



Liverpool Range Wind Farm, NSW

EPBC 2022/09416

PUBLIC ENVIRONMENT REPORT

DRAFT

MARCH 2024



LIVERPOOL RANGE WIND FARM PROJECT, NSW EPBC 2022/09416

Public Environment Report

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Prepared by

Umwelt (Australia) Pty Limited

on behalf of

Tilt Renewables Australia Pty Limited as trustee for
Liverpool Range Wind Farm Project Trust

Project Director: Bill Wallach

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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Draft	Naomi Buchhorn	26/03/2024	Bill Wallach	26/03/2024

Executive Summary

Introduction

This Public Environment Report (PER) has been prepared for the proposed Liverpool Range Wind Farm project (Proposed Action) in accordance with the Final Public Environment Report (PER) Guidelines for the assessment process issued by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW).

The Proposed Action is a state significant development large-scale renewable energy project consisting of a wind farm, that includes up to 185 wind turbine generators and associated infrastructure, an external transmission line, public road upgrades and temporary workforce accommodation.

The Proponent of the Proposed Action is Tilt Renewables Australia Pty Ltd as trustee for the Liverpool Range Wind Farm Project Trust.

The Proposed Action is located about 230 kilometres (km) north-west of Newcastle and 120 km east of Dubbo and extends across the Warrumbungle, Upper Hunter and Mid-Western local government areas (LGAs). The Proposed Action is located within, and forms a component of, the Central-West Orana (CWO) Renewable Energy Zone (REZ).

The Proposed Action aligns with the current strategic direction of the NSW and Australian energy generation market and assists in achieving the planned transition to an increased contribution of renewable energy to meet Australia's energy needs. The objective of the Proposed Action is to develop a 100 per cent emissions-free renewable energy generation facility of approximately 1,332 megawatts (MW), contributing to NSW's transition away from its current reliance on carbon intensive fuels.

The PER contains information about the Proposed Action and its relevant impacts in accordance with the Final PER Guidelines, enabling stakeholders and the Minister to understand the potential impacts to matters of national environmental significance (MNES), associated mitigation measures to avoid and minimise potential impacts and proposed offsets.

History of the Proposed Action

In June 2018, the Liverpool Range Wind Farm was approved by the Commonwealth Department of the Environment and Energy under Section 130(1) and 133 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (EPBC 2014/7136) (Approved Action).

The Approved Action is also authorised under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) State Significant Development (SSD) Consent SSD-6696 which was granted by a delegate of the Minister for Planning on 27 March 2018 (NSW Development Consent). At that time, the Liverpool Range Wind Farm was the largest approved wind farm in NSW with 288 wind turbine generators and a proposed installed capacity of up to 960 megawatts.

Since acquiring the Approved Action in 2019, the Proponent has undertaken a detailed layout review and design optimisation process to progress the Proposed Action towards construction. The design optimisation has considered the significant advances in wind turbine technology since the wind farm was approved in March 2018 and implemented measures to avoid and minimise environmental impacts. As part of this process, more accurate estimates of the extent of required ground disturbance and vegetation/habitat removal have been developed based on 3D terrain modelling and the Proponent's recent wind farm construction experience, most notably the Rye Park Wind Farm project located near Yass, NSW. Ground disturbance required for public road upgrades has also now been accounted for in the Proposed Action, which was not the case for the Approved Action.

The Proponent has also taken substantial steps to satisfy a range of pre-construction conditions of consent in the NSW approval including updating baseline vegetation mapping, commencing collection of baseline data on threatened and at-risk bird and bat species, validating noise compliance, progressing biodiversity offsets, progressing public road upgrade designs, entering into neighbour agreements, and executing a Voluntary Planning Agreements (VPA) with Upper Hunter Shire Council and Warrumbungle Shire Council.

The Proponent is currently progressing an application to modify the NSW Development Consent (NSW Mod-1 Application) to take advantage of these technology changes and increase the generation capacity, and to reflect the findings of the layout review and design optimisation process, and in doing so, to provide greater certainty with regards to the constructability of the Proposed Action and associated potential environmental impacts.

Due to the changes to the design and layout, the Approved Action was re-referred to DCCEEW. This referral was submitted on 2 March 2023 (EPBC 2022/09416) under Part 7 of the EPBC Act (hereafter referred to as the Referred Action).

The Minister determined on 30 March 2023 that the Referred Action was a controlled action, and that approval is required due to the potential for significant impacts on the following matters of national environmental significance (MNES), protected under Part 3 of the EPBC Act:

- listed threatened species and communities (section 18 and section 18A)
- listed migratory species (section 20 and section 20A).

On the same date, the delegate of the Minister determined that the Referred Action be assessed by a PER. Final PER Guidelines for the assessment process were issued by DCCEEW on 31 July 2023.

Summary of the Proposed Action

The Proposed Action will include construction, operation and decommissioning activities associated with the following key components:

- Wind Turbines: up to 185 wind turbines with a maximum blade tip height of 215 metres above ground level (AGL).
- Collector Substations: approximately seven collection substations that step-up the voltage of the reticulation cabling to the transmission line voltage.
- Connection Substation (also referred to as switching station): a single 330 kV connection substation located at the southern end of the Proposed Action Area at Ulan, to facilitate connection into the existing Transgrid 330 kV Wellington – Wollar transmission line.

- Internal Transmission Line: overhead powerline of up to 330 kV, supported by poles or towers and located within a 60 m wide easement, that extends from the north-west of the Development Corridor to the southern-most collector substation proposed near Rotherwood Road, Cassilis.
- External Transmission Line: overhead transmission line of up to 330 kV, supported by poles or towers and located within a 60 m wide easement, that extends from the southern-most collector substation proposed near Rotherwood Road, Cassilis, south to the approved point of connection to the existing infrastructure at Ulan.
- Subdivision of Land: subdivision of land within the Proposed Action Area to create new separate lots for the connection and collector substations and associated ancillary facilities.
- Other infrastructure and ancillary components including:
 - Reticulation Cabling.
 - Access Tracks.
 - Site Access Points (SAP) off the public road network.
 - Operation and Maintenance (O&M) Facilities.
 - Temporary Construction Compound/Laydown Area/Concrete Batch Plants.
 - Temporary Workforce Accommodation Facility (TWA Facility).
 - Public Road Upgrades/Repairs.
 - Permanent Wind Monitoring Masts (Met Masts).
 - Temporary Site Calibration Met Masts.

While the Proposed Action currently includes the approved transmission line and connection point at Ulan to existing Transgrid transmission line, the Proponent is planning to connect the Proposed Action into the proposed CWO REZ transmission line project, that is being developed by the Energy Corporation of NSW (EnergyCo) and ACERZ the Network Operator (a consortium comprised of ACCIONA, Cobra and Endeavour Energy). The CWO REZ transmission line project is subject to separate environmental approvals under the EP&A Act and EPBC Act. The Proponent is working closely with EnergyCo and the Network Operator to progress connection of the Liverpool Range Wind Farm into the CWO REZ transmission line project.

While contracts and program scheduling are being negotiated between the Proponent and EnergyCo, the External Transmission Line alignment between the wind farm and approved connection point at Ulan remains part of the Proposed Action. Connection into the CWO REZ transmission line project would therefore avoid all potential impacts associated with the approved transmission line and connection point at Ulan.

The total Indicative Development Footprint for the entire Proposed Action is estimated to be approximately 1,803 hectares (ha), comprised of the following components:

- Indicative Development Footprint – External Transmission Line (244.4 ha).
- Indicative Development Footprint – Public Road Upgrades (184.7 ha).

- Indicative Development Footprint – TWA Facility (9 ha).
- Indicative Development Footprint – Wind Farm (1,364.9 ha).

Comparison of the Proposed Action to the Approved Action

The Proposed Action, in keeping with the Approved Action, is the construction, operation and decommissioning of a wind farm, ancillary facilities, and an external transmission line connection extending south of the wind farm on-site collector substation to the approved point of connection to the existing Transgrid Wellington to Wollar transmission line at Ulan.

Section 2.0 of the PER provides a detailed description of the Proposed Action, how the Proposed Action has evolved since the Referred Action and Approved Action to avoid and minimise environmental impacts and includes a comparison of the impacts of feasible alternatives of the Proposed Action, Referred Action and the Approved Action.

Following feedback received on the NSW Mod-1 Application during the public exhibition period held in September/October 2022, completion of further geotechnical investigations and more detailed civil and electrical design work, several changes have been made to the proposed infrastructure layout and design. The key changes to the wind farm design of the Proposed Action can be summarised as follows:

- a reduction in the maximum number of wind turbines to 185, which equates to a reduction of 35 compared to the Referred Action (220) and a decrease of 82 compared to the Approved Action (267)
- a reduction in the maximum blade tip height to 215 m AGL, which equates to a decrease of 35 m compared to the Referred Action (250 m) and increase of 50 m compared to the Approved Action (165 m)
- various changes to the number and location of ancillary infrastructure such as substations, operations and maintenance facilities, and concrete batch plants/laydown areas/construction compounds.

The Proposed Action also now includes a Temporary Workforce Accommodation (TWA) Facility to accommodate the peak workforce of approximately 550 full-time equivalents during construction as well as additional staff to operate and maintain the TWA Facility. Given the remote location and lack of short-term and long-term rental properties within a one-hour drive of the Proposed Action, a TWA Facility will be required to construct the Proposed Action.

The total extent of estimated ground disturbance and vegetation removal required to construct the Proposed Action is referred to as the Indicative Development Footprints. The components of the Indicative Development Footprints along with comparison to the Referred Action and Approved Action are provided in **Table ES.1**.

All proposed infrastructure is contained within the Development Corridor which is in effect a micro-siting buffer within which the Indicative Development Footprints must be contained. A development corridor does not apply to the Indicative Development Footprint – Public Road Upgrades as there are limited opportunities to micro-site public road upgrades.

Table ES.1 Comparison of Disturbance Areas and Development Corridors – Approved Action, Referred Action and Proposed Action

Boundaries	Approved Action	Referred Action	Proposed Action	Difference
Development Corridor	12,405.04 ha (did not separate out Wind Farm and External Transmission Line, and did not include TWA Facility)	12,601.6 ha (Wind Farm and External Transmission Line) – did not include TWA Facility Development Corridor	8,734.4 ha (Wind Farm, External Transmission Line, and TWA Facility)	Proposed Action Development Corridor reduced by 3,867.2 ha (or 31 per cent) relative to Referred Action and 3,670.68 ha (or 30 per cent) less than the Approved Action.
Indicative Development Footprint (Wind Farm and External Transmission Line)	752.82 ha	1,599.4 ha comprised of: <ul style="list-style-type: none"> • Wind farm: 1,367.4 ha. • External transmission line: 232.0 ha. 	1,609.4 ha comprised of: <ul style="list-style-type: none"> • Wind farm: 1,365.0 ha. • External transmission line: 244.4 ha. 	Total combined Indicative Development Footprint of Proposed Action increased by 10 ha (+ 0.6 per cent) from the Referred Action. The increase of 856.5 ha or 114 per cent) compared to the Approved Action is attributed to further design detail to ensure constructability and more accurate estimates of extent of required ground disturbance.
Indicative Development Footprint – Public Road Upgrade	Approved Action did not consider impact of Public Road Upgrades	190.7 ha	184.7 ha	Not possible from Approved Action. Minor decrease (6 ha or 3 per cent) between Referred Action and Proposed Action, due mainly to removal of Coolah Road from the Proposed Action.
Indicative Development Footprint – TWA Facility	Approved Action did not consider impact of Public Road Upgrades	Referred Action did not include a TWA Facility.	9 ha	New impact area.
Total Indicative Development Footprint	752.82 ha.	1,790.1 ha	1,803 ha	Minor increase (additional 12.9 ha or 0.7 per cent) between Referred Action and Proposed Action. The increase of 1,050 ha compared to Approved Action is attributable to the inclusion of public road upgrades, further design detail to ensure constructability, and more accurate estimates of extent of required ground disturbance.

The Development Corridor for the Proposed Action has reduced by approximately 31 per cent from that proposed in the Referred Action and by approximately 30 per cent from the Approved Action. Within the Development Corridor, the Indicative Development Footprint of the wind farm and external transmission line has increased negligibly by only 0.6 per cent from the Referred Action. However, there is an increase in the Indicative Development Footprint of the wind farm and external transmission line of the Proposed Action relative to the Approved Action. An explanation for these differences is provided in **Table ES.1**.

The Indicative Development Footprint of all components of the Proposed Action (1,803 ha) and the Referred Action (1,790.1 ha) has increased by approximately 1,050 ha from that identified for the Approved Action (752.8 ha). The ground disturbance impact of the Proposed Action relative to the Approved Action are more realistic in that the Proposed Action considers all temporary and permanent ground disturbance impacts that will be required for all proposed infrastructure and anticipated road upgrades using 3D terrain modelling and civil engineering design software. The 3D terrain modelling provides an accurate representation of the areas required for construction including turbine hardstands, crane pads, laydown areas for blades and to accurately estimate the extent of cut and fill associated with these areas.

While the extent of impact has marginally increased for the Proposed Action from that assessed in the Referred Action (1,790.1 ha), this can be attributed to the inclusion of necessary TWA Facility in the Proposed Action. Importantly it should be noted that the TWA Facility is deliberately located in non-native vegetation.

Due to the removal of turbines and further layout optimisation, the Proposed Action increases the separation distance between turbines as proposed in the Referred Action. In addition, the wind turbines in the Proposed Action have a reduced hub height, reduced maximum blade tip height and a smaller rotor diameter resulting in a 33 per cent reduction in the indicative rotor swept area (RSA) for each turbine. The Proposed Action proposes to increase the minimum ground clearance to the blade tip to 40 m AGL (an increase of 5 m compared to the Approved Action) to further minimise potential impacts to avifauna.

The Proponent has considered and discounted alternative forms of the Action, including the more intensive configuration of the Approved Action. The Proposed Action is the optimal configuration that balances the objective to efficiently deliver renewable energy with reasonable and feasible efforts to avoid and minimise adverse impacts to biodiversity values and incorporate feedback from the local community and stakeholders including government agencies.

Since acquiring the Approved Action in 2019, the Proponent has undertaken substantial measures to avoid and minimise impacts to biodiversity to the extent reasonably practicable and engaged with the local community. Residual impacts to biodiversity are unavoidable, and the Proponent has made substantial progress to secure required offsets.

Approach to Biodiversity Assessment

The Approved Action was originally assessed as a Major Project, under Part 3A of the NSW EP&A Act, and subsequently transitioned to SSD under the EP&A Act. The Approved Action was assessed under the NSW Biodiversity Offsets Policy for Major Projects 2014 (NSW Offsets Policy). The biodiversity values were assessed by NGH Environmental (NGH) based on surveys undertaken between 2012 to 2013, in March 2015 and October 2016. A summary of the surveys completed and survey effort of NGH is provided in **Section 3.2.2.1**.

Umwelt (Australia) Pty Limited (Umwelt) were engaged by the Proponent to complete biodiversity assessment in keeping with the NSW Biodiversity Assessment Methodology (BAM) (DPIE 2020a) to support the NSW Mod-1 Application under the EP&A Act. Ecological surveys for the Referred Action and Proposed Action have been completed by Umwelt in accordance with the BAM (DPIE 2020a) over the course of 2020 to 2023. A summary of the surveys completed for the Proposed Action is provided in **Section 3.2.2.2**, with more details provided in Section 2.0 of the Biodiversity Development Assessment Report (BDAR) (Umwelt 2023a) provided in **Appendix D**.

Ecological surveys completed by NGH commenced in the Proposed Action Area in October 2012 to October 2016. Surveys completed by Umwelt have all been completed within five years of the referral date and within the period since March 2023. The survey data collected by NGH has been considered throughout the assessment consistent with how reputable database records that predate March 2018 are relied upon.

It is important to note, the Proposed Action is not reliant on the NGH surveys. While the NGH surveys have been used to facilitate survey planning and formulating broad understanding of biodiversity values surrounding and within the Proposed Action Area, the recent surveys completed by Umwelt as part of the application of the NSW BAM (DPIE 2020a) form the basis of the assessment and preparation of the BDAR (Umwelt 2023a) and this PER. All Umwelt surveys have been completed within five-years of the referral (EPBC 2022/09416) being formally lodged with DCCEEW and exhibited in February 2023.

The overarching status and condition of biodiversity values within the Development Corridor of the Proposed Action Area compared with the Development Corridor of the Approved Action are similar.

Summary of Vegetation in the Proposed Action Area

The Development Corridor supports 10 PCTs across 17 condition classes. Most of the vegetation in the Development Corridor has been historically modified by agricultural land use. In many areas of the Development Corridor – Wind Farm the canopy layer is present and a midstorey may be present but frequently there is no shrub layer, and the groundcover has been heavily disturbed. In the Development Corridor – Wind Farm, common pasture weeds associated with grazing are widespread and have invaded areas of more intact woodland and forest vegetation.

The Development Corridor – Wind Farm is dominated by PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley and PCT 488 Silvertop Stringybark – Yellow Box +/- Nortons Box grassy woodland on basalt hills mainly on northern aspects of the Liverpool Range, Brigalow Belt South Bioregion, low condition vegetation zones including derived native grassland (30 per cent), exotic grassland (23 per cent) and low condition woodland (17 per cent). About five per cent of the Development Corridor – Wind Farm is mapped as Category 1 – exempt land, that is legally cleared before 1990 and/or cropping land.

About 25 per cent of the Development Corridor – Wind Farm supports moderate/good condition woodland across five different PCTs. The most widespread PCT in moderate/good condition woodland in the Development Corridor – Wind Farm is Vegetation Zone 9 PCT 488, covering about 330 ha.

