move successfully between suitable habitats indicates that the works are unlikely to modify existing habitats to the extent that the species is likely to decline.

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

The Project is unlikely to result in invasion species harmful to this species becoming established in the in the Project area.

8. Introduce disease that may cause the species to decline, or

Name of Threatened Species	Superb Parrot (*Polytelis swainsonii*)

PBFD is considered a threat to the Superb Parrot (TSSC 2016c). The disease is present Australia wide with early reports dating back to the 1880s (Raidal and Peters 2018).

The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Disturbance area, however, it is unlikely that PBFD would be transported via equipment as direct bird contact is considered the main source of transmission (DoEE 2016). As such, it is unlikely that the Project would introduce disease that may cause the species to decline.

9. Interfere substantially with the recovery of the species.

Current conservation and management priorities are outlined within the Conservation Advice (TSSC 2016c), are as follows:

- Place all areas of public land that provide, or potentially provide, nesting or foraging habitat for the species under secure conservation management, particularly those in timber reserves, transport corridors and local government land.
- Promote ecological management of woodland remnants on private land as well as the protection of old, hollow-bearing trees in paddocks.
- Using appropriate incentives, encourage landholders to engage in appropriate regeneration of potential future nest trees and foraging trees.
- Identify and revegetate critical breaks in flight corridors.
- Control and reduce firewood collection from areas occupied by the species, promoting wood-lot development close to markets, and reduce grazing densities under trees where necessary.
- Ensure measures are in place to eliminate grain spills along roadways in order to reduce the incidence of accidental deaths that arise from birds feeding off spilled grain.

The Project works would potentially interfere with objectives, as development potentially requires the clearance small, isolated patches of critical habitat for the species. The number of individuals using the airspace in the Disturbance area is unknown and there's a high level of uncertainty estimating the actual impacts on an ecologically significant proportion of their population.

However, with the implementation of an adaptive bird and bat monitoring program, the Project is consistent with the species Recovery Plan and would not interfere with the recovery of the species.

Conclusion

The Project would require the removal of small patches of suitable habitat for the species, equating approximately 27.85 ha. Whilst there are suitable woodland habitats available for the species, the Project has been intentionally designed to avoid areas of high habitat value, including woodlands. Given the mobility of the species, is easily able to move between high quality habitat patches outside the Disturbance area. Additionally, the risk of turbine strike on the species is considered low and operational impacts would be monitored in an adaptive bird and bat monitoring program.

As such, the Project is not likely to have a significant impact on the Superb Parrot.

Table B.4.11 Diamond Firetail (*Stagonopleura guttata*)

Name of Threatened Species	Diamond Firetail (*Stagonopleura guttata*)

Ecology

The Diamond Firetail is a large (length 10 to 12 cm, weight 17 g), striking finch with a bright red bill, and red eyes and rump. The white throat and lower breast are separated by a broad black breast-band that extends

Name of Threatened Species	Diamond Firetail (*Stagonopleura guttata*)

into the strongly white-spotted, black flanks. It has a grey back and head, and ashy-brown wings. The female is similar to the male although sometimes smaller. The juvenile diamond firetail has a black bill and is duller in colour (DCCEEW 2023a).

Diamond Firetails occur on the south-east mainland of Australia from south-east Queensland to Eyre Peninsula, South Australia, and about 300 km inland from the sea. They have disappeared from many of the more settled parts of NSW, ACT and Victoria, and birds in South Australia appear to have been separated into three isolated subpopulations (Eyre Peninsula, Mt Lofty to Southern Flinders Ranges, and the south-east) (DCCEEW 2023a).

Diamond Firetails occur in eucalypt, acacia or casuarina woodlands, open forests, and other lightly timbered habitats, including farmland and grassland with scattered trees. They prefer areas with relatively low tree density, few large logs, and little litter cover but high grass cover. Diamond Firetails usually occur in flocks of between 5 to 40, and occasionally more. The species appears to be sedentary, though some populations move locally. Their flight is described as low and direct in long lines with slight undulations. Birds roost in dense shrubs or in smaller nests built especially for roosting (DCCEEW 2023a).

Based on the associated PCTs listed within the BioNet threatened species description for the species (NSW DCCEEW 2024b), no corresponding PCTs are mapped within the Disturbance area. However, suitable vegetation communities are likely present in the surrounding area, with likely movement of the species within and across the Disturbance area.

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

The species has a current population estimate of approximately 136,000 mature individuals (DCCEEW 2023a). One record exists within locality and given the variety of suitable habitat present within the Disturbance area, it is considered moderately likely to occur.

The Project would potentially require the removal of suitable habitat for the species. Nevertheless, as the area of vegetation impact only a proportionally small section of the larger Disturbance area and areas of woodland have been intentionally avoided by the current Project design it is unlikely that the works would negatively affect the long-term survival of the whole population. Additionally, it is likely that the population extends into other areas of suitable habitat beyond the Project boundaries which would not be impacted by the proposed works.

The Project has potential to modify the available airspace on occasions when this species is foraging and dispersing through the Disturbance area. However, the species is considered largely sedentary, with flights described as low and concentrated within woodland habitats.

As such, the Project is largely avoiding clearance of vegetation within areas of preferred habitat and is unlikely to lead to a long-term decrease in the Diamond Firetail population.

2. Reduce the area of occupancy of an important population

AOO represents the area of suitable habitat currently occupied by these species. The current AOO is approximately 25,000 km^2 (DCCEEW 2023a). Whilst largely sedentary, populations are known to move locally, between suitable habitats. As such, the regionally dispersive nature of the species allows an ongoing exchange of genetic material between fragmented areas.

The Project would potentially require the removal of suitable foraging habitat for the species. Nevertheless, as the area of vegetation impact only a proportionally small section of the larger Disturbance area and areas of woodland have been intentionally avoided by the current Project design it is unlikely that the works would negatively affect the AOO for the species. Additionally, it is likely that the population, and AOO extends considerably beyond the Project boundaries which would not be impacted by the proposed works.

Name of Threatened Species	Diamond Firetail (*Stagonopleura guttata*)

As such, whilst the Project has potential to reduce available airspace in the Disturbance area at locations of turbines, the Project is not considered reduce the AOO for the species.