South of Durrigere State Conservation Area (located off Ulan Road south of the Golden Highway) along the approved External Transmission Line, there are large areas of intact vegetation. The Development Corridor – External Transmission Line is characterised by derived native grassland (28 per cent), moderate/good condition open forest (22 per cent), moderate/good condition woodland (12 per cent) and thinned woodland (about 18 per cent). About 17 per cent of the Development Corridor – External Transmission Line is mapped as Category 1 – exempt land as defined under the NSW Local Land Services Act 2013 (LLS Act), that is it has been cleared of all native vegetation from all strata and is used for cropping. As with the Development Corridor-Wind Farm the dominant PCT is PCT 483 low condition (Vegetation Zone 7).

There are two PCTs that occur at the southern end of the Development Corridor – External Transmission Line that do not occur in the remainder of the Development Corridor, being PCT 1661 Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin and PCT 1675 Scribbly Gum – Narrow-leaved Ironbark – Bossiaea rhombifolia heathy open forest on sandstone ranges of the Sydney Basin. Both PCTs occur as moderate/good condition and are continuous with large tracts of vegetation in national park, state forest and private land holdings.

The Indicative Development Footprint – Public Road Upgrades is dominated by disturbed land (43 per cent) with derived native grasslands covering about 40 per cent. The native grassland is dominated by Vegetation Zone 8 PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley Low Condition Derived Native Grassland. Woodland remnants in the Indicative Development Footprint – Public Road Upgrades include thinned woodland with native grassland (about 8 per cent), thinned woodland dominated by exotic groundcover (seven per cent) and only two per cent of the Indicative Development Footprint – Public Road Upgrades is moderate good condition woodland.

The land within the Development Corridor – TWA Facility has been cropped for many years and does not support native vegetation, derived or otherwise. The designated no-go-area within the Development Corridor – TWA Facility that follows the existing waterway, contains vegetation that is representative of Vegetation Zone 8 PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley Low Condition Derived Native Grassland. The grassland is poor quality.

Matters of National Environmental Significance (MNES)

MNES known to occur or assessed as having a moderate or higher likelihood of occurring in the Proposed Action Area are listed in **Table ES.2**. This includes a number of species raised by DCCEEW in the Final PER Guidelines as requiring consideration.

Detailed information on records in the Proposed Action Area and locality, surveys completed targeting the MNES and a description of potential or known habitat in the Development Corridor has been provided in **Section 3.0** of the PER.

Table ES.2 MNES to be Assessed in PER

Species/ Community Name	Scientific Name	EPBC Act Status	Likelihood of Occurrence	Description of Environment provide in
Threatened ecological communities				
White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grassland		CEEC	Known	Section 3.5.1
Listed threatened flora				
-	<i>Homoranthus darwinioides</i>	V	Low. Requested by DCCEEW	Section 3.6.1
-	<i>Ozothamnus tessellatus</i>	V	Low. Requested by DCCEEW.	Section 3.6.2
Listed threatened birds				
Regent honeyeater	<i>Anthochaera phrygia</i>	CE	Moderate.	Section 3.7.1
Gang-gang cockatoo	<i>Callocephalon fimbriatum</i>	E	Low. Requested by DCCEEW.	Section 3.7.2
South-eastern Glossy Black-Cockatoo	<i>Calyptorhynchus lathami lathami</i>	V	Known	Section 3.7.3
Grey falcon	<i>Falco hypoleucos</i>	V	Low. Requested by DCCEEW.	Section 3.7.4
Painted honeyeater	<i>Grantiella picta</i>	V	Known	Section 3.7.5
White-throated needletail	<i>Hirundapus caudacutus</i>	V, CAMBA, JAMBA, ROKAMBA	Known	Section 3.7.6
Swift parrot	<i>Lathamus discolor</i>	CE	Moderate	Section 3.7.7
Superb parrot	<i>Polytelis swainsonii</i>	V	Low. Requested by DCCEEW.	Section 3.7.8
Pilotbird	<i>Pycnoptilus floccosus</i>	V	Low. Requested by DCCEEW.	Section 3.7.9
Listed threatened mammals				
Large-eared pied bat	<i>Chalinolobus dwyeri</i>	V	Known	Section 3.8.1
Spotted-tail quoll (SE mainland population)	<i>Dasyurus maculatus maculatus</i>	E	High (call heard)	Section 3.8.2
Corben's long-eared Bat	<i>Nyctophilus corbeni</i>	V	Known	Section 3.8.3
Greater glider (southern and central)	<i>Petauroides volans</i>	E	Known	Section 3.8.4
Yellow-bellied glider (south-eastern)	<i>Petaurus australis australis</i>	V	Known	Section 3.8.5
Koala (<i>Phascolarctos cinereus</i>) (combined populations of Qld, NSW and the ACT)	<i>Phascolarctos cinereus</i>	E	High	Section 3.8.6

Species/ Community Name	Scientific Name	EPBC Act Status	Likelihood of Occurrence	Description of Environment provide in
Grey-headed flying-fox	<i>Pteropus poliocephalus</i>	V	Known (recorded overhead) Requested by DCCEEW.	Section 3.8.7
Listed Migratory Species (Sections 20 and 20A)				
White-throated needletail	<i>Hirundapus caudacutus</i>	V, migratory (CAMBA, JAMBA, ROKAMBA)	Known	Section 3.7.6
Black-faced monarch	<i>Monarcha melanopsis</i>	marine; migratory (Bonn)	Low. Requested by DCCEEW.	Section 3.9.3
Satin flycatcher	<i>Myiagra cyanoleuca</i>	marine; migratory (Bonn)	Low. Requested by DCCEEW.	Section 3.9.2
Rufous fantail	<i>Rhipidura rufifrons</i>	marine; migratory (Bonn)	Medium. Requested by DCCEEW.	Section 3.9.1

Potential Impacts of the Proposed Action

Construction of the Proposed Action will result in temporary and permanent ground disturbance and vegetation removal that has been accounted for within the Indicative Development Footprint.

The main land use impacts will be potential for temporary disruption of existing agricultural land uses during construction, change in the rural setting of the locality given the presence of multiple wind turbines and additional transmission line infrastructure, potential increase in land management costs and activities due to weed spread from vehicle movements, potential changes to aerial land management practices and minor fragmentation of continuity of landholdings during construction. The Proposed Action will also have positive impacts on land use through improving and maintaining access to remote properties, facilitating land management activities and bushfire management.

Potential impacts associated with Proposed Action may include:

- Vegetation clearing resulting in loss of habitat.
- Habitat fragmentation and reduced connectivity.
- Fauna injury or mortality during clearing and potential entrapment in trenches when installing underground utilities.
- Removal of key fauna habitats (hollow-bearing trees, termite mounds, large hollow logs, rock piles, large stick nests).
- Collision risk for birds and bats.
- Fauna injury or mortality due to vehicle strike.
- Wildlife disturbance due to dust, noise and light emissions.
- Changes to surface water flows with increase in hardstand area.

- Reduced water quality due to erosion and sedimentation.
- Potential spill of hazardous materials.
- Introduction or increased prevalence of pests and weeds due to increased vehicle movements and vegetation clearance.
- Increased risk of bushfire due to potential ignition sources on site associated with construction activities.
- Cumulative impacts particularly with other planned wind farm projects in the CWO REZ.

These potential impacts are discussed in detail in **Section 4.2** to **Section 4.5**.

Key Potential Construction Impacts

Construction of the Proposed Action will impact directly on native vegetation and associated fauna habitats from 10 PCTs across 17 vegetation zones. A breakdown of the impact of each of the PCTs is provided in **Table 4.1**. Direct impacts on native vegetation, totals approximately 1,629.1 ha including 768.6 ha of vegetation described as 'low condition derived native grassland' and 'exotic' in condition, being Vegetation Zones 8 and 12. The Proposed Action has avoided 6,473.6 ha or 80 per cent of native vegetation within the Development Corridor.

As noted above, while the External Transmission Line forms part of the Proposed Action, the estimated impacts to biodiversity values along the External Transmission Line are unlikely to apply, as the Proponent is planning to connect the Proposed Action into the proposed CWO REZ transmission line project being developed by EnergyCo and the Network Operator. Removal of the External Transmission Line component of the Proposed Action will reduce extent of vegetation clearance, habitat fragmentation and reduce impacts of the Proposed Action on MNES. Of importance it is worth noting that removal of the External Transmission Line component would result in the avoidance of impact to approximately 17.7 ha of Commonwealth Box Gum Woodland CEEC.

The Proposed Action will result in an increase of vehicle activity through construction of a network of internal access tracks, predominantly between turbine locations but also within the transmission line easement for servicing purposes.

As a result of increased construction and decommissioning traffic movements the following MNES have been identified as being at risk of vehicle strike: glossy black-cockatoo, spotted-tailed quoll, koala and large-eared pied bat.

Due to the disturbed condition of the Proposed Action Area, and the fact that the potential impact locations are all existing public roads that will not have a change in speed limit as a result of the Proposed Action, it is unlikely that any of these MNES would be adversely impacted by the increase in vehicle movements.

Key Potential Operational Impacts

The main operational impacts of the Proposed Action are associated with:

- the operating wind turbines including risk of collision for birds and bats and noise impacts.
- impacts associated with maintenance activities including vehicle movements and spills risks for the wind farm.

Threatened and migratory species and other species groups of concern (e.g. microbats, raptors and waterfowl) may be impacted by operation of the wind farm through direct collision with turbine towers and blades/rotors but also through flying through turbulence associated with the rotor. Risk of collision exists when birds/bats are in flight within the rotor-swept area.

The nature of impacts associated to aerial fauna species from wind energy projects include direct turbine blade strike and barotrauma, the latter being injury caused by a sudden or substantial change in air pressure. While literature exists as to the nature of such impacts, the rate of occurrence and likelihood of impact is very difficult to accurately determine.

Candidate species considered as part of this analysis were selected based on recorded flight data collected during bird and bat utilisation surveys (BBUS) between 2012 and 2015 by NGH and between 2020 and 2023 by Umwelt at the Proposed Action Area. A detailed discussion of the species characteristics, site characteristics and risks are provided in **Section 5.7**.

The prescribed impact assessment for turbine strike considered 29 species, comprising 18 threatened species (13 bird and five bat species) and 11 non-threatened species (nine bird and two bat species). This assessment was not limited to listed MNES or migratory species. Of the 29 species considered, 22 species (16 birds and six bat species) were considered to have a reasonable potential of being impacted by turbine strike, based on understood flight behaviour and/or record of mortality at wind projects in NSW. For the 22 assessed species, four (4) species were considered a High risk, 15 species considered to be at Moderate risk and the remaining three (3) species were considered a Minor risk of being impacted by turbine strike and barotrauma as a result of the Proposed Action. No bird or bat species were considered to result in an extreme risk rating as a result of the Proposed Action.

Several MNES were identified as having a 'High' or 'Moderate' risk rating (Umwelt 2023a). The overall risk rating of High for swift parrot and regent honeyeater reflects the very small remaining population sizes, coupled with each species' migratory nature, the extent of habitat fragmentation in the local area and region and the species' critically endangered status. The overall risk rating of High for white-throated needletail largely reflects the High likelihood of collision of birds in the Proposed Action Area given their known susceptibility to blade strike at other wind farms in Australia. The potential operational impacts and risk ratings have been considered in the impact assessments for these individual MNES. A Bird and Bat Adaptive Management Plan (BBAMP) will be prepared to minimise the risk of turbine strike and will include management measures that will be implemented at specific trigger thresholds.

Decommissioning Impacts

Decommissioning of the Proposed Action would involve reinstating temporary construction compound/laydown areas to facilitate decommissioning of the wind farm above ground structures. The areas to be impacted during decommissioning would not support native vegetation and it is anticipated that there will be no direct impacts on potential habitat for MNES.

Indirect impacts of decommissioning would include noise and vibration, vehicle movements, dust and weed and pests. The duration and intensity of these impacts will be of lesser magnitude than operational impacts.

No additional adverse impacts on habitat fragmentation, connectivity and edge effects are expected to occur in the decommissioning phase. Revegetation activities associated with decommissioning (see Rehabilitation section below) are expected to reduce residual impacts on these aspects over the longer term.

Significant Impact Assessment

Impact assessment of individual MNES are provided in **Section 5.3** (threatened ecological community), **Section 5.4** (threatened birds), **Section 5.5** (threatened mammals) and **Section 5.6** (migratory species). The potential for significant impacts to relevant MNESs associated with all phases of the Proposed Action, as well as the key mitigation measures proposed are listed in **Table ES.3**.

Table ES.3 Summary of Significant Impacts on MNES

MNES	Summary of significant impact	Key relevant avoidance and mitigation measures
Commonwealth Box Gum Woodland CEEC	<p>Clearance of up to 31.6 ha of which 17.3 ha (approximately 55 per cent) will be partially directly impacted within the transmission line 'balance of easement' proposed by the Proposed Action with:</p> <ul style="list-style-type: none"> • 13.2 ha or 42 per cent associated with Indicative Development Footprint – Wind Farm of which 7 ha permanent impact and 5.2 ha partial impact in the internal balance of easement. • 17.7 ha or 56 per cent associated with Indicative Development Footprint – External Transmission Line of which 5.6 ha permanent impact and 12.1 ha partial impact in the external balance of easement. • 0.7 ha or 2 per cent in the Indicative Development Footprint – Public Road Upgrades. <p>All patches of the Commonwealth Box Gum Woodland CEEC are considered to be locally important. The Proposed Action is likely to adversely modify or reduce the composition and quality of retained adjoining vegetation through edge effects.</p>	<ul style="list-style-type: none"> • History of project assessments including numerous modifications of design and layout to avoid and reduce impacts on this vegetation type, including removal and relocation of specific turbines. Relative to the Referred Action, the Proposed Action has avoided 10.4 ha of Commonwealth Box Gum Woodland CEEC. • Several design strategies to avoid/minimise ground disturbance including prioritising the use of spur lines along the ridges to locate access tracks. • Targeted mitigation and monitoring measures (see Table 6.3) including demarcation of boundaries, pre-clearance surveys and tree-felling protocols. • Development and implementation of Biodiversity Management Plan, Environmental Management Plan, Vegetation clearance plan and rehabilitation management plan. • Additional and appropriate mitigation measures to minimise risk of serious and irreversible impacts (SAII).
Swift parrot (<i>Lathamus discolor</i>)	<p>While the Proposed Action avoids important habitat for the national population of the swift parrot, given the status of the species there is potential that the loss of approximately 302.5 ha of potential winter habitat, which may have an adverse effect on the local extent and long-term viability of the swift parrot.</p>	<ul style="list-style-type: none"> • Reduction in rotor swept area due to reduced turbine blade tip height and blade length compared to Referred Action. • Further avoidance through micro-siting of infrastructure at final design. • Consideration of specific mitigation measures through implementation of BBAMP. • Pre-clearance and tree-felling protocols. • Proposed research and/or monitoring program to investigate impact mitigation measures in relation to the impact of blade strike on native bird and bat species. • Development and implementation of Biodiversity Management Plan, Environmental Management Plan, Vegetation clearance plan and Rehabilitation management plan.
Regent honeyeater (<i>Anthochaera phrygia</i>)	<p>While the Proposed Action avoids critical habitat for the national population, and the absence of records, despite extensive surveys for the species, given the status of the species there is potential that the loss of approximately 604.3 ha of potential foraging habitat may have an adverse effect on the local extent and long-term viability of the regent honeyeater.</p>	
White-throated needletail (<i>Hirundapus caudacutus</i>)	<p>The Proposed Action has the potential to have a significant impact as there is a chance that there could be mortality of an ecologically significant proportion of its population.</p>	

The Proposed Action is not considered to have a significant impact on the following MNES:

- Gang-gang cockatoo (*Callocephalon fimbriatum*). The Proposed Action is considered to have a likely negligible impact on potential habitat for the gang-gang cockatoo given the minimal proposed habitat impacts, lack of records of the species within the Development Corridor, and a greater quality habitat for the species within the nearby Goulburn River National Park.
- South-eastern glossy black-cockatoo (*Calyptorhynchus lathami lathami*) as the Proposed Action would clear a negligible amount of potential foraging habitat and breeding habitat, nor impact on an important population of the species.
- Superb parrot (*Polytelis swainsonii*) as there is no evidence of breeding and only one record of the superb parrot by others within a 10 km radius of the Development Corridor and just 22.9 ha of potential habitat will be impacted by the Proposed Action.
- Greater glider (southern and central) (*Petauroides volans*), as potential habitat is largely avoided and connectivity to known records in Coolah Tops National Park can be maintained through detail design.
- Koala (*Phascolarctos cinereus*) (combined populations of QLD, NSW and the ACT), as not recorded in Development Corridor, no evidence of breeding population in the Development Corridor. Breeding population may occur in forest/woodland habitat adjacent to the Indicative Development Footprint – External Transmission Line. In this area the impact will be linear and narrow and is unlikely to fragment or isolate the koala.
- Painted honeyeater (*Grantiella picta*) as potential habitat most likely to be associated with the Indicative Development Footprint – External Transmission Line where impacts are linear and narrow and unlikely to fragment habitat for a mobile species.
- Large-eared pied bat (*Chalinolobus dwyeri*) as the Proposed Action will not impact roosting and breeding habitat. The Proposed Action is not expected to result in an adverse impact on a potentially occurring important population of the large-eared pied bat due to the very low population density of the species (as evidenced by the lack of records since 2012), no breeding habitat being directly impacted, the retention of substantial areas of potential foraging habitat within the Development Corridor and the mitigation strategies that will be employed as part of the Proposed Action.
- Corben's long-eared bat (*Nyctophilus corbeni*) due to the very low population density of the species, the retention of substantial areas of potential breeding and foraging habitat within the Development Corridor and the mitigation strategies that will be employed as part of the Proposed Action.
- Yellow-bellied glider (south-eastern) (*Petaurus australis australis*) as habitat largely avoided and connectivity to known records in Coolah Tops National Park can be maintained through detail design.
- Spotted-tail quoll (*Dasyurus maculatus maculatus*) despite the impacts to 193.9 ha of potentially suitable habitat as there will be no direct impacts to the species as these impacts are not considered likely to result in any isolation or fragmentation for the species.
- Grey-headed flying fox (*Pteropus poliocephalus*) despite the Proposed Action impacting 312.1 ha of potential foraging habitat given the sheer distances from the nearest known nationally important camp (over 100 km) and nearest known camp (over 40 km) make the species unlikely to frequently forage within the Proposed Action Area.

- Satin flycatcher (*Myiagra cyanoleuca*) a migratory species that may occupy terrestrial habitat during migration but has been recorded rarely with no publicly known records in the Proposed Action Area or adjacent areas since 2003. The Proposed Action may impact up to 101.8 ha of marginal habitat but is unlikely to substantially destroy or isolate important habitat.

Proposed Avoidance, Minimisation and Mitigation Measures

Proposed avoidance, minimisation and mitigation measures for these potential impacts are identified and discussed in **Section 6.1** and **Section 6.2**.

The Proposed Action has undergone substantial design changes since project feasibility began in 2012, many of which have been the result of specific biodiversity avoidance measures. A range of design amendments occurred as part of the original assessment for the Approved Action including amendment to the external transmission line to avoid areas of NSW Box Gum Woodland CEEC and relocation of turbines to avoid areas of NSW Box Gum Woodland CEEC. Since the Proponent took ownership of the Approved Action in 2019, additional changes to the design have been made with a focus on avoiding impacts to native vegetation, habitats and heritage values where possible and respecting landholder imposed no-go zones.

To mitigate unavoidable impacts to MNES during construction and operation and support the implementation of other licences and permits, an environmental management framework will be developed including an Environmental Management Strategy and associated management plans. Mitigation measures will be finalised through the preparation and approval of the Biodiversity Management Plan (BMP) including a rehabilitation management plan, a Bird and Bat Adaptive Management Plan (BBAMP), and an Environmental Management Plan (EMP). Wherever relevant, management plans will be prepared to the satisfaction of the Minister, and where required will be prepared in consultation with regulatory agencies and in accordance with all relevant State and Commonwealth approvals and legislation.

Table 6.3 summarises the potential mitigation measures for MNES proposed for the Proposed Action, including the timing, action, outcome, and responsibility of these measures. Each of the control measures will contribute to the maintenance of habitat quality for MNES within and adjacent to the final impact areas of the Proposed Action.

Rehabilitation

The Proponent has also committed to the rehabilitation of areas temporarily disturbed during construction and upon decommissioning of the wind farm. A rehabilitation management plan will be developed for the Proposed Action as part of the BMP to ensure all temporary construction areas (e.g. temporary construction facilities, lay-down areas, etc.) are rehabilitated to a condition similar to pre-construction vegetation conditions.

The planned rehabilitation activities are designed to reintegrate any disturbed area with the surrounding land and existing vegetation to a condition similar to that existing prior to construction, to ensure it is safe, stable and non-polluting. Rehabilitation activities will occur progressively for areas temporarily disturbed during construction, and further rehabilitation activities will occur as part of decommissioning.

Prior to decommissioning of the wind farm, an appropriate Decommissioning and Rehabilitation Plan will be prepared in consultation with relevant stakeholders. This plan will consider relevant best practice guidance for rehabilitation of wind farms.

Offsets

Despite substantial avoidance and minimisation efforts completed to date, the Proposed Action will result in residual impacts to a number of MNES. Residual impacts must be offset in accordance with the EPBC Act Environmental Offsets Policy 2012 and Offsets Assessment Guide (OAG), or other endorsed offset framework (for example, the NSW Biodiversity Offset Scheme (BOS) established under the *Biodiversity Conservation Act 2016* (BC Act). The NSW BAM and BOS have been endorsed by the Commonwealth. This means that offsetting outcomes achieved through the BAM will be accepted for the purposes of the EPBC Act, provided that they are 'like-for-like' in relation to listed threatened species and communities as defined for the purposes of the EPBC Act.

The Proponent is seeking to offset the Proposed Action using the NSW BAM – Credit Calculator assessments for the Proposed Action and include complete impacts as well as partial direct impacts that have been calculated in the balance of easement component of the transmission lines (internal and external). Within the balance of easement, a proportion of biodiversity values will remain within select vegetation zones following construction and during the operation of the Proposed Action.

These residual impacts associated with the entire Proposed Action (i.e. wind farm, public road upgrades and external transmission line) are summarised in **Table ES.4**. The credit liabilities for MNES are identified in **Table ES.4** and described in more detail in **Section 8.0** of the PER and the BDAR attached in **Appendix D**.

Table ES.4 Residual Impacts to MNES Requiring Offsets (Entire Proposed Action)

MNES	Potential Habitat in Development Corridor (ha)	Potential Habitat in Indicative Development Footprint (ha)	Total Credits
Threatened Ecological Community			
White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grassland	174.1	31.6	1,068
Species (species-credits)			
South-eastern Glossy Black-Cockatoo (breeding habitat)	5.4	2.0	38
Greater Glider (southern and central)	111.3	19.3	692
Large-eared Pied Bat	572.0	106.7 ha	4,839
Species (ecosystem credits)			
Regent Honeyeater	3,233.8	603.9	16,727
Gang-gang Cockatoo (no breeding habitat)	45.7	13.4	427
South-eastern Glossy Black-Cockatoo (foraging habitat)	508.0	83.7	2,531
Painted Honeyeater	3,407.9	627.6	17,142
White-throated Needletail (terrestrial habitat)	2,348.6	463.2	11,706
Swift Parrot	1,653.0	302.5	8,130
Superb Parrot	124.2	22.9	573

MNES	Potential Habitat in Development Corridor (ha)	Potential Habitat in Indicative Development Footprint (ha)	Total Credits
Spotted-tail Quoll (SE mainland population)	941.4	193.9	4,864
Corben's Long-eared Bat	721.5	156.8	4,022
Yellow-bellied Glider (south-eastern)	87.4	15.2	447
Koala (<i>Phascolarctos cinereus</i>) (combined populations of Qld, NSW and the ACT)	3,726.1	720.6	19,203
Grey-headed Flying-fox	1,731.5	312.0	8,276

Impacts relating to wind turbine strike (and barotrauma) are possible for the Proposed Action, as they are for any wind farm. The frequency and particular species that will be impacted by wind turbine strike (and barotrauma) cannot be confidently known until operational monitoring occurs. Details of the approach to offsetting prescribed impacts relating to turbine strike (and barotrauma) will be detailed in the Bird and Bat Adaptive Management Plan (BBAMP) that will be prepared for the Proposed Action in consultation with DPHI, BCS and Commonwealth DCCEEW.

The Proponent has developed and is actively working towards the implementation of a comprehensive biodiversity offset strategy for the Proposed Action. The Proponent has prepared the Preliminary Biodiversity Offset Strategy (Offset Strategy) provided in **Appendix G** and has engaged Wedgetail Project Consulting Pty Ltd (Wedgetail) to assist with the implementation of the Offset Strategy.

The Proponent intends on satisfying the majority of their offset obligations for the Proposed Action for the Indicative Development Footprint – Wind Farm and Indicative Development Footprint – Public Road Upgrades, through securing land-based offsets such as establishing new Biodiversity Stewardship Agreement (BSA) sites under the BAM or purchasing credits on the public credit market. To-date the Proponent has secured eight land-based offset opportunities, five of which will be established as new BSA sites and the remaining three relate to the purchase of credits from established BSA sites. The five new BSA sites proposed to be established are currently being investigated and assessed by Wedgetail on behalf of the Proponent. Together, the eight land-based opportunities are expected to generate over 90% of the ecosystem and species credits required to offset the unavoidable impacts associated with the wind farm and public road upgrade components of the Proposed Action. Moreover, the Proponent has gone through extensive efforts to strategically offset the Proposed Action through identifying suitable properties that do not simply generate the suitable credits, but that would also deliver additional strategic landscape-scale biodiversity wins. This includes but is not limited to the strategic connection of habitat between presently disconnected conservation areas or locating BSA sites adjacent to existing national parks or conservation areas.

Where there is shortfall in available credits to retire against the Proposed Action, the Proponent will prioritise the purchase of required offset credits via the public credit market. Wedgetail are assisting the Proponent with searching for and identifying suitable credits on the public market to commence negotiations with potential sellers.

Additional and Appropriate Mitigation Measures

The Proponent has committed to additional mitigation measures to minimise risk of serious and irreversible impacts (SAIL) to the NSW listed Box Gum Woodland CEEC and in so doing minimise impacts to Commonwealth Box Gum Woodland CEEC. The additional SAIL mitigation measures include setting aside land at a 1:1 area ratio of conserved vegetation to impacted Low and Moderate-good condition class Box Gum Woodland CEEC under a BSA (the SAIL Measures). The Proponent proposes to implement the SAIL Measures at a BSA site it is proposing to establish near Barraba, north of Tamworth NSW, located within the Peel IBRA sub-region. Based on the estimated impacts to Low and Moderate-good condition Box Gum Woodland CEEC associated with the Indicative Development Footprint – Wind Farm and Indicative Development Footprint – Public Road Upgrades, the SAIL Measures will result in the conservation in perpetuity of an additional 13.9 ha of Commonwealth Box Gum Woodland CEEC over and above offsetting requirements under the NSW BOS, that would not otherwise occur without the Proposed Action. A detailed description of the proposed SAIL measures and implementation framework is provided in **Appendix G**.

Consultation

Substantial effort has been made by the Proponent to share information and receive feedback on the Referred Action and Proposed Action and benefit sharing opportunities to ensure all relevant questions and concerns within the community are clearly understood and appropriately addressed. Consultation and engagement activities have been undertaken with a range of stakeholders including directly impacted landholders, local residents, government authorities, local councils, utilities owners, and community groups.

Targeted consultation with registered aboriginal parties (RAPs) was undertaken as part of the Aboriginal Cultural Heritage Assessment (ACHA) that has been prepared by Umwelt (2022b, 2023h, 2023i). Consultation with RAPs has informed the development of management recommendations included in the ACHA which are intended to supplement the existing conditions of the Development Consent that govern the management of cultural heritage. The Proponent also undertakes regular consultation and provides project updates with the relevant Local Aboriginal Land Councils (LALCs) in the region.

Consultation with the community and key stakeholders is ongoing and will continue prior to and during construction and operation of the Proposed Action. Ongoing consultation activities will aim to provide the community and stakeholders with awareness of construction processes and activities, updates on the proposed timing of construction and opportunities for ongoing feedback and input. The Proponent receives and responds to complaints in accordance with its complaints management policy on all of its projects.

Conclusion

The Proposed Action is located within, and forms a key component of the CWO REZ, an area declared by the NSW Government as suitable for renewable energy development. The Proponent and the Proposed Action have together been designated by EnergyCo as a Candidate Foundational Generator (CFG) which further demonstrates the critical role that the Proposed Action plays in helping the NSW Government deliver on its commitments to increase renewable energy generation and decarbonise the electricity generation system. The Proposed Action represents one of the largest approved projects within the CWO REZ, is aligned with the NSW and Commonwealth governments' energy and climate policies and will make a meaningful contribution to achieving the goal of net zero emissions by 2050.

The Proposed Action is a direct response to the NSW and Commonwealth Governments' commitments to transition to renewable electricity generation and forms a key component of the CWO REZ. The National Electricity Market (NEM) needs to rapidly transition to renewable energy to support the NSW Climate Change Policy Framework, as well as the Commonwealth Government's commitments under the Paris Agreement. The Proposed Action will materially assist in addressing this by delivering approximately 1,332 MW of renewable energy capacity to the NEM.

The Proponent has considered and discounted alternative layouts and construction methodologies, including the more intensive configuration of the Approved Action and Referred Action. The Proposed Action is the optimal configuration balancing the key overarching objectives of efficient delivery of renewable energy with avoidance of biodiversity values and consideration of feedback from the local community and stakeholders including government agencies.

Consistent with the precautionary principle, the Proponent has completed detailed studies of the existing environment, considered relevant constraints and alternatives, and where applicable used scientific modelling to assess and determine potential impacts. All reasonable and feasible efforts have been made to avoid and minimise the predicted impacts associated with the Proposed Action and to facilitate efficiency in construction activities. To this end, there has been careful evaluation to avoid/minimise the risk of irreversible damage to the environment, wherever possible.

The Proposed Action will result in residual impacts however these impacts will be effectively managed, mitigated and offset in accordance with relevant State and Commonwealth legislation. The Proponent is committed to implement mitigation measures for each phase of the Proposed Action to ensure residual impacts on MNES will be appropriately managed. There will also be further opportunities to reduce impacts on MNES values during the detailed design and construction phase of the project, for example through micro-siting of infrastructure at final design.

The Proposed Action will provide approximately 550 full-time positions during peak construction and approximately 40 full-time staff during its operational life, thus providing increased employment opportunities in the local region. The Proposed Action will result in a direct injection of approximately \$6 million per annum to the local community through direct payments to landholders, VPA contributions and other community benefit sharing initiatives to the local community. The Proponent will also be required to make additional payments through the CWO REZ Access Scheme, a portion of which will be invested by the NSW Government for community and employment purposes in the region.

While the Proposed Action results in several changes to the turbine parameters and infrastructure layout it is considered that the Proposed Action is substantially the same development as the Approved Action. The Proposed Action adheres to ecologically sustainable development principles through the integration of relevant economic, environmental and social considerations. Overall, the Proposed Action is expected to deliver positive net benefits for the community and environment, and therefore warrants approval.

Acronyms and Abbreviations

ACEREZ	Consortium formed by ACCIONA, Cobra and Endeavour Energy
ACHA	Aboriginal Cultural Heritage Assessment
AEF	Accommodation and Employment Framework
AEMO	Australian Energy Market Operator
agl	Above ground level
AHD	Australian Height Datum
AIP	Australian Industry Participation authority
AOO	area of occupancy
ARDG	Australian Resource Development Group Pty Limited
asl	Above sea level
BACI	Before-After Control Impact
BAM	Biodiversity Assessment Methodology (NSW)
bgl	below ground level
BMP	Biodiversity Management Plan
BBMP	Bird and Bat Management Plan
BBS	Brigalow Belt South IBRA Region
BBUS	Bird and bat utilisation survey
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BCF	Biodiversity Conservation Fund (NSW)
BCS	Biodiversity Conservation and Science Directorate – part of NSW Environment and Heritage group in the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW).
BCT	Biodiversity Conservation Trust (NSW). Group in the NSW DCCEEW.
BDAR	Biodiversity Development Assessment Report
BoM	Bureau of Meteorology
BOP	Balance of Plant contractor
BOS	Biodiversity Offset Scheme (NSW)
BSA	Biodiversity Stewardship Agreement (NSW)
BSA site	Biodiversity Stewardship Agreement (BSA) site, established under the <i>Biodiversity Conservation Act 2016</i>
BSP	Benefit Sharing Plan
BSSAR	Biodiversity Stewardship Site Assessment Report
CAMBA	China-Australia Migratory Bird Agreement
CCC	(Liverpool Range Wind Farm) Community Consultative Committee
CCS	Composition condition score (part of the BAM)
CEEC	Critically endangered ecological community
CEMP	Construction Environmental Management Plan

CFG	Candidate Foundation Generators (in the Central-West Orana Renewable Energy Zone)
CSSI	Critical State Significant Infrastructure (NSW)
CST	Credit Supply Taskforce (NSW)
CWO REZ	Central-West Orana Renewable Energy Zone
DAWE	(Former) Commonwealth Department of Agriculture, Water and the Environment (now DCCEEW)
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water (previously Department of Agriculture, Water and the Environment)
DCCEEW (NSW)	Department of Climate Change, Energy, the Environment and Water (previously part of NSW DPE). The environment portfolio department of NSW includes the following groups: Environment and Heritage (BCS), NSW Water, BCT, NSW Environment Protection Authority, EnergyCo, NSW National Parks and Wildlife Service, BCT, Adapt NSW and NSW Climate and Energy Action group.
DoEE	(Former) Commonwealth Department of the Environment and Energy (now DCCEEW)
DNG	Derived native grassland
DPE	NSW Department of Planning and Environment (note as of 1 January 2024 the Planning portfolio has become part of DPHI and the environment portfolio has become part of NSW DCCEEW)
DPHI	NSW Department of Planning, Housing, and Infrastructure (note Planning portfolio was previously part of DPE).
EEC	Endangered ecological community
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EOO	extent of occupancy
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPL	Environment Protection Licence (NSW)
ESD	Ecologically Sustainable Development
FBA	Framework of biodiversity assessment (NSW). Previous assessment approach that applied to Part 3A major project assessments in NSW. Superseded by BAM (DPIE 2020a)
FTE	full time equivalent
GIS	Geographic information system
GW	Gigawatt
ha	hectare(s)
HBT	Hollow bearing tree
IBRA	Interim Biogeographic Regionalisation for Australia (Version 7)
JAMBA	Japan-Australia Migratory Bird Agreement
KBA	Key Biodiversity Area
kV	Kilovolt
LALC	Local Aboriginal Land Council
LGA	Local government area
LLS Act	NSW <i>Local Land Services Act 2013</i>

m	metre(s)
MGA	Map Grid of Australia
MNES	Matters of National Environmental Significance
MW	megawatt
NEM	National electricity market
NGH	NGH Environmental
NSW	New South Wales
O&M	Operation and Maintenance Facilities
OSOM	Oversize and over-mass
PCT	plant community type
PER	Public Environment Report
PMST	Protected Matters Search Tool
RAP	Registered Aboriginal Party
REZ	Renewable energy zone
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
RSA	rotor swept area
RtS	Response to Submissions
SAIL	serious and irreversible impacts
SAP	site access point
SB	Sydney Basin IBRA Region
SCADA	Supervisory Control and Data Acquisition
SEARs	Secretary's Environmental Assessment Requirements (NSW)
SIMO	Social Impact Management Overview
SPRAT	Commonwealth Species Profile and Threats (database)
SSD	State Significant Development
SWL	Standing water level
TEC	threatened ecological community
TfNSW	Transport for New South Wales
TBDC	Threatened Biodiversity Data Collection
TIA	Traffic impact assessment
TMP	Traffic management plan
TWA	Temporary workforce accommodation
VIS	Vegetation Information System (NSW)
VOTW	Valley of the Winds Wind Farm
VPA	Voluntary planning agreement
VZ	vegetation zone
WTG	wind turbine generators