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

Several populations of the Diamond Firetail exist across its range, given the largely sedentary nature of the species and fragmented habitat. However, as previously mentioned the ability to disperse in periods of unfavourable conditions allows an ongoing exchange of genetic material within these populations, which can often be fragmented over regions.

As such, whilst the Project potentially requires the removal of minor patches of suitable habitat, clearance in woodland habitats has been avoided wherever possible by current Project designs. In addition, due to the narrow nature of the access tracks (would generally have a trafficable width of about 6.5 m) and continued ability of the Southern Whiteface to move across the landscape the Project would not result in fragmentation of the population within the Disturbance area.

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

Critical habitat for the survival of the species has been defined within the conservation advice (DCCEEW 2023a), and refers to:

- Areas that are necessary for activities such as foraging, breeding, roosting, or dispersal
- Areas that are necessary 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)
- Areas that are necessary to maintain genetic diversity and long-term evolutionary development,
- Areas that are necessary for the reintroduction of populations or recovery of the species or ecological community
- Areas of relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs, or both
- Areas of Eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats,
- Areas of low tree density, few large logs, and little litter cover but high grass cover for foraging, roosting and breeding
- Areas of Drooping She-oak (Allocasuarina verticillata) within the Mt Lofty Ranges.

Based on this criterion any habitat which is likely or known to support Diamond Firetail is considered critical habitat. However, no Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat for this species (DCCEEW 2023a) .

Given the records within the wider locality, it is likely that the species is present across the woodland and shrubland habitats in the Project area. Whilst areas of woodland have been largely avoided by current footprint design, minor areas of clearance for access tracks are potentially required. Additionally, given the potential for changes in the Project area's surface hydrology, a temporarily impact nearby waterbodies is possible.

However, given distance from primary work areas, including turbine construction and substation development, and Project designs which aim to avoid suitable habitat for the species, critical habitat would not be affected to the extent that the survival of the species is threatened.

5. Disrupt the breeding cycle of an important population

Name of Threatened Species	Diamond Firetail (*Stagonopleura guttata*)

Between August and January, groups separate into small colonies to breed. Nests are bottle shaped and are made of green grass blades and stems lined with fine grasses and feathers. To safeguard their eggs and nestlings, Diamond Firetails often build their nests into the base of the large stick-nest of a bird of prey such as a whistling kite (*Haliastur sphenurus*), white-bellied sea eagle (Haliaeetus leucogaster), wedge-tailed eagle (*Aquila audax*), brown falcon (*Falco berigora*), nankeen kestrel (*Falco cenchroides*) or a square-tailed kite (*Lophoictinia isura*). Others choose to build their nests among the prickly foliage of shrubs such as hakeas, rose bushes, boxthorn, and the sea urchin hakea (*Hakea petiolaris*). Both partners build the nest, however, only the female does the weaving. Both partners incubate the eggs and care for the young. Usually only one clutch is laid per season. A clutch size of 4–5 eggs is normal (DCCEEW 2023a).

Construction is expected to commence in early 2028 and take about 3 years to complete, as such construction activities may disturb two or three reproductive seasons. This degree of impact would vary depending on construction staging (i.e., if most vegetation clearing is undertaken in the first year or staggered over multiple years). However, as preferred woodland breeding and foraging grounds are located outside of key development areas, direct impacts would be limited.

In addition, as the species is known to be capable of moving between habitats as suitability changes and given availability of high-quality habitat in surrounding areas, where no impacts are expected, the works are not considered likely to impact the breeding cycle of the population.

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

The Project would potentially require the removal of habitat utilised by the species. However, no PCTS associated with the species are present within the Disturbance area.

However, the extent of operational impacts due to construction of elevated access roads is unknown. Although designs of the roads are not yet developed, it has been assumed for the purpose of this assessment that they will be elevated to avoid flooding in high rainfall events (similar to other existing roads within the Disturbance area facilitating access to existing powerlines). This may change the hydrology of the habitat by increasing water runoff from hard stand areas and increasing flooding in lower areas bound by elevated roads. Given the species reliance on woodlands surrounding wetland habitats, indirect impacts to water quality from changes surface hydrology could potentially result in changes to habitat suitability and quality in the Project area.

Movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds and pathogens into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk. However, it is important to note that potential habitat loss is likely restricted to small footprints over a large area, and the species is considered likely to persist in the Project area over the long-term given the low impact activity associated with an operational wind farm and the extent of habitat that will remain, especially beyond the boundaries of the Disturbance area.

Despite potential changes to habitat conditions across the Project area, the availability of connected habitat in surrounding areas, and ability of the Diamond Firetail to move successfully between suitable habitats indicates that the works are unlikely to modify existing habitats to the extent that the species is likely to decline.

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

Invasive weeds are a known threat to the species, as invasives reduce the floristic and structural characteristics of preferred foraging habitat and alter resource availability (DCCEEW 2023a). The movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds

Name of Threatened Species	Diamond Firetail (*Stagonopleura guttata*)

into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk.

Additionally, the degradation of shrub layer by European rabbits is an established threat to habitat for the Diamond Firetail (DCCEEW 2023a). However, it is recognised that rabbits are already considered established across the Project area.

The Project is unlikely to result in further invasive species harmful to this species becoming established in the Disturbance area.

8. Introduce disease that may cause the species to decline, or

Disease is not considered a key threat for the species. The importation of materials and movement of construction and operational maintenance vehicles has the potential to introduce pathogens to the Disturbance area, however, this is considered a minor risk.

9. Interfere substantially with the recovery of the species.

No recovery plans have been developed for this species. Primary conservation outcomes for the species include maintaining or increasing current abundance and distribution (DCCEEW 2023a).

The Project works would potentially interfere with conservation and management priorities (DCCEEW 2023a), as development potentially requires the clearance small, isolated patches of critical habitat for the species. As suitable woodland habitat has been largely avoided by current Project design and given the considerable availability of suitable habitat beyond Project boundaries in which the species can access, the works are not considered likely to interfere with the recovery of the species.

Conclusion

The Project has potential to remove small patches of suitable habitat for the species. Whilst there are suitable woodland habitats available for the species, the Project has been intentionally designed to avoid areas of high habitat value, including permanent wetlands and woodland. Given the mobility of the species, is easily able to move between high quality habitat patches outside the Disturbance area. Additionally, the risk of turbine strike on the species is considered low and operational impacts would be monitored in an adaptive bird and bat monitoring program.

As such, the Project is not likely to have a significant impact on the Diamond Firetail.

Table B.4.12 Southern Bell Frog (*Litoria raniformis*)

Name of Threatened Species	Southern Bell Frog (*Litoria raniformis*)

Ecology

The Southern Bell Frog (also known as the Growling Grass Frog) is a large frog which occurs across south-eastern Australia, with females growing to at least 100 mm snout-urostyle length. Colouration varies from dull olive to bright emerald-green on the dorsum, with large irregular golden-bronze blotches. The groin and hind side of the thighs are usually bright bluish, while the lower sides and underside are off-white. The skin has numerous rounded warty projections on the back and sides. The Southern Bell Frog is active during both the day and night and is highly mobile. Tadpoles have an aquatic period lasting 2 – 15 months, grow to 110 mm in total length and, in the later stages of development, have a characteristic green to yellowish dorsal colouration (Clemann and Gillespie 2012).

The Southern Bell Frog is endemic to south-eastern Australia, including South Australia, Victoria, Tasmania, NSW and the ACT. In NSW, the species occurs from Bombala in the far south-eastern corner of the state, through the Southern Tablelands, and along the Murrumbidgee and Murray Rivers. The species occurs

Name of Threatened Species	Southern Bell Frog (*Litoria raniformis*)

throughout much of Victoria except for the semi-arid north-west, far east Gippsland and higher parts of the Eastern Highlands (Clemann and Gillespie 2012).

In the south-east of South Australia, the species is usually found among vegetation within or at the edges of permanent water such as slow flowing streams, swamps, lagoons, and lakes. In disturbed areas it also commonly occurs in artificial waterbodies such as farm dams, irrigation channels, irrigated rice crops and disused quarries, particularly where natural habitat is no longer available. Favoured sites frequently have a large proportion of emergent, submerged, and floating vegetation, and slow-flowing or still water (Clemann and Gillespie 2012).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). Within the Project area, these comprise PCTs 11, 13, 17 and 24 for the Southern Bell Frog. Overall, across the Disturbance area, the impact to PCTs associated with this species is approximately 145.47 ha.

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

The recovery plan for the Southern Bell Frog states that "any viable population is considered to be an important population for the persistence and recovery of the species" and that it must not be isolated from interactions with other nearby populations (Clemann and Gillespie 2012). There are no estimates of the population size of the population nationally, or in NSW. There are 1,585 records of the species within locality, with suitable wetlands and creek corridors across the Project area providing suitable habitat and resulting to a high likelihood of occurring. As it is likely the species utilises the Project area, or could migrate to it in good conditions, this assessment assumes a viable population is possible in the Project area, especially towards the northern portions of the Project area.

Suitable wetland habitat exists across the Project area and requires minor clearance of surrounding wetland vegetation during development. However, watercourses and areas of woodland have been avoided in the current Project design, with operational turbines and development areas located outside buffer areas. Additionally, further suitable habitat is available in the surrounding area, outside the Project area.

As such, the Project is not considered likely to result in a long-term decrease in the size of an important population.

2. Reduce the area of occupancy of an important population

AOO represents the area of suitable habitat currently occupied by the species. The AOO of the species has not been calculated, however it is known to occupy various aquatic environments from native emergent vegetated as slow flowing permanent streams, swamps, lagoons and lakes to roadside drainage lines (Clemann and Gillespie 2012).

Current Project design includes a buffer around existing watercourses, and woodland habitats. As such, no waterbodies or permanent wetlands would be impacted during construction phase of the Project. Minor areas of shrubland wetland would be impacted during the development of access tracks or temporary set-down areas, however, would be minimal. In addition, majority of the wetlands and creeks within the Project area are connected to larger high quality water habitats including the Murrumbidgee River to the north, which provides additional suitable habitat for the species.

As such, the Project is not considered to reduce the AOO of the species.

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

The Project would require the construction of extensive access tracks and easements across the Disturbance area. The access tracks would link the turbines and provide access from external roads. Access tracks would generally have a trafficable width of about 6.5 m and would be maintained permanently.

Name of Threatened Species	Southern Bell Frog (*Litoria raniformis*)

The Southern Bell Frog is a highly mobile frog that can move at least one kilometre in 24 hrs (Clemann and Gillespie 2012). The presence of permanent waterbodies are important connectivity structures for the Southern Bell Frog in the larger landscape. Although there is a minor risk of direct strike from vehicles as a barrier, particularly during construction, overall, the construction and operational activities are not considered likely to impact connectivity to the species. The works would not fragment a population into two or more populations.

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

Habitat critical to the survival of the Southern Bell Frog differs throughout its range (Clemann and Gillespie 2012). As discussed above, habitat can vary greatly from preferred areas (permanent slow flowing streams, swamps, lagoons, and lakes with emergent vegetation) to highly disturbed wetland areas. Key features of the habitat in its northern range include large, continuous areas containing both permanent and ephemeral waterbodies that undergo regular flooding, and are surrounded by areas containing suitable refugia in the form of ground debris, vegetation cover and cracking soils (Clemann and Gillespie 2012).

Given the network of wetlands and creeks located across the Project area, the Project area is considered to contain areas of critical habitat for the species. However, areas of permanent wetland and woodland have been largely avoided in the Disturbance area, with turbines placed outside buffer areas. Additionally, further suitable habitat is available in the surrounding area, outside the Disturbance area. As such, it is not considered likely that the Project will adversely affect habitat critical to the survival of the species.

5. Disrupt the breeding cycle of an important population

In semi-arid NSW, seasonal flooding of wetland systems necessary for breeding to occur. Breeding occurs in spring and summer, particularly following flooding events (Clemann and Gillespie 2012).

Construction is expected to commence in early 2028 and take about 3 years to complete. As such, it may impact three years of breeding cycles, however, is more likely to impact one, during the clearing works. In addition, the construction of elevated access tracks may have a minor positive impact on hydrology for the species, by increasing flooding of low land areas.

However, as the Project would not result in the removal of permanent wetland habitat or waterbodies, as well as availability of high-quality habitat in surrounding areas, the impact to breeding cycle is considered low.