Glossary of Terms

Terminology	Description
Nomenclature and terminology specific to the Proposed Action	
Adjacent areas	For the purposes of this Public Environment Report (PER), the adjacent areas refer to the shared border area of the Coolah Tops National Park, located north-east of the Proposed Action, which provide suitable habitat for the Koala and other EPBC listed species, and all other areas adjacent to the Proposed Action, which provide habitat or potential habitat for the relevant EPBC listed ecological community and species assessed herein in Section 3 and Section 5 of the PER.
Approved Action	Liverpool Range Wind Farm (EPBC 2014/7136) was approved on 29 June 2018. The Approved Action is defined in the EPBC Approval (EPBC 2014/7136) as ‘to construct and operate a wind farm including up to 288 wind turbine generators, a 330 kV overhead powerline, electrical reticulation, connection substations, maintenance facilities and access tracks between Coolah and Cassilis, NSW, as described in EPBC referral 2014/7136’. The location and extent of the Approved Action is shown in Figure 1.1 and Figure 1.2 .
Associated residences	Associated residences are either those landowners that have signed a: <ul style="list-style-type: none"> • host agreement where the landowner has a lease or infrastructure agreement in relation to their property, or • participating ‘neighbour’ agreement where the residence is within proximity of the Proposed Action and there is an agreement in relation to potential impacts from the Proposed Action.
Balance of easement	The portion of the 60 metre (m) wide easement area along the proposed internal and external 330 kV transmission line, that excludes civil works areas for access tracks, string pads, pole/tower disturbance areas. Within the balance of easement only vegetation above 4 m in height (at full maturity) is assumed to be removed, in accordance with Transgrid vegetation management guidelines (Transgrid nd).
Commissioning	For the purposes of this PER, commissioning means the commencement of Hold Point Testing in accordance with the requirements specified by EnergyCo for the Central-West Orana Renewable Energy Zone.
Development Corridor	The Development Corridor is a micro-siting buffer within the Proposed Action Area which contains all of the Indicative Development Footprint of the proposed wind farm, transmission line, TWA Facility and ancillary infrastructure to allow for final detailed design and micro-siting. The Development Corridor does not refer to the development (impact) footprint. The consolidated Development Corridor is comprised of three separate areas that each encompass the relevant land areas required to deliver the wind farm, external transmission line, and TWA Facility components, referred to as the: <ul style="list-style-type: none"> • Development Corridor – Wind Farm. • Development Corridor – External Transmission Line. • Development Corridor – TWA Facility. There is a partial overlap of about 144.6 ha over the Development Corridor – Wind Farm and Development Corridor – External Transmission Line due to common access tracks required for the construction and operation of both components.

Terminology	Description
	<p>No Development Corridor has been defined for the anticipated public road upgrades as public road alignments are generally fixed and therefore possess limited opportunities for micro-siting.</p> <p>The total Development Corridor covers approximately 8,734.4 hectares (ha) and is described in detail in Section 2.1.1 and shown Figure 1.4.</p>
Development Corridor – External Transmission Line	<p>The portion of the Development Corridor that includes all infrastructure related to the portion of the transmission line between the on-site collector substation, located near Rotherwood Road, and the approved point of connection to the existing network infrastructure at Ulan. The Development Corridor – External Transmission Line covers approximately 1,540.5 ha.</p> <p>This boundary partially overlaps with the Development Corridor – Wind Farm.</p>
Development Corridor – Temporary Workforce Accommodation (TWA) Facility	<p>This portion of the Development Corridor covers approximately 14.6 ha and includes the TWA Facility infrastructure proposed to be accessed off Vinegary Road, approximately 3 km east of Coolah township.</p>
Development Corridor – Wind Farm	<p>The portion of the Development Corridor that covers approximately 7,323.9 ha and includes all wind farm related infrastructure including the portion of the internal transmission line north of the on-site collector substation located near Rotherwood Road, Cassilis.</p> <p>This boundary partially overlaps with the Development Corridor – External Transmission Line. For the purposes of this report and the biodiversity assessment (Umwelt 2023a) the overlapping portion of the Development Corridor has been assessed as part of the Development Corridor – External Transmission Line.</p>
Indicative Development Footprint	<p>The total estimated extent of all temporary and permanent ground disturbance and vegetation removal associated with the construction of the Proposed Action. It is estimated to be approximately 1,803 ha, comprised of:</p> <ul style="list-style-type: none"> • Indicative Development Footprint – Wind Farm. • Indicative Development Footprint – External Transmission Line. • Indicative Development Footprint – Public Road Upgrades. • Indicative Development Footprint – TWA Facility.
Indicative Development Footprint – External Transmission Line	<p>The estimated extent of all temporary and permanent ground disturbance and vegetation removal (244.4 ha) associated with the External Transmission Line associated with the construction of the transmission line (i.e. that portion of the transmission line extending south of the on-site collector substation at Rotherwood Road, Cassilis to the approved point of connection to the existing Wellington to Wollar transmission line at Ulan).</p> <p>It includes all temporary and permanent ground disturbance and vegetation removal required to construct access tracks within the transmission line easement, access tracks to the transmission line easement from nearby public roads, pole/tower locations, string pads and potential upgrade to Transgrid infrastructure at Ulan and vegetation removal within the balance of easement to be undertaken in accordance with Transgrid vegetation management guidelines. Further description of vegetation removal in the easement is provided in ‘balance of easement’ in this glossary.</p> <p>Connection to the proposed Central West Orana Renewable Energy Zone (CWO REZ) transmission line is the preferred connection point. In circumstances where the Proposed Action connects into the CWO REZ transmission line, the External Transmission Line would no longer be required.</p>

Terminology	Description
Indicative Development Footprint – Public Road Upgrades	<p>The estimated extent of all temporary and permanent ground disturbance and vegetation removal (184.7 ha) associated with the construction of the anticipated public road upgrades required as part of the Proposed Action. It is a realistic estimate of ground disturbance and vegetation removal and will be refined further during detailed design once contractor(s) are engaged.</p> <p>Note: this impact was not assessed as part of the Approved Action.</p>
Indicative Development Footprint – TWA Facility	<p>The estimated extent of all temporary and permanent ground disturbance (9 ha) associated with the TWA Facility within the Development Corridor – TWA Facility.</p>
Indicative Development Footprint – Wind Farm	<p>The estimated extent of all temporary and permanent ground disturbance and vegetation removal (1364.9 ha) associated with the construction of the wind farm, located within the Development Corridor – Wind Farm generally north of the on-site collector substation at Rotherwood Road, Cassilis.</p> <p>Wind farm related infrastructure includes internal access tracks, wind turbine hardstands, substations, met masts, the portion of the internal transmission line north of the on-site collector substation as well as temporary facilities including concrete batch plants, construction compounds, laydown areas and vegetation removal required within the balance of easement required in accordance with Transgrid vegetation management guidelines. It excludes the public road upgrades and external transmission line.</p>
NSW Mod-1 Application	<p>Tilt Renewables are progressing an application to modify the NSW Development Consent (SSD-6696). The NSW Mod-1 Application was submitted under Section 4.55(2) of the NSW <i>Environmental Planning and Assessment Act 1979</i> (EP&A Act) in September 2022. The key changes were a reduction in the number of wind turbines to 220, an increase in the maximum blade tip height to 250 m above ground level and amendments to the associated infrastructure.</p> <p>The NSW Mod-1 Application was publicly exhibited in September/October 2022. The NSW Mod-1 Application was referred to the Commonwealth DCCEEW in late 2022 (see Referred Action).</p> <p>Since public exhibition and review of submissions received from the public and government agencies two amendments of the NSW Mod-1 Application have been made:</p> <ul style="list-style-type: none"> • Amendment 1 was prepared in response to submissions. This amendment was made in September 2023 and is referred throughout the PER as the Proposed Action. • Amendment 2 was made to the NSW government in January 2024 to include an onsite temporary workforce accommodation facility (TWA Facility). This amendment is included in the Proposed Action in the PER. <p>Currently (March 2024) the NSW Mod-1 Application is undetermined.</p>
Proponent	<p>Tilt Renewables Australia Pty Ltd as trustee for Liverpool Range Wind Farm Project Trust is the Proponent / Person proposing to take the action.</p>

Terminology	Description
Proposed Action	The Proposed Action refers to the optimised design and layout of an approved large scale wind farm project (the Approved Project). Approval is being sought under the NSW <i>Environmental Planning and Assessment Act 1979</i> (EP&A Act) and Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) to construct, operate, maintain and decommission a wind farm with up to 185 wind turbine generators with a maximum blade tip height of 215 m above ground level (AGL), transmission line infrastructure, public road upgrades, TWA Facility, and other ancillary infrastructure. The Proposed Action is described in detail in Section 2.1 .
Proposed Action Area	The Proposed Action Area includes all of the involved landholders' land parcels as well as the Indicative Development Footprint for the required public road upgrades and a public road upgrade investigation area. The Proposed Action Area is shown in Figure 1.1 and Figure 2.1 . The Proposed Action Area is approximately 51,638.6 ha.
Public Road Upgrades Investigation Area	The portion of the Proposed Action Area that covers approximately 206.6 ha being a 10-metre buffer area applied to the Indicative Development Footprint – Public Road Upgrades. The investigation area would be subject to further ecology and heritage survey during detailed design process.
Referred Action	Refers to the action as described in the referral made by the Proponent at the end of 2022 and publicly exhibited from the 2 March 2023 until the 20 March 2023. The Referred Action was determined to be a controlled action on the 30 March 2023. The Referred Action is shown in Figure 1.3 .
Temporary Workforce Accommodation (TWA) Facility)	The Proponent is proposing a project-specific, TWA Facility as an ancillary component of the Proposed Action, to facilitate construction of the Liverpool Range Wind Farm. The TWA Facility will be required for the duration of the construction phase of the Proposed Action, approximately four years. The TWA Facility buildings would be modular-style that, fabricated off-site and transported to the TWA site for installation. The TWA Facility would have a total capacity of approximately 600 rooms, which considers a construction peak workforce of approximately 550 and additional rooms for staff required to operate and maintain the TWA Facility (such as dining and recreational facilities, wastewater treatment etc).
Biodiversity nomenclature and terminology	
Biodiversity Assessment Method	The NSW Biodiversity Assessment Method, is the biodiversity assessment method established under the <i>Biodiversity Conservation Act 2016</i> (BC Act) for the purpose of assessing the impact of actions on threatened species and threatened ecological communities, and their habitats.
Biodiversity Conservation Trust	The NSW Biodiversity Conservation Trust (BCT) is a statutory body established under Part 10 of the <i>Biodiversity Conservation Act 2016</i> as a statutory not for profit body Its primary purpose is to partner with landholders to enhance and conserve biodiversity across NSW through delivery of conservation programs and fulfilment of certain roles under the NSW Biodiversity Offset Scheme.
Biodiversity credits	Biodiversity credits are used to measure both the unavoidable impacts on biodiversity from development and clearing at a development site and the predicted improvement in biodiversity condition gain at a stewardship site. There are two types of biodiversity credits being ecosystem credit and species credits.

Terminology	Description
Biodiversity Credit Supply Taskforce and Biodiversity Credit Supply Fund	<p>The NSW Biodiversity Credit Supply Taskforce was established to increase the supply of biodiversity credits by working with landholders to enter into biodiversity stewardship agreements (BSA) to generate priority credits (that is credits in or most likely to be in demand). The taskforce will hand over executed BSAs to the BCT to support implementation and compliance.</p> <p>The taskforce will operate the Biodiversity Credit Supply Fund acquiring priority biodiversity credits at competitive market prices and on-selling them to proponents (at the purchase price plus cost recovery fee) to support delivery of infrastructure and other projects. The fund operates within the NSW DCCEEW under the existing provisions of the BC Act.</p>
Biodiversity Stewardship Agreement	<p>A Biodiversity Stewardship Agreement (BSA) in NSW is a formal arrangement made under the BC Act. These agreements are established to conserve and restore habitat for native species and ecosystems. As such, they are a land-based offset site (BSA site), protected in perpetuity.</p>
Category-1 exempt land	<p>Category 1 exempt land is defined under Section 60H of the NSW Local Land Services Act 2013 (LLS Act) as</p> <ul style="list-style-type: none"> • land cleared of native vegetation as at 1 January 1990 or lawfully cleared of native vegetation after the 1 January 1990. • It is land containing low conservation value grasslands or • native vegetation identified as regrowth in a property vegetation plan where regrowth date is specified or • land bio-certified under the BC Act. • For the purposes of the NSW Biodiversity Assessment Method (BAM), category 1 exempt land is excluded from the assessment of the impacts of any clearing of native vegetation and loss of habitat other than prescribed impacts. <p>Further explanation of category 1 exempt land is provided in the biodiversity assessment report provided in Appendix D.</p>
Commonwealth Box Gum Woodland CEEC	<p>White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community listed under the EPBC Act.</p>
Credit obligation	<p>Credit obligations are generated by a development or clearing activity resulting in unavoidable biodiversity impacts.</p>
Ecosystem credit	<p>A measurement of the value of threatened ecological communities and threatened species habitat under the NSW Biodiversity Assessment Method (BAM) for species that can be reliably predicted to occur with a plant community type (PCT). Ecosystem credits measure the loss in biodiversity value of the development and the gain in biodiversity value at an offset site.</p>
Ecosystem credit species	<p>Threatened species whose occurrence can generally be predicted by vegetation surrogates and/or landscape features, or that have a low probability of detection using targeted surveys. They do not require targeted surveys under the NSW BAM (DPIE 2020).</p>
Important habitat maps	<p>NSW Biodiversity Conservation and Science have defined, important habitat maps to identify areas that are considered important to support critical life stages of specific species including breeding areas or locations important for foraging or over-wintering for migratory species. In mapped areas the species is considered present.</p>

Terminology	Description
	Under the NSW Biodiversity Assessment Method (BAM), these species are dual credit species assessed for both species (important habitat map) and ecosystem credits (all other areas the species is likely to occur).
Key Biodiversity Area	Key Biodiversity Areas (KBA) are 'sites contributing significantly to the global persistence of biodiversity', in terrestrial, freshwater and marine ecosystems. The Global Standard for the Identification of Key Biodiversity Areas (IUCN 2016) sets out globally agreed criteria for the identification of KBAs worldwide.
NSW Box Gum Woodland CEEC	White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions – Critically Endangered Ecological Community listed under the BC Act.
Serious and irreversible impacts (NSW)	An impact of a development on threatened species and ecological communities listed under the BC Act that meet the criteria to be an entity at risk of serious and irreversible impact (SAIL) is determined in accordance with the principles prescribed in Section 6.7 of the Biodiversity Conservation Regulation 2017.
Species credit	The class of biodiversity credits created or required for the impact on species credit species.
Species credit species	Threatened species listed under the NSW BC Act for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence or components of their habitat. Species credit species are listed in the NSW Threatened Biodiversity Data Collection database. They require targeted surveys under the BAM (DPIE 2020a).

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1.0 General Information

1.1 Title of the Action

The title of the Proposed Action is the Liverpool Range Wind Farm (LRWF), description of the Proposed Action is provided below in **Section 2.1**.

1.2 The Proponent

The Proponent details for the Proposed Action are provided in **Table 1.1**.

Table 1.1 Proponent Details

Proponent Name	Tilt Renewables Australia Pty Ltd as trustee for the Liverpool Range Wind Farm Project Trust
Proponent Contact	Matt Stafford
Proponent Postal Address	PO Box 16080, Collins St West, Melbourne VIC 8007

The Proponent is Tilt Renewables Australia Pty Ltd (ACN 101 038 331) as trustee for the Liverpool Range Wind Farm Project Trust (the Trust). The Proponent and the Trust are entities within the Tilt Renewables group of companies, with the ultimate holding company being PARF Company 2 Pty Ltd (ACN 613 789 772).

1.3 Objectives of the Action

The Proposed Action aligns with the current strategic direction of the NSW and Australian energy generation market and assists in achieving the planned transition to an increased contribution of renewable energy to meet Australia’s energy needs.

The National Electricity Market (NEM) needs to rapidly transition to renewable energy to deliver the NSW Climate Change Policy Framework and NSW Government’s commitment set out in the NSW *Climate Change (Net Zero Future) Act 2023*, as well as the Commonwealth Government’s commitments under the Paris Agreement. At present, additional renewable energy capacity is being added to the NEM at a lower rate than what the Australian Energy Market Operator (AEMO) has identified as required to achieve the transition to renewable energy (Parkinson, 2023). The objective of the Proposed Action is to develop a 100 per cent emissions-free renewable energy generation facility of approximately 1,332 megawatts (MW), contributing to NSW’s transition away from its current reliance on carbon intensive fuels. The Proposed Action is predicted to make significant contributions to the shortfall in generation that will arise with the recent retirement of Liddell Power Station in NSW’s Hunter Valley (April 2023) and planned closure of Eraring Power Station in 2025.