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

During construction, the works would require the removal of approximately 145.47 ha of suitable habitat for the species, primarily within grassland wetland and shrubland wetlands. There is risk of erosion and sediment run-off to surrounding areas during excavation works, however this would be largely contained within the Disturbance area. The construction of elevated access tracks may also have an impact on hydrology for the species, by increasing flooding of low land areas, or increasing movement of weeds and pollutants across the Project area.

Whilst the Disturbance area has been developed to avoid waterbody habitat potentially utilised by the species, changes to surface hydrology in the surrounding area (i.e., road and access track development, clearing of native vegetation), could potentially result in temporary impacts to water quality from sediment runoff and altered flood patterns. Such impacts have potential to impact availability of food sources, including frogs, on which the species rely.

However, the species is relatively adaptable to site disturbances, with additional high quality wetland habitat available in the surrounding area, from floodplains of the Murrumbidgee to the north and Ramsar wetlands further to the south. As such, whilst minor temporary impacts are likely to occur across suitable habitat in the

Name of Threatened Species	Southern Bell Frog (*Litoria raniformis*)

Project area, the availability of habitats would not be impacted to the extent that the species is likely to decline.

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

Movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds into habitat edges. However, as the majority of construction and operation (maintenance) works would be located in chenopod shrubland areas, this is considered a negligible risk to habitat of the Southern Bell Frog.

8. Introduce disease that may cause the species to decline, or

Chytridiomycosis (Chytrid fungus) is known to infect Southern Bell Frogs (Clemann and Gillespie 2012). It travels via soil and water and, as such is difficult to manage in floodplain areas.

Nevertheless, due to the majority of construction and operation vehicle traveling on elevated access tracks in low rainfall conditions, and avoidance of permanent wetland areas during construction, the risk of introducing and spreading the disease is considered low.

9. Interfere substantially with the recovery of the species.

National recovery objectives, as outlined within the National Recovery Plan (Clemann and Gillespie 2012) for the species include:

- Secure extant populations of Southern Bell Frogs, particularly those occurring in known breeding habitats, and improve their viability through increases in size and/or area of occurrence.
- Determine distribution, biology, and ecology of the Southern Bell Frog, and identify causes of the decline of the species across its geographic range.
- Address known or predicted threatening processes and implement appropriate management practices where possible to ensure that land use activities do not threaten the survival of the Southern Bell Frog.
- Increase community awareness of and support for Southern Bell Frog conservation.

The Project would not conflict with the above objectives or any associated recovery actions for the species recovery.

Conclusion

Whilst there are several previous records of the species across the Project area, the current Disturbance area has been designed to largely avoid watercourses and areas of suitable permanent wetland habitat across the Project area.

However, whilst removal of approximately 145.47 ha of suitable shrubland wetland/grassland wetland habitat is required, areas of clearance are likely restricted to isolated patches and unlikely to significantly affect populations, breeding cycles or introduce disease. Considering the above assessment, the Project is unlikely to have a significant impact on the Southern Bell Frog.

Table B.4.13 *Murray Cod (Maccullochella peelii)*

Name of Threatened Species	Murray Cod *(Maccullochella peelii)*

Ecology

Murray Cod is Australia's largest freshwater fish, reaching a maximum length of 1.8 m and 113 kg. This iconic species has high conservation, biodiversity, cultural and recreational values. Murray Cod are present

Name of Threatened Species	Murray Cod *(Maccullochella peelii)*

throughout the majority of larger waterways of the MDB. The Murray Cod occupies much of its historical range, but there have been some local extinctions. Translocated populations have been established outside its natural range. Murray Cod abundance has declined significantly over the past 100 years, but there is evidence of partial recovery in some areas.

Murray Cod are apex predators that occupy a broad range of habitats, from large, turbid, slow flowing rivers to clear rocky streams and billabongs. While they occupy a broad range of flowing and standing waters it is considered a main river channel specialist. In lowland rivers they show a high affinity for structural woody habitat, deeper water, proximity to the riverbank and high surface flows. Murray Cod do occur in floodplain channels when they are inundated, but the use of the floodplain proper by adults, juveniles and larvae appears limited.

The species spawns in spring and summer with rising water temperatures. Large, adhesive eggs are laid on hard surfaces including logs, rocks, and clay, which are then guarded by males until they hatch.

While the species generally exhibits high site fidelity and homing behaviours, the species opportunistically make large scale movements. In rivers, adult upstream spawning migration occurs in response to increasing temperatures, with adults migrating back downstream following spawning. Two thirds of fish return to their original home site. During floods, Murray Cod move between the main channel, anabranches, and floodplain before returning to the main channel (SKM 2003, Gilligan 2019b, Koehn 2020).

Key threats to Murray Cod include:

- Loss of instream structure.
- Thermal pollution, largely impacting successful reproduction and reproductive cues.
- Fish kills – blackwater and reductions in water quality.
- Recreational harvest, including post handling mortality for catch and release.
- Barriers to movement, and mortality associated with those structures, especially undershot weirs.
- Changes to hydrology.
- Loss of larvae, juveniles, and adults in irrigation channels (National Murray Cod Recovery Team 2010, Koehn 2020)

Murray Cod have not been recorded in the Project area, but have been observed in Nimmie Creek, an anabranch of the Murrumbidgee River, approximately 10 km downstream of the Project, and upstream in Hay. The stretch of the Murrumbidgee River upstream of the Project from Hay to Wagga Wagga contains an Important Population of the species (National Murray Cod Recovery Team 2010). Suitable habitat for Murray Cod may be present in the main channels of Fiddlers Creek and Uara Creek, which are partially within the Project area, but nearby construction works are not planned, with the potential exception of road crossings of the Fiddlers Creek main channel.

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

The primary risk to Murray Cod associated with the construction of the wind farm is reduced habitat quality in the Murrumbidgee River downstream of the Project through siltation of the permanent and ephemeral creeks within the Project area. The construction of the wind farm may involve vegetation clearing, shallow excavations for installation of the turbines and transmission lines, and construction of vehicle crossings over minor waterways. These activities may have a deleterious impact on downstream water quality by increasing sedimentation. Sedimentation may by caused by an increased particulate load in stormwater runoff due to vegetation clearing and damage to banks due to vehicle crossing. Additionally, the unintentional release of construction-related chemicals to waterways may impact downstream water quality.