The Proposed Action generally consists of refinements of the various component elements of the wind farm as outlined in the Referred Action and does not change the overall strategic context of the Approved Action or Referred Action.

The Proposed Action will provide approximately 550 full-time positions during construction over a four-year period and approximately 40 full-time staff during its operational life, thus providing increased employment opportunities in the local region.

The Proposed Action will result in a direct injection of approximately \$6 million per annum to the local community through direct payments to landholders, Voluntary Planning Agreement (VPA) contributions and other community benefit sharing initiatives to the local community.

To achieve this objective, the Proponent proposes to develop a wind farm that consists of up to 185 wind turbine generators and associated infrastructure, external transmission line, public road upgrades and temporary workforce accommodation. The Proponent intends to connect the Proposed Action into the Central-West Orana (CWO) Renewable Energy Zone (REZ) transmission line infrastructure currently being planned by Energy Corporation of NSW (EnergyCo). In the event the Proposed Action connects into this transmission line, the external transmission line that is currently part of the Proposed Action would no longer be required and all associated impacts would no longer apply.

A detailed description of the Proposed Action is provided in **Section 2.0**.

1.4 Location of the Action

The Proposed Action is located about 230 kilometres (km) north-west of Newcastle and 120 km east of Dubbo and extends across the Warrumbungle, Upper Hunter and Mid-Western local government area (LGA). The closest towns include Coolah, located about six kilometres to the west of the wind farm, and Cassilis, located approximately three kilometres to the east of the Proposed Action (refer to **Figure 1.1**).

The Proposed Action is located within, and forms a component of, the CWO REZ declared under the *Electricity Infrastructure Investment Act 2020* (NSW) (refer to **Figure 1.1**). More discussion of the CWO REZ is provided in **Section 1.6**.

1.5 Background to Development of the Action

The Approved Action is a large-scale renewable energy project, known as the Liverpool Range Wind Farm (LRWF) that is owned by and being developed by Tilt Renewables Australia Pty Ltd as trustee for Liverpool Range Wind Farm Project Trust (the Proponent). The Approved Action was approved by the Commonwealth Department of the Environment and Energy under Section 130(1) and 133 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in June 2018 (EPBC 2014/7136).

The Approved action (refer to **Figure 1.2**) is defined in the EPBC Approval as ‘to construct and operate a wind farm including up to 288 wind turbine generators, a 330 kV overhead powerline, electrical reticulation, connection substations, maintenance facilities and access tracks between Coolah and Cassilis, NSW, as described in EPBC referral 2014/7136’. The EPBC Approval was granted to Epuron Pty Ltd who were the original developers of this Action. On 2 May 2019 the EPBC Approval was transferred to Liverpool Range Wind Farm Project Trust.

The Approved Action is authorised under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) State Significant Development (SSD) Consent SSD-6696, granted on 27 March 2018 by a delegate of the Minister for Planning. At that time, the Approved Action was the largest approved wind farm in NSW with a proposed installed capacity of up to 960 megawatts that would contribute to both the Commonwealth Government's Renewable Energy Target and NSW's Renewable Energy Action Plan and was consistent with the NSW Government's vision for a secure, reliable, affordable and clean energy future for the state (DPE 2018). The NSW Department of Planning and Environment (DPE), in their assessment report, considered the site to be suitable for the Project, as it is located in a region with significant wind resources, with good access to electricity transmission infrastructure and relatively few environmental constraints (DPE 2018).

Since the wind farm was approved in March 2018, there have been significant advances in wind turbine technology. Since acquiring the Approved Action in 2019, the Proponent has undertaken a detailed layout review and design optimisation process to progress the Proposed Action towards construction. This has included:

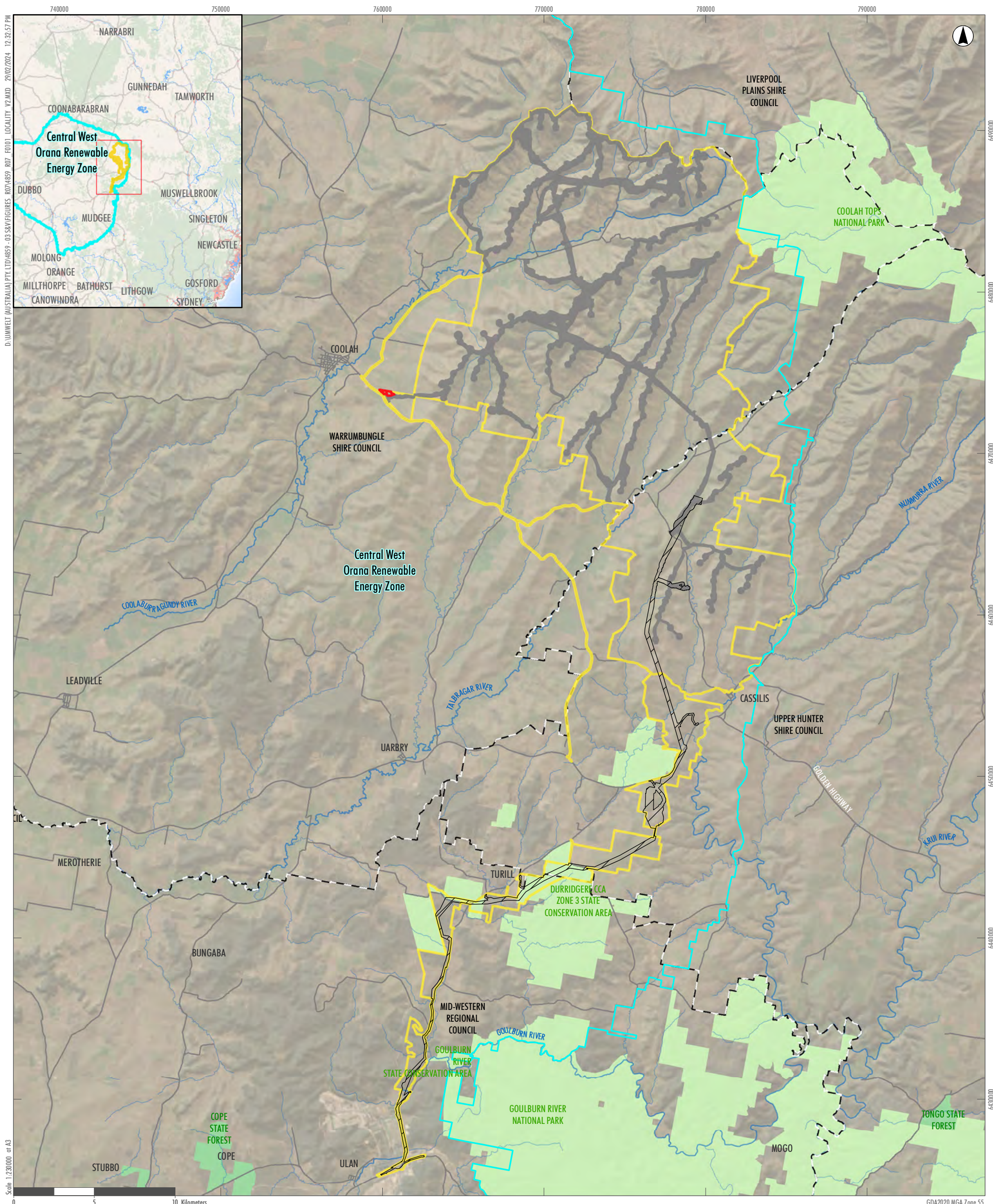
- Design review to make necessary refinements to the layout to enable the use of newer, more efficient and larger wind turbine technology. Key drivers for the layout changes were to ensure constructability, to avoid and minimise environmental impacts and the identification of more accurate estimates of the extent of required ground disturbance.
- Taking steps towards satisfying NSW pre-construction conditions of consent including updating baseline vegetation mapping, commencing collection of baseline data on threatened and at-risk bird and bat species, noise compliance, progressing biodiversity offsets, public road upgrades, neighbour agreements and Voluntary Planning Agreements (VPA) with Upper Hunter and Warrumbungle Shire Councils.
- Working with EnergyCo to progress the connection into the proposed Central-West Orana Renewable Energy Zone (CWO REZ) transmission line project, and to identify all required public road and infrastructure upgrades between the Port of Newcastle and the CWO REZ to facilitate over-size/over-mass loads.
- Entering into negotiations for procurement and offtake agreement contracts.
- Ongoing stakeholder engagement (Tilt Renewables 2022).

An application to modify the NSW Development Consent SSD-6696 (known as the NSW Mod-1 Application and/or the Referred Action) was pursued to take advantage of these technology changes and to reflect the findings of the layout review and design optimisation process, and in doing so provide greater certainty with regards to the constructability of the Project and associated potential environmental impacts. The application to modify the NSW Development Consent was submitted to the NSW DPE under Section 4.55(2) of the EP&A Act in September 2022 (NSW Mod-1 Application).

The Liverpool Range Wind Farm was referred to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) on 2 March 2023 (EPBC 2022/09416) under Part 7 of the EPBC Act. **Figure 1.3** shows the Referred Action as assessed in the EPBC Act referral.

The Minister determined on 30 March 2023 that the Liverpool Range Wind Farm was a Controlled Action, and that approval is required as the Referred Action has the potential to have a significant impact on Matters of National Environmental Significance (MNES). The Liverpool Range Wind Farm is to be assessed by PER.

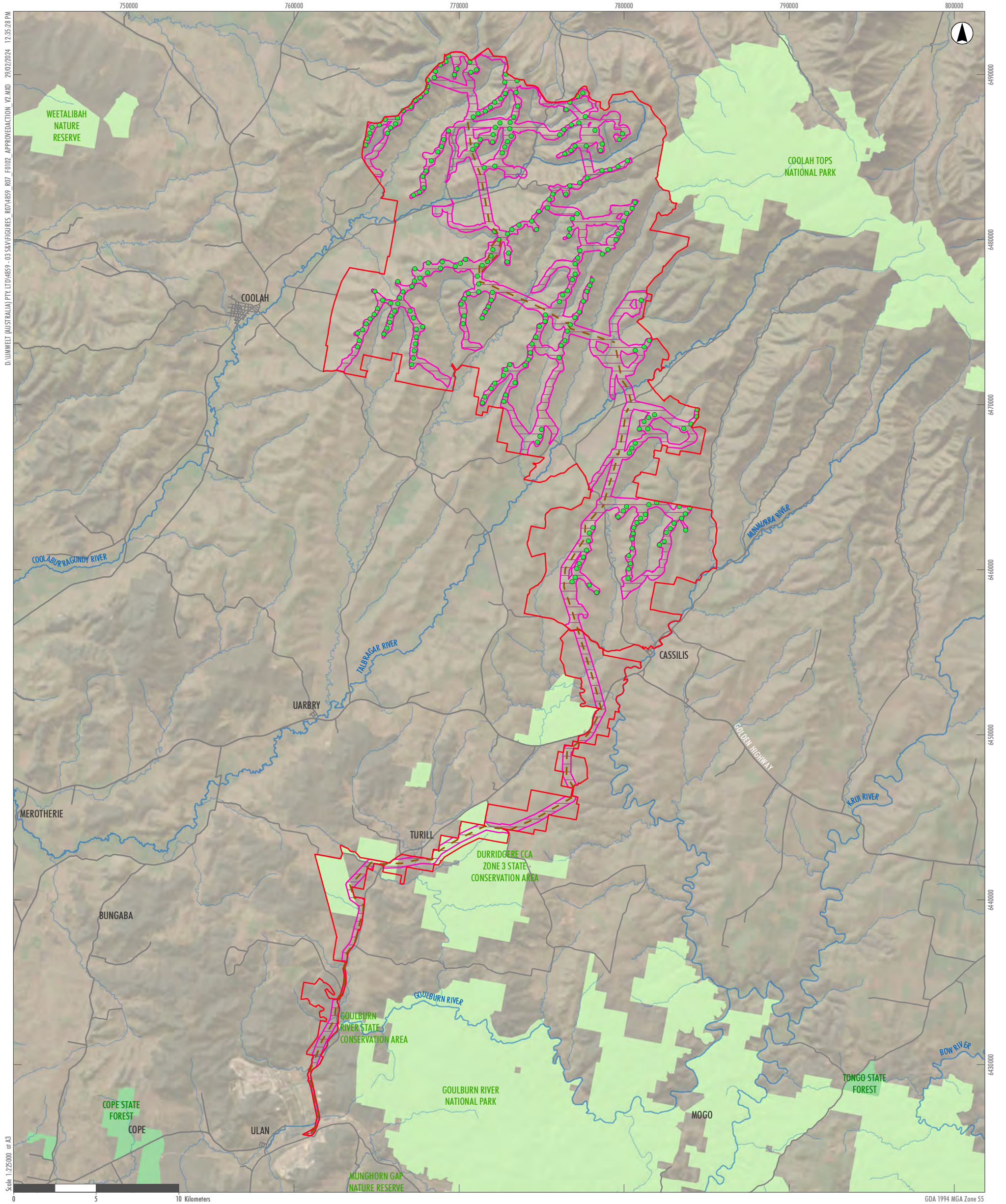
Since referral, the Referred Action has changed and is now assessed as the Proposed Action to modify proposed wind turbine parameters and to include a temporary workforce accommodation facility (TWA Facility) to facilitate the construction of the Liverpool Range Wind Farm. Variations from the Referred Action to the Proposed Action are discussed in detail in **Section 2.2** and include the reduction in the number of wind turbine generators from 220 to 185 and changes in the wind turbine design to lower the maximum blade tip height from 250 metres to 215 metres, lower the hub height and reduce the indicative rotor diameter. A letter has been prepared and submitted to the Commonwealth DCCEW on 23 January 2024 to notify them of the intent to vary the Referred Action to the Proposed Action as provided for under Section 156A of the EPBC Act. While the request to vary the Referred Action has not yet been determined, on 18 March 2024 Commonwealth DCCEW requested further information from the Proponent to support their assessment which is provided in **Section 4.2.7**.



Legend

- Proposed Action Area
- Central West Orana Renewable Energy Zone
- Development Corridor**
- Development Corridor - Wind Farm
- Local Government Boundary
- Development Corridor - TWA Facility
- Road
- Development Corridor - External Transmission Line
- Drainage Line
- National Parks (NPWS Estate)
- State Forest

FIGURE 1.1
Locality Plan



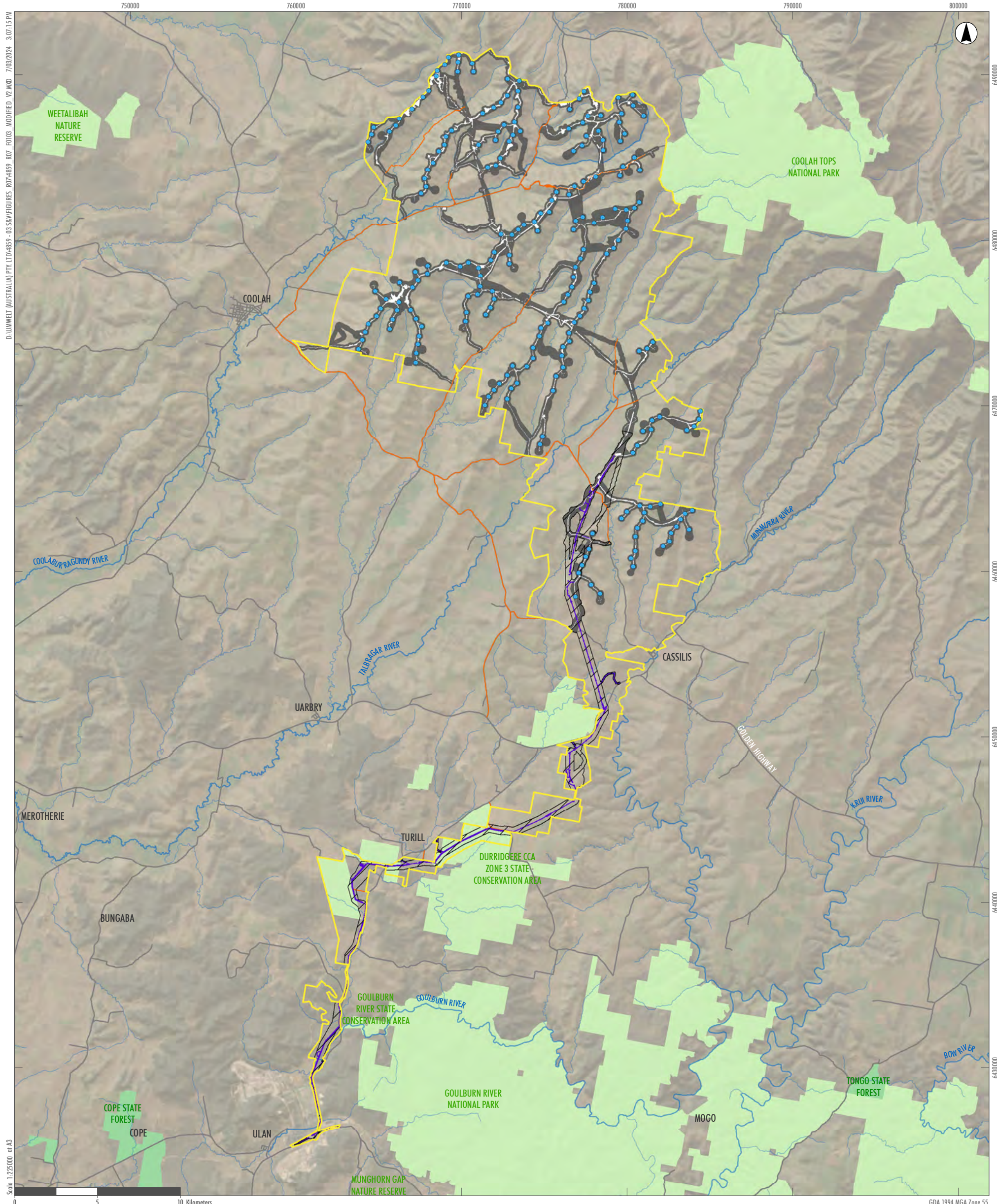
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- Legend**
- | | |
|-------------------------------|------------------------------|
| Approved Action Area | Road |
| Approved Development Corridor | Drainage Line |
| Approved Wind Turbines | National Parks (NPWS Estate) |
| Approved Transmission Lines | State Forest |

FIGURE 1.2

Liverpool Range Wind Farm - Approved Action

Image Source: ESRI Basemap (2021) Data source: NSW LPI (2021), NSW DSFI (2021); NPWS Estate (2019)



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GDA 1994 MGA Zone 55

Legend

- | | |
|---|--------------------------------|
| Referred Action | — Road |
| □ Referral Area | — Drainage Line |
| • Referred Wind Turbines | ■ National Parks (NPWS Estate) |
| Development Corridor | ■ State Forest |
| ■ Development Corridor – Wind Farm | |
| □ Development Corridor – External Transmission Line | |
| Indicative Development Footprints | |
| □ Indicative Development Footprint – Wind Farm | |
| ■ Indicative Development Footprint – External Transmission Line | |
| ■ Indicative Development Footprint – Public Road Upgrades | |

FIGURE 1.3

Liverpool Range Wind Farm - Referred Action (late 2022)

Image Source: ESRI Basemap (2021) Data source: NSW LPI (2021), NSW DSFI (2021); NPWS Estate (2019)

1.6 Related Actions

1.6.1 LRWF Project-Specific Quarry

Following more detailed design work completed since referral of the Referred Action, there is now much more certainty on the extent of public road upgrades/ repairs and bulk earthworks and the associated rock, gravel, and sand quantities required to construct the Proposed Action. Substantial volumes of suitable rock, gravel and sand will be required during construction of the wind farm.