Name of Threatened Species	Murray Cod *(Maccullochella peelii)*

Works would be undertaken in accordance with standard sediment and erosion controls to manage and minimise further siltation and construction-related chemicals will be bunded to reduce the risk of leaks entering waterways. Provided these standard practices are maintained throughout the construction of the proposal, it is unlikely that increased sedimentation of the waterways would occur.

As such, the Project is not considered to lead to a long-term decrease in the size of the population of Murray Cod

2. Reduce the area of occupancy of an important population

As discussed above, Murray Cod habitat is unlikely to occur within the Disturbance area other that the small sections of the Uara Creek and Fiddlers Creek, which are each at least a kilometre from any works. The primary risk is siltation of downstream habitats, which is unlikely with implementation of standard sediment and erosion controls.

As such, the Project is not considered to reduce the AOO of Murray Cod.

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

Murray Cod are unlikely to occupy most of the Disturbance area other than the northern section, which includes Fiddlers Creek and Uara Creek. The Project does not include works in waterways which would obstruct fish passage for Murray Cod.

As such, the Project is not considered to fragment an existing population into two or more populations.

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

No Critical Habitat for Murray Cod as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat. As discussed above, the Disturbance area mostly intersects with canals and ephemeral waterways unlikely to provide habitat to Murray Cod. Construction works will not be performed near the larger waterways within and near the Disturbance area.

As such, the Project is not considered to adversely affect habitat critical to the survival of Murray Cod.

5. Disrupt the breeding cycle of an important population

Murray Cod are unlikely to occupy most of the Disturbance area other than the northern section which includes small portions of Fiddlers Creek and Uara Creek. No barriers to fish passage are to be constructed as part of the Project and no changes to spawning cues, such as alterations of flood regimes or temperature will occur as part of the Project.

As such, the Project is not considered to disrupt the breeding cycle of Murray Cod.

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

Murray Cod are unlikely to occupy most of the Disturbance area other than the northern section, which includes Fiddlers Creek and Uara Creek. As discussed above, the highest risks to habitat associated with the Project construction are temporary increases in sedimentation downstream of the Project due to vegetation clearing and establishment of access tracks, which would be mitigated by standard sediment and erosion control standards.

As such, the Project is not considered to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that Murray Cod is likely to decline.

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

Name of Threatened Species	Murray Cod *(Maccullochella peelii)*

The Project is not anticipated to introduce any aquatic invasive species to the Disturbance area or surrounds. However, several invasive species, such as Common Carp (*Cyprinus carpio*), Eastern Gambusia (*Gambusia holbrooki*), and Redfin Perch (*Perca fluviatilis*) are already recorded in Uara Creek and the Murrumbidgee River near, upstream, and downstream of the Project. Invasive species such as Common Carp are more tolerant of low water quality and may outcompete Murray Cod in waterways with increased sedimentation. However, standard sediment and erosion controls would prevent adverse effects to water quality.

As such, the Project is not considered to result in further establishment of invasive species.

8. Introduce disease that may cause the species to decline, or

The Project is not anticipated to introduce any aquatic diseases to the Disturbance area or surrounds or increase the population of known disease carriers such as Redfin Perch.

As such, the Project is not considered to result in the introduction of diseases that may cause Murray Cod to decline.

9. Interfere substantially with the recovery of the species.

There is an established national recovery plan for Murray Cod (National Murray Cod Recovery Team 2010), which outlines the following recovery objectives:

Determine the distribution, structure, and dynamics of Murray Cod populations across the MDB.

Manage river flows to enhance recruitment to Murray Cod populations

Evaluate the risks of threats and benefits of recovery options on Murray cod populations for each management unit

Determine the habitat requirements of Murray Cod life stages and populations

Manage the recreational fishery for Murray Cod in a sustainable manner while recognising the social, economic, and recreational value of the fishery

Encourage community ownership for Murray Cod conservation

Manage Recovery Plan implementation.

As the Project is unlikely to reduce habitat quality or reduce the Murray Cod population, it unlikely to interfere with the recovery objectives listed above.

Conclusion

The Project will not degrade habitat quality, disrupt the breeding cycle, or reduce the population of Murray Cod, and as such the Project is not likely to have a significant impact on Murray Cod.

B.5 Migratory and marine species

The Significant impact guidelines (DoE 2013a) define an area of 'important habitat' for a migratory species as:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or
- habitat that is of critical importance to the species at particular life-cycle stages, and/or
- habitat utilised by a migratory species which is at the limit of the species range, and/or
- habitat within an area where the species is declining.

Whilst there are several permanent waterbodies, including a lake as well as numerous creeks and tributaries located across the Project area, given the likely improved habitat conditions of the Murrumbidgee River to the north and Ramsar wetlands further to the south, much of the habitat in the Project area is unlikely to be preferred important habitat for listed migratory waterbird species. However, the north of the Project Area does intersect with the Lowbidgee floodplain, a listed nationally important wetland, which provides potentially suitable habitat for a range of migratory species. The remainder of the Project area is likely to be utilised by migratory species for occasional foraging and traversing of the airspace over the Project area.

In addition to permanent creek systems including Abercrombie Creek, there are also irregularly flooded Lignum and Nitre Goosefoot swamps and drainage depressions within the Project area. Further permanent water sources include Dry Lake, man-made farm dams and several tributaries of the Murrumbidgee River which cross the Project area to the north. However, given long term agricultural use of the area, including livestock grazing, and abundance of high quality habitat beyond the Project boundaries, these habitats are unlikely to support an ecologically significant proportion of the population of the waterbird migratory species.

However, given the location of the Project area between regions of preferred wetland habitat and large permanent waterways, the airspace of the Project area is often regularly inhabited by both migratory and marine species. Given the potential operational impacts associated with a largescale windfarm, including disruption of migratory paths and fatalities from blade strike collisions, there are potential direct impacts to migratory and marine species. Further information is provided below.

B.5.1 Migratory waterbirds

Table B.5.1 Migratory species

Category	Migratory species
Fork-tailed Swift (*Apus pacificus*)	
The Fork-tailed Swift has a length of 18–21 cm, a wingspan of 40–42 cm and weighs around 30–40 g. It is a medium-sized Swift, with a slim body with long scythe-shaped wings that taper to finely pointed tips. It is characterized by a long and deeply forked tail. The Fork-tailed Swift is mainly blackish with a white band across the rump. There is also a white patch on the chin and throat. The body, tail and upper wings are black-brown, and they have a faint pale scaling to the saddle and white scalloping to the underbody. The sexes are alike with no seasonal variation, juveniles are also indistinguishable in the field (DCCEEW 2024a). The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia. In NSW, the Fork-tailed Swift is recorded in all regions. The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher (DCCEEW 2024a). The species occurs aerially over a wide range of habitats, which vary from rainforests to treeless plains. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub,	

Category	Migratory species

heathland, or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes (DCCEEW 2024a).

Sharp-tailed Sandpiper (*Calidris acuminata*)

Sharp-tail sandpipers are approximately 17 – 22 cm long, have a wingspan of 36 – 43 cm, and weigh around 65 g. They are a small to medium sized sandpiper, with a potbelly and rather drawn-out rear end. They have a small, flat head on top of a short neck. Both sexes appear similar but show marked seasonal variation in plumage. Juveniles are distinct from adults (DCCEEW 2014).

During the non-breeding season, approximately 91% of the East Asian-Australasian population migrates to Australia and New Zealand. Sharp-tailed sandpipers occur within all states of Australia. They are found mostly in the south-east and are widespread in both inland and coastal locations. The species also occurs in both freshwater and saline habitats. The species is widespread in most regions of NSW and Victoria, especially in coastal areas. The species utilises fresh and hypersaline environments, feeding along the edge of water on mudflats, coastal and inland wetlands, and sewage ponds. After rainfall events, the species may also feed on areas of agricultural pasture (DCCEEW 2014).

Curlew Sandpiper (*Calidris ferruginea*)

Curlew sandpiper is 18-23 cm long, have a wingspan of 38-41 cm, and weigh approximately 57 g. Their bill is long, black and decurved, with a finely pointed tip. Males and females appear similar; however, females are slightly larger and have a longer bill. In breeding plumage, females also have a slightly paler chestnut-coloured underbody, with more white feathers and darker barring. The species shows marked seasonal variation, and juveniles are distinctive from adults (DoE 2015c).

The Curlew Sandpiper is distributed around most of the Australian coastline (including Tasmania). It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration. It generally occupies littoral and estuarine habitats, and in NSW is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes, and lagoons on the coast and sometimes inland (DoE 2015c).

Curlew sandpiper often feed in mixed flocks with other species of shorebirds, pecking at invertebrates on the surface of the mud or making shallow probes below its surface. They generally forage within mudflats and nearby shallow water. In non-tidal wetlands, they usually wade, mostly in water 15–30 mm, but up to 60 mm deep. In intertidal areas, they forage at the edge of shallow pools and drains, and along sandy shores, often following the receding tide to forage near the water edge. They also feed on part of the mudflats that have been exposed for a longer period, foraging in small groups. Occasionally they forage on wet mats of algae or waterweed, or on banks of beach cast seagrass or seaweed. At high tide, the species tends to forage among low sparse emergent vegetation such as saltmarsh, and sometimes within flooded paddocks or inundated salt flats (DoE 2015c).

The extent of suitable habitat estimated in this assessment comprises the PCTs listed in the BioNet threatened species description for the species (NSW DCCEEW 2024b). Within the Project area, this comprises PCT 24 for the Curlew Sandpiper. Overall, across the Disturbance area the impact to PCTs associated with this species is approximately 0.25 ha.

Pectoral Sandpiper (*Calidris melanotos*)

The Pectoral Sandpiper has a length of 19–24 cm, a wingspan of 37–45 cm and a weight of 85 g for males and 60 g for females. The species is characterised by a flat back and a plump body that tapers to a drawn-out rear end. The head is small and rounded, situated on a long neck. The legs are short, and the bill varies from short and straight, to medium-length and gently decurved. When at rest the folded primaries (flight feathers) are level with, just short of, or slightly longer than the tip of the tail. Also, the folded primaries are short in breeding adults and long in juveniles (DCCEEW 2024d).

Category	Migratory species

In NSW, the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions (DCCEEW 2024d). In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains, and artificial wetlands (DCCEEW 2024d).

Gull-billed Tern (*Gelochelidon nilotica*)

The Gull-billed Tern is entirely white, except for a black crown from bill to nape, a grey back and upper wings and darker flight feathers. The iris is dark brown, bill and legs black. The sexes are similar. In non-breeding plumage, the head is mainly white, the crown streaked brownish-grey, and the ear coverts are dull black. Immature birds are similar to non-breeding adults. Juveniles are similar to immature birds, but the shoulders are mottled grey and brown. The common name relates to the thicker, shorter bill of this tern, closer in shape to that of a gull (BirdLife Australia 2024b).

The Gull-billed Tern occurs on all continents except Antarctica. Gull-billed Terns are found in freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms, irrigated croplands, and grasslands (BirdLife Australia 2024b). They are only rarely found over the ocean. The Gull-billed Tern is nomadic or migratory. Although essentially an inland species, outside breeding season it shows a distinct preference for saltmarshes and lagoons near the coast. Movements are not fully understood but it is common and widespread in south-eastern Australia, and only a vagrant in Tasmania. It winters mainly in the north and substantial numbers migrate to New Guinea and perhaps Indonesia (BirdLife Australia 2024b).

White-throated Needletail (*Hirundapus caudacutus*)

The White-throated Needletail is a large swift with a thickset, cigar-shaped body, stubby tail and long pointed wings (20 cm in length and approximately 115–120 g in weight). Sexes are alike, with no seasonal variation in plumage. The adults have a dark-olive head and neck, with an iridescent gloss on the crown; the mantle and the back are paler, greyish; and the upper wings are blackish, sometimes with a greenish gloss, with a contrasting white patch at the base of the trailing edge; the upper tail is black with a greenish gloss. The face is dark olive with a narrow, white band across the forehead and lores and a white patch on the chin and throat. The underparts are generally dark olive except for a U-shaped band across the rear flanks, the vent and the undertail coverts, and the undertail is black with a greenish gloss. The underwing is black brown with glossy grey-brown flight feathers. The bill is black, the eyes black-brown and the legs and feet are dark grey, sometimes with a pinkish tinge (TSSC 2019a).