The Proponent has identified an opportunity to establish a temporary project-specific hard rock quarry (Temporary Quarry) for the sole purpose of producing and supplying quarry products to support the construction of the Proposed Action. Australian Resource Development Group Pty Limited (ARDG) has been engaged to assist with the development of the quarry and will submit a separate referral under the EPBC Act for this component of the Proposed Action. The Temporary Quarry will therefore be subject to a separate assessment process under the EPBC Act, and is not considered in detail in this PER. An application for approval of the Liverpool Range Quarry (SSD-68063715) by NSW Department of Planning, Housing and Infrastructure (DPHI) has commenced and request for the NSW Secretary's Environmental Assessment Requirements (SEARs) has been made in February 2024. However, cumulative impacts and benefits associated with the use of the Temporary Quarry have been considered in **Section 4.5.1**.

1.6.2 Other Projects within the CWO REZ

The Proposed Action is an approved renewable energy project located within the CWO REZ. EnergyCo is the NSW statutory authority appointed as the Infrastructure Planner responsible for the coordination of the development of generation and network infrastructure. ACERREZ, a consortium comprised of ACCIONA, Cobra and Endeavour Energy, has been confirmed as the preferred Network Operator to deliver and operate the new transmission network for the CWO REZ. The New South Wales Government approved EnergyCo entering a Commitment Deed with ACERREZ. Subject to regulatory and planning approvals ACERREZ will design, build, finance, operate and maintain the CWO REZ transmission network for the next 35 years. This includes new high-capacity overhead transmission lines, energy hubs and related infrastructure.

The CWO REZ covers about 20,000 square kilometres centred on the regional towns of Dubbo and Dunedoo, extending west to Narromine, to the south-east beyond Mudgee, north-east to Cassilis, south of Wellington and north to Gilgandra. A number of renewable energy projects are proposed, approved or under construction within the CWO REZ. EnergyCo has been working closely with 11 Candidate Foundation Generators to plan their proposed connection to the CWO REZ Transmission Line (EnergyCo 2023a). The CWO REZ declaration includes an initial intended network capacity of three gigawatts with a draft declaration to increase this to six gigawatts out for public comment in the third quarter of 2023.

The Candidate Foundation Generators are listed in **Table 1.2** together with a summary of the approval status of each of the related Actions. These proposals are considered related Actions in that they are being taken, or have been approved, in the region affected by this Action, as part of the CWO REZ.

Table 1.2 Candidate Foundation Generators Project Status

Proposed Projects in CWO REZ	EPBC Referral	NSW Approval	Assessment Status
Candidate Foundation Generators in CWO REZ			
Spicers Creek Wind Farm	2022/09387	SSD 41134610	Controlled action. Bilateral agreement applies. EIS public exhibition closed 24 August 2023. Submissions report Provided 6 December 2023. Currently in assessment phase.
Cobbora Solar Farm	2022/09269	SSD 29491142	Controlled action. Bilateral agreement applies. Currently in assessment phase. Preparing Environmental Impact Statement (EIS).
Sandy Creek Solar Farm	Unknown	SSD 41287735	Preparing EIS for NSW approval.
Dapper Solar Farm	Unknown	SSD 52217961	In development, preparing EIS for NSW approval.
Orana Wind Farm	Unknown	SSD 58260958	In development, preparing EIS for NSW approval.
Tallawang Solar Farm	2022/9171	SSD 23700028	Controlled action. Bilateral agreement applies. EIS public exhibition closed 24 November 2022. Currently in assessment phase EPBC and Response to Submissions for NSW approval.
Birriwa Solar Farm and Battery Energy Storage System	Unknown	SSD 29508870	EIS public exhibition closed 19 October 2023. Submission report provided 28 September 2023. Currently in Assessment phase.
Barneys Reef Wind Farm	2022/09358	SSD 24106966	Controlled action. Bilateral agreement applies. Currently in assessment phase. Preparing EIS.
Stubbo Solar Farm	2022/9180	SSD 10452	Not a controlled action (determined 13 May 2022). NSW approval determined 29 June 2021.
		SSD 10452 Mod 1	NSW Modification 1 Access Road Realignment – currently in assessment phase.
Valley of the Winds Wind Farm	2020/8668	SSD 10461	Assessment phase. Bilateral agreement applies. EIS public exhibition closed 20 June 2022. Currently back in the assessment phase after Completion of the response to submissions phase.
Liverpool Range Wind Farm	2022/09416	SSD 6696	SSD 6696 approved 27 March 2018 Controlled action, approved.
		SSD 6696 Mod 1	EIS public exhibition closed 17 October 2022. Submissions Report provided 14 August 2023. Currently in Assessment Phase in NSW.
CWO REZ transmission projects			
CWO REZ Transmission Line Project	2022/09353	SSI 48323210	Controlled action. Bilateral agreement applies. Currently in assessment phase for EPBC. EIS public exhibition to close 8 November 2023. Currently responding to Submissions phase for NSW approval.

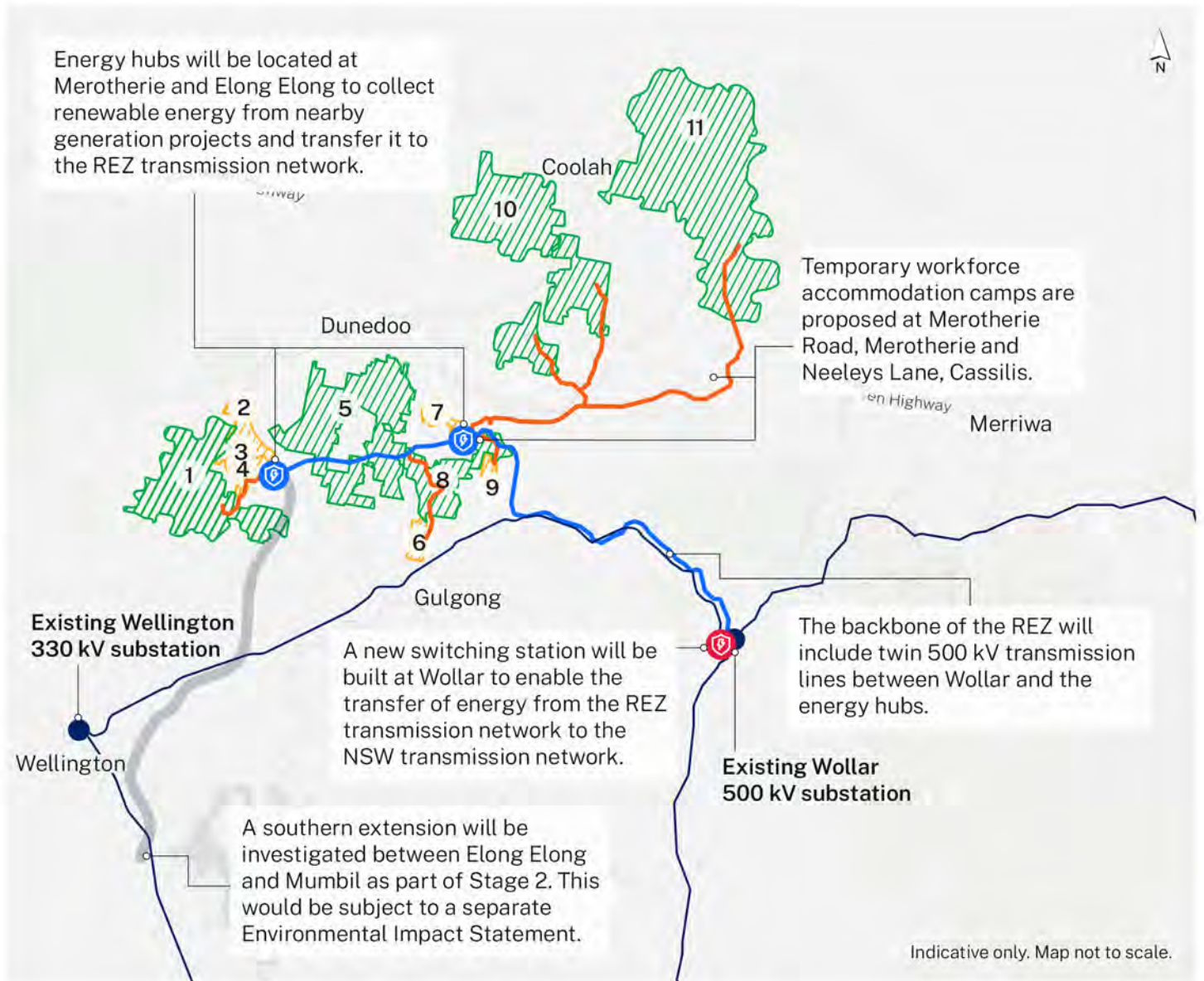
Proposed Projects in CWO REZ	EPBC Referral	NSW Approval	Assessment Status
CWO REZ Transmission – Wollar Substation Upgrade Project	2021/9055	SSI 27741480	Controlled action. State application withdrawn as this Project is now being assessed as a component of CWO REZ Transmission project.

The location of CWO REZ and related Candidate Foundation Generators relative to the Proposed Action are shown in **Figure 1.4**.

The CWO REZ Transmission Line project was declared Critical State Significant Infrastructure (CSSI) under Section 5.13 of the NSW EP&A ACT on the 23 November 2020 and was declared as a controlled action under the EPBC Act (EPBC 2022/09353) to be assessed in accordance with the NSW Bilateral Agreement under Part 9 of the EPBC Act. The CWO REZ Transmission Line project includes:

- A new Wollar switching station.
- Construction and operation of about 90 km of twin double circuit 500 kV transmission lines to connect the energy hubs to the existing NSW transmission network via the new Wollar switching station.
- Energy hubs (substations, may include battery storage) at Merotherie and Elong Elong, to transform power collected from renewable energy generation projects to the 500 kV network infrastructure.
- About 150 km of 330 kV transmission lines, to connect the renewable energy generation projects to the CWO REZ energy hubs.
- Switching stations along the 330 kV network.
- Ancillary facilities, utility adjustments, property adjustments and new and upgraded access tracks (EnergyCo 2023b).

REZ transmission project study area – Stage 1



Legend

- 330 kV transmission corridor
- 500 kV transmission corridor
- ⊕ Energy hub sites
- ⊕ New Wollar switching station site
- Existing substations
- ▨ Planned wind project
- ▨ Planned solar project
- Potential southern extension (Stage 2)
- Existing NSW transmission network

Candidate Foundation Generator projects with proposed connections to the REZ network

- | | |
|--|---|
| 1. Spicers Creek Wind Farm (Squadron Energy) | 6. Tallawang Solar Farm (RES) |
| 2. Cobbora Solar Farm (Marble Energy) | 7. Birriwa Solar Farm and BESS (ACEN Australia) |
| 3. Sandy Creek Solar Farm (Lightsource BP) | 8. Barneys Reef Wind Farm (RES) |
| 4. Dapper Solar Farm (Origin Energy) | 9. Narragamba Solar Farm (ACEN Australia) |
| 5. Orana Wind Farm (Acciona Energia) | 10. Valley of the Winds (ACEN Australia) |
| | 11. Liverpool Range Wind Farm (Tilt Renewables) |

Renewable energy generation projects are shown for information purposes only. The projects identified may not proceed or connect to the REZ transmission network, while other projects not shown may proceed and be connected on a merit basis. Projects will require individual planning approvals and access rights to the new transmission line before any work starts.

Figure 1.4 CWO REZ Transmission Line Project

Source EnergyCo (2023c).

The CWO REZ Transmission Line project includes a 330 kV transmission line between Merotherie Energy Hub and the LRWF project and the Valley of the Winds project (EnergyCo 2023b).

At present, the Proposed Action proposes to use the CWO REZ Transmission Line to connect into the national electricity grid. Assuming that connection into the CWO REZ Transmission Line is possible, the External Transmission Line connection down to Ulan, which forms part of the Proposed Action, would no longer be required and all impacts associated with the External Transmission Line would be avoided. However, given that the CWO REZ Transmission Line is yet to be approved, and while contracts and program scheduling are being negotiated between the Proponent and EnergyCo, the External Transmission Line remains part of the Proposed Action to ensure that the wind farm can still connect to the national electricity grid in the unlikely event that the delivery timeframes for the CWO REZ Transmission Line project do not align.

EnergyCo, on behalf of the proponents for the generation projects, is carrying out transport studies in consultation with Transport for NSW (TfNSW) to identify and coordinate road upgrades required for the over-size and over-mass (OSOM) haulage route between the Port of Newcastle and the CWO REZ (EnergyCo 2023d). The OSOM haulage route follows the state road network including sections of the New England Highway, Golden Highway and Castlereagh Highway. EnergyCo is responsible for the environmental assessment and upgrade of the road along the haulage route from the Port of Newcastle to Cassilis. Each generator will be responsible for planning and implementing the necessary OSOM vehicle movements and upgrades of local roads within their project areas (EnergyCo 2023d).

1.7 Current Status

As described above in **Section 1.5**, the Approved Action is a renewable energy project located within the CWO REZ. The project as originally designed (the Approved Action) was approved by the Commonwealth Department of the Environment and Energy under Section 130(1) and 133 of the EPBC Act in June 2018 (EPBC 2014/7136).

With modifications to the design and layout of the Approved Action, the Liverpool Range Wind Farm was referred to DCCEEW on 2 March 2023 (EPBC 2022/09416) under Part 7 of the EPBC Act (Referred Action). The Minister determined on 30 March 2023 that approval is required as the Referred Action has potential to have a significant impact on the following MNES, protected under Part 3 of the EPBC Act:

- listed threatened species and communities (section 18 and section 18A)
- listed migratory species (section 20 and section 20A).

On the same date, the delegate of the Minister determined that the Referred Action be assessed by a PER. Draft Guidelines for the PER were developed by DCCEEW and issued for public comment on 11 April 2023. Final PER Guidelines for the assessment process were issued by DCCEEW on 31 July 2023. The guidelines are provided in full in **Appendix A**.

Umwelt has been engaged by the Proponent to prepare the PER. This PER contains information about the Proposed Action and its relevant impacts in accordance with the Final PER Guidelines, enabling stakeholders and the Minister to understand the environmental consequences of the Proposed Action relevant to the MNES.

Assessment of the Proposed Action by PER under the EPBC Act is being undertaken separately to the NSW Mod-1 Application assessment process. The NSW assessment process for SSD-6696 Mod-1 is currently at the assessment phase with the Response to Submissions Report for the second amendment to the application currently being prepared.

Subject to timely approvals and commercial agreements, construction of the Proposed Action is expected to commence in second quarter of 2025. The construction phase is expected to last for a period of four years.

1.8 Consequences of Not Proceeding with the Action

The Proposed Action is aligned with the strategic direction of the NSW and Australian energy generation market and will assist in achieving the planned transition to an increased contribution of renewable energy to meet Australia's energy needs. The Proposed Action is one of the Candidate Foundation Generator projects within the declared CWO REZ and transmission line connection to the Proposed Action has been included in the design of the CWO REZ network (EnergyCo 2023b, 2023c). If this Proposed Action or the Approved Action were not to proceed, the development of a replacement project would likely result in delays in delivery of renewable energy from the CWO REZ.

The Approved Action is not feasible to construct and would have greater impacts on the community and environment than the Proposed Action and would therefore not likely proceed in the event that the Proposed Action is not approved. The Proposed Action would provide 550 full-time equivalent (FTE) positions during construction and approximately 40 during operation, approximately \$80 million of added value over the construction period for the Warrumbungle, Upper Hunter and Mid-Western Regional Local Government Areas and 1,332 MW capacity energy generation for the NSW and Australian energy markets, contributing to Australia's move towards increased renewable energy. If a replacement project were to be proposed and assessed, the energy market and community would lose the potential benefits of the Proposed Action and be burdened with ongoing design and assessment processes.

Not proceeding with the Approved Action or the Proposed Action would also mean that the adverse impacts outlined in **Section 4.0** and **Section 5.0** of this report to not occur.

The consequences of not proceeding with the Proposed Action are considered further in **Section 2.5.1**.

1.9 Structure of this PER

The PER is structured in accordance with Schedule 4 of the Environment Protection and Biodiversity Conservation Regulations 2000 and the PER Guidelines issued by DCCEEW for the Proposed Action (refer to **Appendix A**), as follows:

- **Chapter 1.0** provides general information and background of the Proposed Action.
- **Chapter 2.0** describes the Proposed Action, including precise location of any works/components, planned timing and activities to be undertaken during each stage (construction, operation and decommissioning), safeguards and mitigation measures. A description of feasible alternatives of the Proposed Action is also provided in **Section 2.5**.

- **Chapter 3.0** provides:
 - description of the existing environmental values of the site and adjacent areas that may be affected by the Proposed Action
 - description of the ecological investigations including desktop and field studies undertaken to determine the likely presence and/or habitat characteristics for each of the relevant MNES
 - description of the vegetation and habitats
 - description of the MNES that are likely to be present including an assessment of the presence of individuals, assessment of suitable habitat within and adjacent to the site, information on surveys targeting the MNES and survey results.
- **Chapter 4.0** describes the direct and indirect impacts of the Proposed Action associated with construction (refer to **Section 4.1**), operation (refer to **Section 4.3**), decommissioning (refer to **Section 4.1** and cumulative impacts (refer to **Section 4.5**).
- **Chapter 5.0** includes an assessment of the impacts of the Proposed Action:
 - on MNES (refer to **Section 5.3**, **Section 5.4**, **Section 5.5** and **Section 5.6**) including consideration of the significant impact assessment guidelines
 - on migratory bird and bat species associated with wind turbines (refer to **Section 5.7**).
- **Chapter 6.0** describes the measures to avoid, mitigate and manage impacts of the Proposed Action on biodiversity values and MNES. It includes an outline of the management plans to be prepared and implemented for the Proposed Action.
- **Chapter 7.0** describes rehabilitation requirements including restoration of habitat and a summary of monitoring programs.
- **Chapter 8.0** summarises the residual impacts of the Proposed Action on MNES and the environmental offset requirements.
- Additional information provided includes:
 - other approvals and conditions that apply, are or reasonably believed likely to apply (refer to **Chapter 9.0**)
 - summary of consultation completed for the Proposed Action (refer to **Chapter 10.0**)
 - details of the environmental record of the proponent (refer to **Chapter 11.0**)
 - a summary of economic and social matters (refer to **Chapter 12.0**)
 - a conclusion (refer to **Chapter 13.0**)
 - list of information sources (refer to **Chapter 14.0**).

A checklist demonstrating where the PER Guidelines have been addressed in this report is provided in **Appendix A**.

2.0 Description of the Action

2.1 Proposed Action

The Proposed Action will include construction, operation and decommissioning activities associated with the following key components:

- **Wind Turbines:** up to 185 wind turbines with a maximum blade tip height of 215 metres, including an adjacent hardstand area for lift cranes and a material laydown.
- **Collector Substations:** approximately seven collection substations that step-up the voltage of the reticulation cabling (typically 33 kV) to the transmission line voltage (anticipated to be 330 kV). The collector substations are comprised of multiple components including transformers, circuit breakers, bus bars, and gantries, and are anticipated to occupy a 3D envelope approximately 70 m long x 60 m wide x 9 m high. The steel gantries that support the incoming/outgoing power lines are anticipated to be approximately 25 m high.

In the event the Proposed Action connects into the CWO REZ transmission line the southern on site collector substation located off Rotherwood Road, Cassilis will convert to a connection substation, and the external transmission line to Ulan and associated connection substation/switching station at Ulan would no longer be required.

- **Connection Substation (also referred to as switching station):** a single 330 kV connection substation located at the southern end of the Proposed Action Area at Ulan, to facilitate connection into the existing Transgrid 330 kV Wellington – Wollar transmission line. Similar to substations, switching stations typically contain bus bars, circuit breakers and steel gantries. The switching station is anticipated to occupy a 3D envelope approximately 150 m long x 100 m wide x 9 m high. Steel gantries that support the power lines are anticipated to be approximately 25 m high.
In the event the Proposed Action connects into the CWO REZ transmission line the external transmission line to Ulan and associated connection substation/switching station at Ulan would no longer be required.
- **Internal Transmission Line:** overhead powerline of up to 330 kV, supported by poles or towers and located within a 60 m wide easement, that extends from the north-west of the Development Corridor to the southern-most collector substation proposed near Rotherwood Road, Cassilis. The supporting poles are anticipated to be of a steel construction with an indicative height of approximately 30-50 m, generally located at intervals of approximately 300 m wherever practicable. Steel towers may need to be used, particularly in complex terrain, as they allow for longer spans and reduced number of supporting structures. Steel poles and towers are anticipated to have an indicative height of approximately 40–50 m.
- **External Transmission Line:** overhead transmission line of up to 330 kV, supported by poles or towers and located within a 60 m wide easement, that extends from the southern-most collector substation proposed near Rotherwood Road, Cassilis, south to the approved point of connection to the existing infrastructure at Ulan. The anticipated tower or pole design is as described above for the Internal Transmission Line.

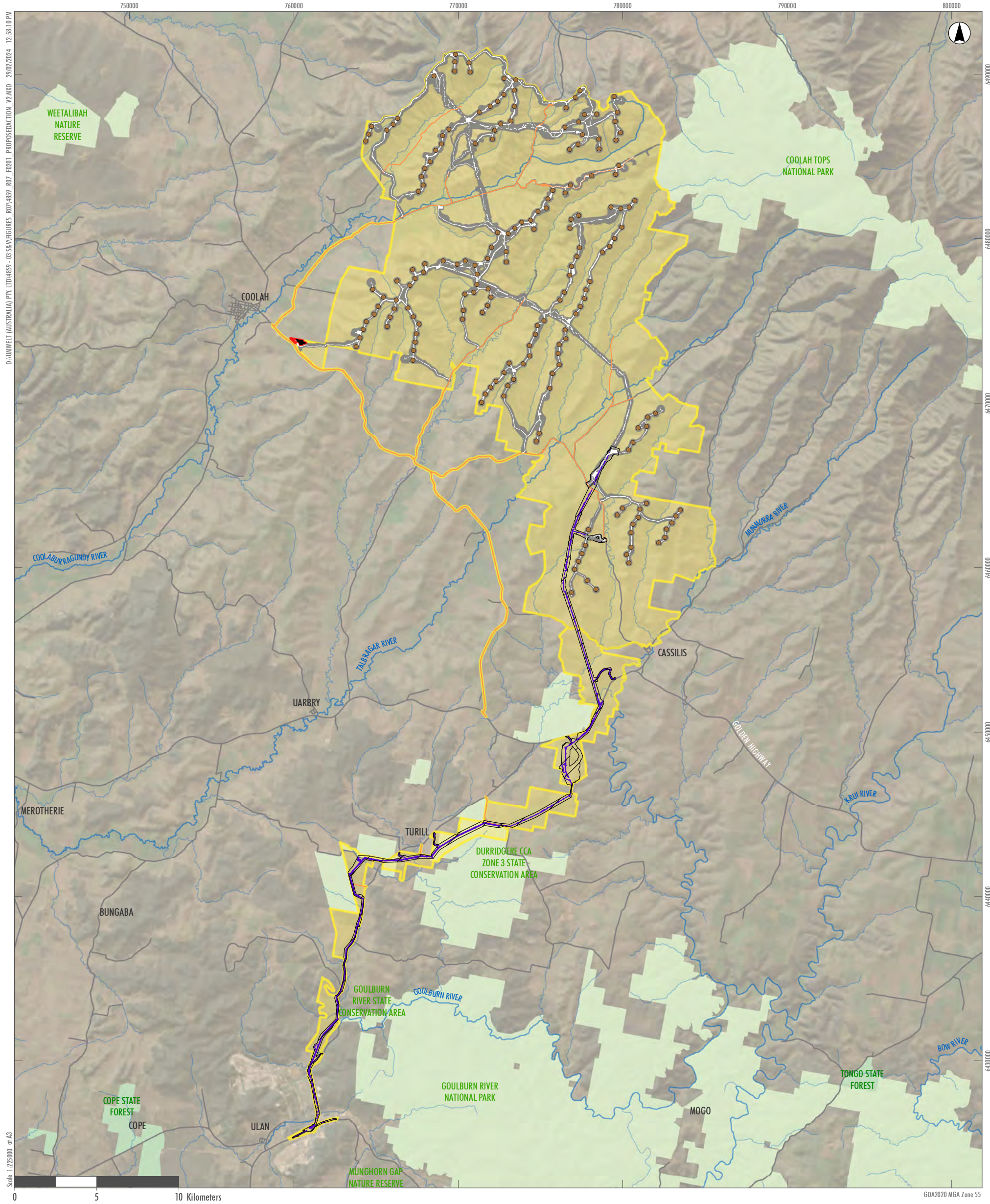
Approval is also being sought to connect the Proposed Action into the CWO REZ transmission line (and remove the external transmission line connection to Ulan) in circumstances where the delivery timeframe for the CWO REZ transmission line aligns with the Proposed Action.

- **Reticulation cabling:** underground electrical reticulation cabling, and potentially some overhead powerlines, that provide an electrical connection between the wind turbines and the collector substations. Reticulation cabling is typically rated at 33 kV. Typically, underground reticulation cabling is buried in one or more trenches adjacent to access track batters.
- **Access Tracks:** access tracks, typically with a trafficable width of 5.5-6 m, to provide access from the public road network to wind farm and transmission line infrastructure and meteorological masts and include required cut/fill batters and drainage infrastructure.
- **Site Access Points (SAP):** provision of the following site access points off public roads:
 - up to 34 SAPs from nearby public roads to facilitate construction and ongoing maintenance of the wind farm components located north of the Golden Highway
 - up to 40 SAPs from nearby public roads to facilitate construction and ongoing maintenance of the proposed External Transmission Line located south of the Golden Highway.
- **Operation and Maintenance (O&M) Facilities:** approximately three O&M facilities incorporating a control room, maintenance and equipment storage facilities. The O&M facility is used to store spare parts and other equipment used for ongoing maintenance of the wind farm, as well as Supervisory Control and Data Acquisition (SCADA) equipment to monitor and control the electrical performance of the wind farm. The O&M facility is anticipated to occupy a 3D envelope approximately 45 m long x 30 m wide x 15 m high.
- **Temporary Construction Compound/Laydown Area/Concrete Batch Plants:** Approximately 10 temporary construction facilities, including temporary concrete batching plants, rock crushing equipment, temporary laydown facilities, and construction compounds, of which nine are located within the Wind Farm Site and one located off Cliffdale Road, Turill within the External Transmission Line Site.
- **Temporary Workforce Accommodation Facility (TWA Facility):** an ancillary project-specific TWA Facility to accommodate a peak of approximately 550 construction staff over a four-year period. The TWA Facility would be approximately 9 ha in area and would be comprised of prefabricated accommodation building modules, kitchen and dining facilities, administrative and maintenance buildings, recreational facilities and wastewater treatment facilities. Upon completion of construction of the Proposed Action, the TWA Facility will be decommissioned and the site rehabilitated in accordance with the relevant landholder's requirements.
- **Public Road Upgrades/Repairs:** upgrades/repairs to the relevant public roads, intersections and associated structures, in proximity to the Proposed Action required for construction and delivery, installation and maintenance of wind turbines, transmission lines, and related infrastructure, in accordance with upgrade/repair standards as agreed with relevant roads authorities.
- **Permanent Wind Monitoring Masts (Met Masts):** approximately 10 permanent Power Curve Validation (PCV) met masts to the final hub height, and associated access tracks.

- **Temporary Site Calibration Met Masts:** approximately 10 temporary site calibration met masts to the final hub height, to be located at a subset of the turbine locations and removed prior to erection of each relevant turbine.
- **Subdivision of Land:** subdivision of land within the Proposed Action Area to create new separate lots for the connection and collector substations and associated ancillary facilities.

An overview of the layout of the Proposed Action is shown in **Figure 2.1**. The proposed coordinates for the proposed wind turbines are provided in **Appendix B**.

As described further in **Section 2.2**, the Proposed Action has been changed since the referral and now includes an ancillary TWA Facility within the Development Corridor. The TWA Facility is required for the period of construction (Umwelt 2024). More details are provided about the TWA Facility in **Section 2.2.2**.



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GDA2020 MGA Zone 55

Legend

- | | | |
|---|---|------------------------------|
| Proposed Action Area | Indicative Development Footprints | National Parks (NPWS Estate) |
| Wind Turbines | Indicative Development Footprint - Wind Farm | State Forest |
| Development Corridor | Indicative Development Footprint - TWA Facility | Road |
| Development Corridor - Wind Farm | Indicative Development Footprint - External Transmission Line | Drainage Line |
| Development Corridor - TWA Facility | Indicative Development Footprint - Public Road Upgrades | |
| Development Corridor - External Transmission Line | | |

FIGURE 2.1

Liverpool Range Wind Farm - Proposed Action

2.1.1 Development Corridors

The Development Corridor, for the Proposed Action, is approximately 8,734.4 ha in area and is the corridor within which all proposed infrastructure will be located, and micro-siting of infrastructure can occur. The Development Corridor has been created to allow for some flexibility during construction and to allow minor changes to the location of infrastructure (otherwise known as micro-siting). Importantly, the Development Corridor does not represent the area of ground disturbance, it is representative of the area in which ground disturbance can occur. The Development Corridor has been divided into three distinct, and partially overlapping areas, as follows:

- Development Corridor – Wind Farm (7,323.9 ha): this portion of the Development Corridor includes all wind farm related infrastructure including the portion of the internal transmission line north of the on-site collector substation located near Rotherwood Road. This portion of the Development Corridor wholly contains the wind farm indicative development footprint (discussed further below).
- Development Corridor – TWA Facility (14.6 ha): this portion of the Development Corridor is located adjacent to the Development Corridor – Wind Farm and includes the TWA Facility infrastructure.
- Development Corridor – External Transmission Line (1,540.5 ha): this portion of the Development Corridor includes all infrastructure related to the portion of the transmission line between the on-site collector substation located near Rotherwood Road and the approved point of connection to the existing network infrastructure at Ulan. This portion of the Development Corridor wholly contains the external transmission line indicative development footprint (discussed further below).

Note: the combined area exceeds 8,734.4 ha due to partial overlap (144.6 ha) of the Development Corridor – Wind Farm and Development Corridor – External Transmission Line. This overlapping section has been allocated to the Wind Farm Development Corridor in the PER and the NSW Biodiversity Development Assessment Report (BDAR) (Umwelt 2023a).

Throughout this report the term Development Corridor refers to all three Development Corridors, unless otherwise stated.

The Development Corridor assessed in this PER and the BDAR prepared in the Submissions phase of the NSW assessment process, is broadly consistent to that of the Approved Action (Umwelt 2023a). Proposed changes to the Approved Development Corridor have been made in response to the revised indicative design, to limit disturbance to particular biodiversity values and allow for avoidance of areas of sensitivity.

The Development Corridor was surveyed in accordance with the NSW Biodiversity Assessment Methodology (BAM) (DPIE 2020a) in relation to the collection of Vegetation Integrity plots, however targeted species credit surveys were limited to areas that were not surveyed by NGH (2013a, 2013b and 2017) as part of the Approved Development Corridor, or where the vegetation, habitat and/or condition was not consistent with the biodiversity values previously identified in the Approved Development Corridor. This approach is consistent with discussions with DPIE (30 January 2020) and BCS (13 February 2020).

Given public road alignments are generally fixed and thus there are limited opportunities to micro-site them, the Indicative Development Footprint – Public Road Upgrades (refer to **Table 2.1**) is not governed by the Development Corridor and therefore extends beyond it in most locations.

2.1.2 Indicative Development Footprint

Indicative Development Footprints represent the ground disturbance and vegetation removal (native and exotic) associated with all relevant temporary and permanent infrastructure and public road upgrades.

The total Indicative Development Footprint of the Proposed Action is estimated to be approximately 1,803 ha. The components of the Indicative Development Footprint are provided in **Table 2.1**. While the TWA Facility is provided separately in **Table 2.1** this new component is an ancillary facility for the Wind Farm.