The White-throated Needletail is widespread in eastern and south-eastern Australia. In eastern Australia, the species is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Dividing Range and occasionally onto the adjacent inland plains. Further south on the mainland, it is widespread in Victoria, though more so on and south of the Great Dividing Range, and there are few records in western Victoria (TSSC 2019a).

In Australia, the White-throated Needletail is mostly aerial, from heights of less than 1 m up to more than 1000 m above the ground. Although they occur over most types of habitats, they are recorded most often above wooded areas, including open forest and rainforest, and may also fly below the canopy between trees or in clearings. When flying above farmland, they are more often recorded above partly cleared pasture, plantations, or remnant vegetation at the edge of paddocks. The species roosts in trees amongst dense foliage in the canopy or in hollows (TSSC 2019a).

Caspian Tern (*Hydroprogne caspia*)

The Caspian Tern has long, slender backswept wings and a slightly forked tail. The heavy bill is red with a dusky tip. The sexes are similar, with a body length between 53 and 60 cm long, and an average weight of 680 g. The Caspian Tern has a white body, with a black and white streaked crown from bill to nape and a short shaggy crest. The mantle and upper wings are grey, and the flight feathers are darker. The eye is dark brown,

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and legs are black. When breeding, the crown is black. Immature birds are similar to non-breeding adults. Younger birds are mottled grey and brown (DCCEEW 2024e).

Within Australia, the Caspian Tern has a widespread occurrence and can be found in both coastal and inland habitats. In NSW, the species is widespread east of the Great Divide, mainly in coastal regions, and in the Riverina and Lower and Upper Western Regions. Breeding is recorded from the Menindee Lakes (DCCEEW 2024e). The Caspian Tern is mostly found in sheltered coastal embayments (i.e., harbours, lagoons, inlets, bays, estuaries, and river deltas) and those with sandy or muddy margins are preferred. They also occur on near-coastal or inland terrestrial wetlands that are either fresh or saline, especially lakes (including ephemeral lakes), waterholes, reservoirs, rivers, and creeks. They also use artificial wetlands, including reservoirs, sewage ponds and saltworks (DCCEEW 2024e).

Wood Sandpiper (*Tringa glareola*)

The Wood Sandpiper is a small thin wader, with a length of 19–23 cm, a wingspan of 56–57 cm and a weight of 55 g. The species has a short straight bill and long legs. The species is a dark grey-brown or plain brown above and spotted and white below with a greyish wash on the breast. It has dark streaking on the fore neck and breasts as well as some barring on the fore-flanks. In all plumages the species shows a white supercilium, extending well behind the eye with greenish or yellow legs (DCCEEW 2024g).

In NSW there are records east of the Great Divide, from Stratheden and Casino, south to Nowra and elsewhere, mostly from the Riverina, but also from the Upper and Lower Western Regions (DCCEEW 2024g).

The Wood Sandpiper uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. They are typically associated with emergent, aquatic plants or grass, and dominated by taller fringing vegetation, such as dense stands of rushes or reeds, shrubs, or dead or live trees, especially *Melaleuca* and River Red Gums (*Eucalyptus camaldulensis*) and often with fallen timber. They also frequent inundated grasslands, short herbage, or wooded floodplains, where floodwaters are temporary or receding, and irrigated crops. They are also found at some small wetlands only when they are drying. They are rarely found using brackish wetlands, or dry stunted saltmarsh. The species uses artificial wetlands, including open sewage ponds, reservoirs, large farm dams, and bore drains (DCCEEW 2024g).

Common Greenshank (*Tringa nebularia*)

Common Greenshanks are 30–35 cm long, have a wingspan of 55–65 cm, and weigh approximately 170 g. They are a large and heavily built wader with a long and slightly upturned bill. The species shows no sexual dimorphism but does exhibit some seasonal variation in plumage. Juveniles are distinct from adults (DCCEEW 2024b).

The Common Greenshank is widespread in coastal regions, occurs in all types of wetlands, and has one of the widest distributions of any shorebird in Australia. In NSW, the species is widespread west of the Great Dividing Range, especially between the Lachlan and Murray Rivers and the Darling-Baaka River drainage basin, including the Macquarie Marshes, and north-west regions (DCCEEW 2024b).

The Common Greenshank forages at the edge of wetlands, in soft mud on mudflats, in channels, or within shallows around the edge of waterbodies. These locations are often situated near or among mangroves or other sparse, emergent, or fringing vegetation such as sedges or saltmarsh. The bird occasionally feeds amongst seagrass beds (DCCEEW 2024b).

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

The Project has potential to modify the available airspace on occasions when these species are migrating, foraging, or dispersing through the Disturbance area. Given the lack of information around the level of blade strike risk for these species, the proportion of individuals that fly at RSA height is generally unknown. Given

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this, there's a high level of uncertainty estimating the actual impacts on an ecologically significant proportion of their population at a national and international scale.

While the Project is likely to impact areas of habitat that could potentially be used for breeding purposes, this habitat is not considered to be important habitat for these species. These species are not known to have a restricted breeding habitat.

However, during the operation as a wind farm the airspace across the Disturbance area is considered to be substantially modified with significant impact for migratory/marine species.

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

The movement of construction and operational maintenance vehicles has the potential to increase the movement of weeds and invasive species into habitat edges, however considering the current movement of livestock on the property, this is considered a minor increased risk.

In addition, given the availability of high quality habitat in the locality, outside of the Project area, the Project area is not considered important habitat for these species, and it would not result in an invasive species that is harmful to these species.

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

The Project is not considered likely to seriously disrupt the lifecycle of an ecologically significant proportion of most of these populations. These species occur throughout Australia and having not been identified as being in a decline except the Curlew Sandpiper and White-throated Needletail.

There's potential for several of these species to fly within the turbine RSA heights and be susceptible to impacts from blade strike due to the high flight heights and suitable habitat in the Project area. There are uncertainties around the number of individuals likely to use the airspace in the Project area and ability to estimate impacts on an ecologically significant proportion of their population at a national and international scale.

As a result, the Project has potential to have a significant impact on migratory species as there is a chance or possibility that it will seriously disrupt the lifecycle of an ecologically significant proportion of their population due to the uncertainties around the number of individuals occupying the air space at risk of blade strike collision.

Conclusion

There are uncertainties around the number of individuals Fork-tailed Swift likely to use the airspace in the Disturbance area and ability to estimate impacts on an ecologically significant proportion of their population at a national and international scale.

As a result, the Project has potential to have a significant impact migratory species, specifically Sharp-tailed Sandpiper, Gull-billed Tern, and Caspian Tern as there is a chance or possibility that it will seriously disrupt the lifecycle of an ecologically significant proportion of their population due to the uncertainties around the number of individuals occupying the air space at risk of blade strike collision.

This assessment is based on a precautionary approach, and there has been no assessment of bird and bat utilisation and migratory bird flight activity at this stage of the assessment. These tasks will be conducted during the environmental assessment phase of the Project and will provide at least 24 months of survey data over multiple seasons and climactic conditions designed to determine the presence and activity by these migratory species.

B.5.2 Marine species

The Significant impact guidelines (DoE 2013a) do not define specific impact criteria for listed marine species when occurring outside of a Commonwealth marine area. When the Proposed action is located within a Commonwealth marine area, significant impact criteria apply, which includes an assessment as to whether there is a real chance or possibility that the action will:

- Have a substantial adverse effect on a population of a marine species or cetacean including its life cycle (for example, breeding, feeding, migration behaviour, life expectancy) and spatial distribution.

However, as there are no Commonwealth marine areas within or surrounding the Project area, completing an assessment of significance for marine species is not required.

Whilst there are several permanent waterbodies, including a lake as well as numerous creeks and tributaries located across the Project area, given the size and condition of the Murrumbidgee River to the north and Ramsar wetlands further to the south, much of the habitat in the Project area is unlikely to be preferred important habitat for listed marine species.

However, given the location of the Project area between regions of preferred wetland habitat and large permanent waterways, the airspace of the Project area is likely often regularly inhabited by marine species. As such, there are potential direct impacts to marine species associated with the operation of a largescale windfarm. Such impacts include disruption of flight paths within local and regional distributions, fatalities from blade strike collisions, reduction in local ranges as waterbodies within the Project area become difficult to access and potential substantial modification of the environment (i.e. airspace) in which they typically inhabit.

Of the 16 listed marine species with moderate to high likelihood of occurring within the Project area, only three are not also listed migratory or threatened species. As such, the majority of the listed marine species have been assessed against threatened species or listed migratory criteria, and potential significant impacts determined. For the remaining three species, impacts are considered similar to migratory species in that species occupying airspace of the Project area are potentially at risk of blade strike collisions, modification of dispersion behaviours and access to Project area habitats.

The potentially impacted EPBC listed marine species (which are not also EPBC listed migratory species or threatened species) include the following:

Black-eared Cuckoo (*Chalcites osculans*)

The Black-eared Cuckoo is brown-grey on the head, neck and back, with a faint olive-bronze metallic sheen on the saddle of the back. The rump is pale, and the underparts are creamy-buff without the barring that is so distinctive on the other bronze-cuckoos, except on the outer feathers of the tail. The face is creamy-white, with a white eyebrow widening towards the neck, and below that an obvious black eye-stripe. The juvenile is like the adult, but paler (BirdLife Australia 2024a).

The Black-eared Cuckoo is widespread on mainland Australia, but avoids the wet, heavily forested areas on the east coast and the south-west corner of Western Australia. It is an occasional vagrant to offshore islands and Tasmania (BirdLife Australia 2024a). The Black-eared Cuckoo is found in drier country where species such as mulga and mallee form open woodlands and shrublands. It is often found in vegetation along creek beds (BirdLife Australia 2024a).

White-bellied Sea-Eagle (*Haliaeetus leucogaster*)

The White-bellied Sea-Eagle is a large raptor that has long, broad wings and a short, wedge-shaped tail. It measures 75–85 cm in length and has a wingspan of 180–220 cm. Females weigh between 2.8 and 4.2 kg, and are larger than the males, which weigh between 2.5 and 3.7 kg. The plumage of adult birds is predominantly white and grey. The head, breast and belly, and the feathering on the legs, are white. The back and upper surfaces of the wings are grey, although the wings have black tips. The undersides of the wings are greyish black around the distal edges, with a smaller area of white along the leading edge. The tail is grey at the base and has a white tip. The bill is bluish-grey with a blackish tip, the iris is dark brown, and the legs and feet are a cream colour (DCCEEW 2024f).

The White-bellied Sea-Eagle is distributed along the coastline of mainland Australia and Tasmania. It also extends inland along some of the larger waterways, especially in eastern Australia. The inland limits of the species are most restricted in south-central and south-western Australia, where it is confined to a narrow band along the coast. The distribution of the sea-eagle may shift in response to climatic conditions, with an apparent decreased occupancy of inland sites during drought conditions (DCCEEW 2024f). The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, the sea). Birds have been recorded in (or flying over) a variety of terrestrial habitats (DCCEEW 2024f)

Rainbow Bee-eater (*Merops ornatus*)

The Rainbow Bee-eater is a medium-sized bird, the males measure 25 cm in length and the females 22 cm. The wingspan is 34 cm in the male and 31 cm in the female. The adults have green or blue-green colouring, a bold black stripe across the eye and bright yellow colouring on the chin and cheeks. The tail is black with blue edging and have a long, slender and decurved black bill. The adult males and females are similar in appearance but can usually be distinguished by differences in the length and shape of the tail-streamers.

The Rainbow Bee-eater is distributed across much of mainland Australia and occurs on several near-shore islands. It is not found in Tasmania and is thinly distributed in the most arid regions of central and Western Australia (DCCEEW 2024f). The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. It usually occurs in open, cleared or lightly timbered areas that are often, but not always, located in close proximity to permanent waterbodies. The Rainbow Bee-eater occurs in open woodlands and shrublands, including mallee, and in open forests that are usually dominated by eucalypts. It also occurs in grasslands and, especially in arid or semi-arid areas, in riparian, floodplain or wetland vegetation assemblages (DCCEEW 2024f).

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