Table 2.1 Indicative Development Footprint components and areas

Indicative Development Footprint Components	Description	Area (Ha)
Wind Farm	<p>The total indicative area of <u>temporary and permanent</u> ground disturbance associated with permanent and temporary infrastructure within the Wind Farm, including:</p> <ul style="list-style-type: none"> • Wind turbine hardstands. • Internal access tracks (preferred options only). • Internal transmission line easement: <ul style="list-style-type: none"> ○ Internal access tracks, pole/tower locations, string pads. ○ Clearance of trees with heights above 4 m at full maturity within the 60 m wide easement. Where no vegetation clearance is required, those areas are excluded. • 9 x indicative locations for temporary construction compounds, laydown areas, and concrete batch plants. • All 3 x locations for permanent Operations & Maintenance (O&M) facility. • 10 x indicative locations for permanent met masts. • 7 x indicative locations for collector substations. 	1,364.9
External Transmission Line	<p>The total indicative area of <u>temporary and permanent</u> ground disturbance associated with the external transmission line:</p> <ul style="list-style-type: none"> • External transmission line easement (preferred options only): <ul style="list-style-type: none"> ○ Internal access tracks, pole/tower locations, string pads. ○ Clearance of trees with heights above 4 m at full maturity within the approximately 60 m wide easement. Where no vegetation clearance is required, those areas are excluded. ○ Access tracks into easement from nearby public roads. • Potential strengthening works to TransGrid infrastructure at Ulan. • Indicative temporary construction compound/laydown area/concrete batch plant location near Cliffdale Road. 	244.4
Public Road Upgrade	<p>The total indicative area of <u>temporary and permanent</u> ground disturbance associated with the anticipated upgrades to public roads proposed to be used by the Proposed Action, to the standards agreed with relevant councils.</p>	184.7
Subtotal (ha)		1794.0

Indicative Development Footprint Components	Description	Area (Ha)
TWA Facility	Total indicative <u>temporary</u> ground disturbance associated with the TWA Facility. Required for period of construction (refer to Section 2.2.2).	9
Total (ha)		1,803

The assessment in the PER and in the BDAR (Umwelt 2023a) focus on the Indicative Development Footprints, however consideration of biodiversity values and surveys completed have considered the wider Development Corridor. Due to the nature of wind farm projects, whereby their impact footprints are finalised at such late stages, understanding the values in surrounding land is essential to facilitating avoidance and minimisation measures through refinement and finalisation of the development footprints. Thus, where relevant to do so, the ecological assessment presents and discusses the extent of survey work, GIS Mapping and data analysis completed within the Development Corridor.

Given public road alignments are generally fixed and thus there are limited opportunities to micro-site them, the Indicative Development Footprint – Public Road Upgrades is not governed by the Development Corridor and extends beyond it in most locations.

2.1.2.1 Delineation of Indicative Development Footprints

Indicative Development Footprints for the Proposed Action have been developed in an iterative manner whereby preliminary layouts were modelled with consideration of known environmental constraints, were further assessed for environmental impacts, and then further refinements made considering the preliminary environmental assessments and feedback from key stakeholders.

The refined Indicative Development Footprints have been developed for all proposed infrastructure and anticipated road upgrades using 3D terrain modelling and civil engineering design software. The 3D terrain modelling provides an accurate representation of the areas required for construction including turbine hardstands, crane pads, laydown areas for blades and to accurately estimate the extent of cut and fill associated with these areas. **Figure 2.2** provides an example of the 3D terrain modelling outputs, showing the extent of earthworks including cut and fill along a section of Internal access track within the Proposed Action Area.

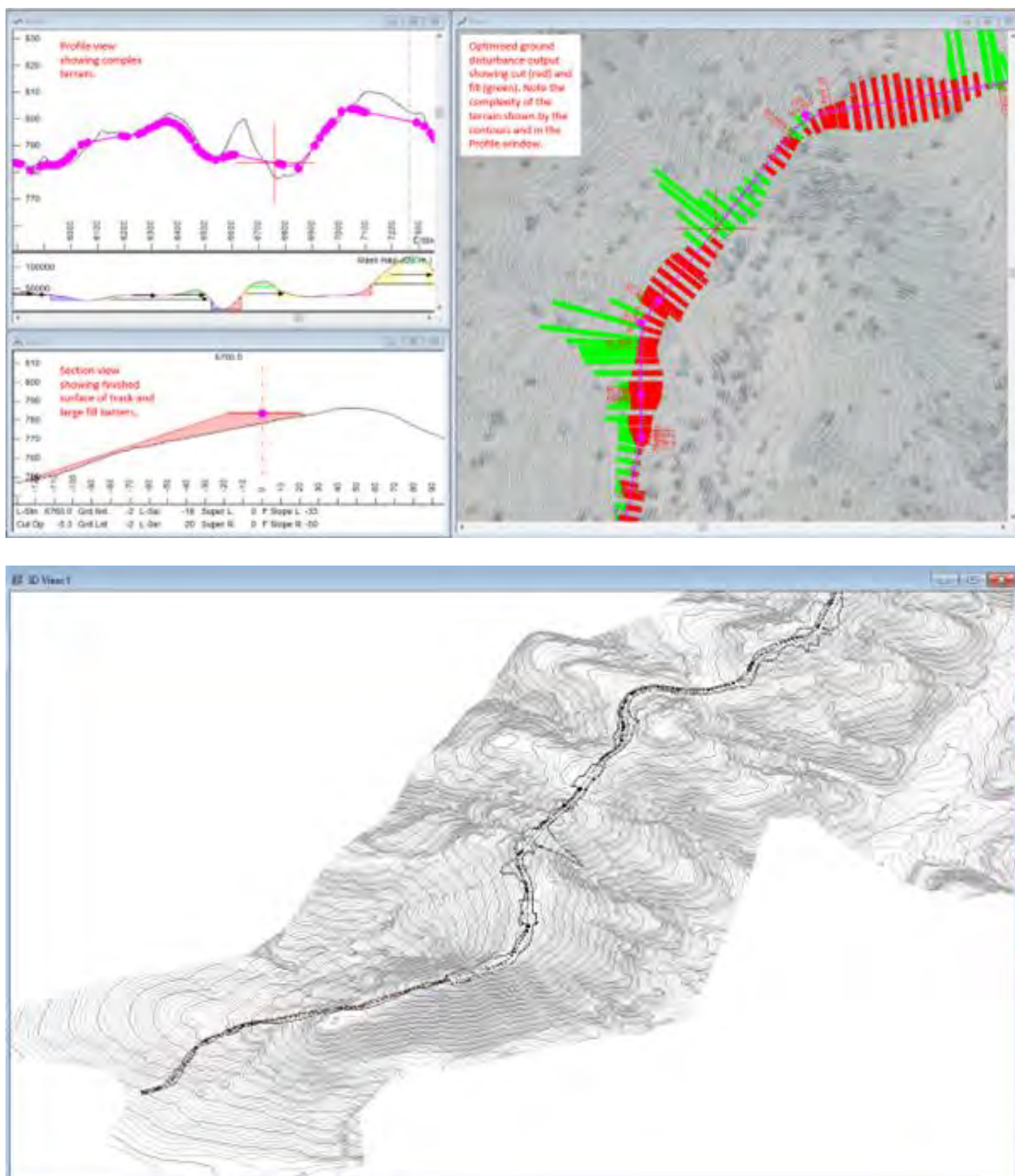


Figure 2.2 3D terrain modelling outputs used to delineate areas for Indicative Development Footprints

2.2 Changes to the Action since the EPBC Act Referral

2.2.1 Design and Layout Changes

Since the referral and public exhibition of the project application in New South Wales (20 September to 17 October 2022), the design and layout of the Referred Action has been revised in response to submissions by the community and NSW Government agencies. These changes include:

- A further reduction in the number of turbines, from 220 to 185.
- Reduction in the maximum blade tip height by 35 m (from 250 m to 215 m above ground level).
- Reduction in hub height by 31 m (from 160 m to 129 m).
- Reduction in indicative rotor diameter by 38 m (from 210 m to 172 m).
- Removal and/or relocation of multiple turbines to avoid or minimise environmental impacts and further infrastructure amendments.

This has resulted in a reduction in the area of the Proposed Action Development Corridor by approximately 31 per cent compared to the Referred Action.

A summary of the components of the Proposed Action and changes to the Referred Action, since the EPBC Referral was lodged in late 2022, are provided in **Table 2.2**.

Table 2.2 Current Status of the Proposed Action

Element	Referred Action (2022)	Proposed Action
Site Boundary		
Action Area	52,122.9 ha comprised of: <ul style="list-style-type: none"> • 46,539 ha (wind farm) • 5,583.9 ha (external transmission line). 	51,638.6 ha comprised of: <ul style="list-style-type: none"> • 46,531.9 ha (wind farm) • 4,900.1 ha (external transmission line) • 206.6 ha (public road upgrade investigation area). <p>Total combined Proposed Action Area reduced by 484.3 ha (-1 per cent) relative to Referred Action. However, the Proposed Action Area has been expanded to include all public road upgrades that were previously external to the Referred Action Area and an investigation area.</p>
Development Corridor – Wind Farm, External Transmission Line and TWA Facility.	12,601.6 ha comprised of: <ul style="list-style-type: none"> • 10,317.1 ha (wind farm) • 2,906.2 ha (external transmission line). <p>Note: <i>the combined area exceeds 12,601.6 ha due to partial overlap of the Wind Farm and External Transmission Line portions of the Development Corridor.</i></p>	8,734.4 ha comprised of: <ul style="list-style-type: none"> • 7,323.9 ha (wind farm) • 1,540.5 ha (external transmission line) • 14.6 ha (TWA facility). <p>Total combined Development Corridor is reduced by 3,867.2 ha (-30 per cent) which is comprised of following reductions:</p> <ul style="list-style-type: none"> • Reduction of 2,993.2 ha (-29 per cent) (wind farm).

Element	Referred Action (2022)	Proposed Action
		<ul style="list-style-type: none"> Reduction of 1,365.7 ha (-47 per cent) (external transmission line). <p>Note: the combined area exceeds 8,734.4 ha due to partial overlap (144.6 ha) of the Wind Farm and External Transmission Line portions of the Development Corridor.</p>
Turbine parameters and layout		
Number of turbines	220	185 (reduced by 35) (-16 per cent)
Maximum blade tip height (AGL)	250 m	215 m (reduced by 35 m) (-14 per cent)
Hub height	160 m	129 m (reduced by 31 m) (-19 per cent)
Indicative rotor diameter	210 m	172 m (reduced by 38 m) (-18 per cent)
Indicative minimum blade ground clearance	40 m	No change
Indicative rotor swept area (RSA) per turbines	34,636 m ²	23,235 m ² (reduced by 11,401 m ²) (-33 per cent)
Indicative total RSA for wind farm	7,619,920 m ²	4,298,475 m ² (reduced by 3,321,445 m ²) (-44 per cent)
Indicative generating capacity	1,320 MW	1,332 MW (increased by 12 MW) (+1 per cent)
Wind Farm – Ancillary infrastructure		
Wind farm access track length	259.9 km	246.4 km (reduced by 13.5 km) (-5 per cent)
Internal transmission line length	43.93 km	41.7 km (reduced by 2.2 km) (-5 per cent)
Permanent PCV met masts	Up to 14, up to final hub height (40 indicative locations)	Approximately 10, up to final hub height (11 indicative locations) (reduced by 4) (-29 per cent)
Collector substations	Up to 7 (10 indicative locations)	Approximately 7 (7 indicative locations) (no change in maximum number)
O&M facilities	Up to 3 (6 indicative locations)	Approximately 3 (3 locations identified) (no change in maximum number)
Temporary calibration met masts	Up to 28, up to final hub height	Approximately 10, up to final hub height (reduced by 18) (-64 per cent)
Temporary concrete batch plants	Up to 9 (18 indicative locations)	Approximately 9 (13 indicative locations) (no change in maximum number)
Temporary construction compound/ laydown areas	Up to 9 (18 indicative locations)	Approximately 9 (13 indicative locations) (no change in maximum number)
TWA Facility	Not included	Proposed for construction period only. Located on privately owned cropping land. Total disturbance area estimated to be 9 ha

Element	Referred Action (2022)	Proposed Action
External transmission line and connection infrastructure		
External transmission line length	56.24 km	54.6 km (reduced by 1.64 km) (-3 per cent)
Access track length	63.5 km	57.8 km (reduced by 5.7 km) (-9 per cent)
Temporary concrete batch plants	Up to 1 (off Cliffdale Road, Turill)	No change
Temporary construction compound/laydown areas	Up to 1 (off Cliffdale Road, Turill)	No change
Connection substation/switching station	Up to 1	No change
Indicative development footprints		
Indicative Development Footprints (Wind Farm and External Transmission Line)	Combined total of 1,599.4 ha, comprised of: <ul style="list-style-type: none"> • Wind farm: 1,367.4 ha. • External transmission line: 232.0 ha. 	Combined total of 1,609.4 ha, comprised of: <ul style="list-style-type: none"> • Wind farm: 1,364.9 ha. • External transmission line: 244.4 ha. Total combined Indicative Development Footprint increased by 10 ha (+ 0.6 per cent). The Total Indicative Development Footprint of all components (that is including TWA Facility and Public Road Upgrades is 1,803.0 ha.
Indicative Development Footprint – TWA facility	Not identified in Referred Action	<ul style="list-style-type: none"> • 9 ha.
Indicative Development Footprint – Public Road Upgrades	190.7 ha (includes existing road pavement)	184.7 ha (includes existing road pavement) (reduced by 6 ha) (-3 per cent)
Schedule of lands	The Action (including pinch point locations relevant to public road upgrades and OSOM haulage route) is located across 599 cadastral lots.	The Action (including pinch point locations relevant to public road upgrades and OSOM haulage route) is located across 586 cadastral lots, the full list provided in the Schedule of Lands in Appendix C of this report.
Preferred transport route and road upgrades		
Over-dimensional (OD) and Heavy Vehicle Access Route	Preferred route identified	No change
Indicative OSOM Haulage Route (between Port of Newcastle and Project site)	Preferred route identified	EnergyCo are responsible for separately assessing and carrying out all road upgrades for the OSOM haulage route from Port of Newcastle to Cassilis. The Proponent is responsible for any OSOM upgrades required for this Action from the intersection of the Golden Highway and Vinegaroy Road.

Element	Referred Action (2022)	Proposed Action
Site access points	<p>A combined total of 90 site access points from public roads, comprised of:</p> <ul style="list-style-type: none"> • Wind Farm: up to 47 site access points. • External Transmission Line: up to 43 site access points. 	<p>Reduction of site access points to a new total of 74 site access points from public roads (reduced by 16), comprised of:</p> <ul style="list-style-type: none"> • Wind Farm: up to 34 site access points. • External Transmission Line: up to 40 site access points.
Construction details		
Construction hours	<ul style="list-style-type: none"> • Monday to Friday 7 am to 6 pm. • Saturday 8 am to 1 pm. • Work outside these hours may be required, however this will be limited to activities that are inaudible to residences and other unavoidable works. 	<p>No change.</p> <p>Likely to be requirement for out of hours work for activities that once started cannot be stopped e.g. blade lifts and concrete pours. Approval will be obtained prior to commencement of out of hours work in accordance with the conditions of the existing Development Consent.</p>
Estimated construction workforce	800 peak workforce	550 peak workforce (reduced by 250) – will be confirmed when a Balance of Plant contractor has been appointed (scheduled for mid 2024)
Estimated construction duration	Approximately 3 years	Approximately 4 years (increase of 1 year)
Operational details		
Estimated commencement of operation	Progressive commencement of operations from 2025	Progressive commencement of operations from 2026
Estimated operational workforce	47	Approximately 40 (minor decrease)
Estimated project life	30 years	No change

In addition to the physical project parameters described in **Table 2.2**, the Referred Action has been amended to include the following components in the Proposed Action:

- Temporary workforce accommodation (TWA Facility) (refer to **Section 2.2.2**).
- Remove the indicative OSOM haulage route between the Port of Newcastle and Proposed Action Area (this was originally included in the EPBC Act referral but EnergyCo is now responsible for the environmental assessment and upgrade of the road along the haulage route from Port of Newcastle to Cassilis (refer to **Section 1.6**)).
- Request approval for potential alternate transmission line connection (refer to **Section 2.2.3**).
- Revise the estimated peak construction workforce from 800 to approximately 550 workers (FTE).

2.2.2 Temporary Workforce Accommodation

A large number of projects are currently proposed within the CWO REZ. While these projects bring significant benefit to the region through investment and employment opportunities, demand for services particularly accommodation has the potential to cause significant impact, both in relation to project only and cumulative impact.

It is estimated that a peak workforce of approximately 550 (FTE) will be required during the construction phase of the Proposed Action. There will be a ramp-up and ramp-down from that peak workforce number as construction progresses and winds down respectively. Given the remote location and lack of short- and long-term rental properties within a one-hour drive of the Proposed Action, a TWA Facility is expected to be required. This is supported by the findings of the Accommodation and Employment Framework (AEF) that was prepared for the Proposed Action (Umwelt 2023b) and advice received from several major construction companies. The project-specific TWA Facility has been sited, located and sized appropriately to attract and maintain the workforce required over the approximately four year construction period. A detailed description of the TWA Facility and environmental impact assessment are provided in the Liverpool Range Wind Farm Mod-1 Application – Amendment Report – Temporary Project-specific Workers Accommodation Facility (Umwelt 2023c).

The TWA Facility is proposed to be located within the Development Corridor – TWA Facility, which is located directly adjacent to the Development Corridor – Wind Farm in the far western corner of the Proposed Action Area. The Indicative Development Footprint – TWA Facility would be located outside of a designated no-go-area along an adjacent waterway to avoid impacts to recorded biodiversity values (refer to **Figure 2.3**). The Indicative Development Footprint – TWA will be wholly contained within the Development Corridor – TWA and is expected to be largely to the east of the waterway however it may extend to the west of the no-go-area that runs along the existing waterway that intersects the Development Corridor – TWA Facility. Development for the TWA Facility on the agricultural land to the west of the no-go-area may require installation of services. If needed, these would be installed using horizontal directional drilling to avoid clearance of vegetation in the no-go-area.

As shown in **Figure 2.3**, the Development Corridor – TWA Facility is adjacent to the Development Corridor – Wind Farm. The proposed TWA Facility is located on the privately owned rural, Sunnyside property (Lot 160 DP 750744) about three kilometres east of Coolah in the Warrumbungle Shire LGA. The Development Corridor – TWA Facility is 14.6 ha and the Indicative Development Footprint – TWA Facility occupies an area of approximately 9 ha of agricultural (cropping) land in the north of the property. The TWA Facility would have a capacity of approximately 600 rooms for peak workforce and additional staff to operate and maintain the facility.

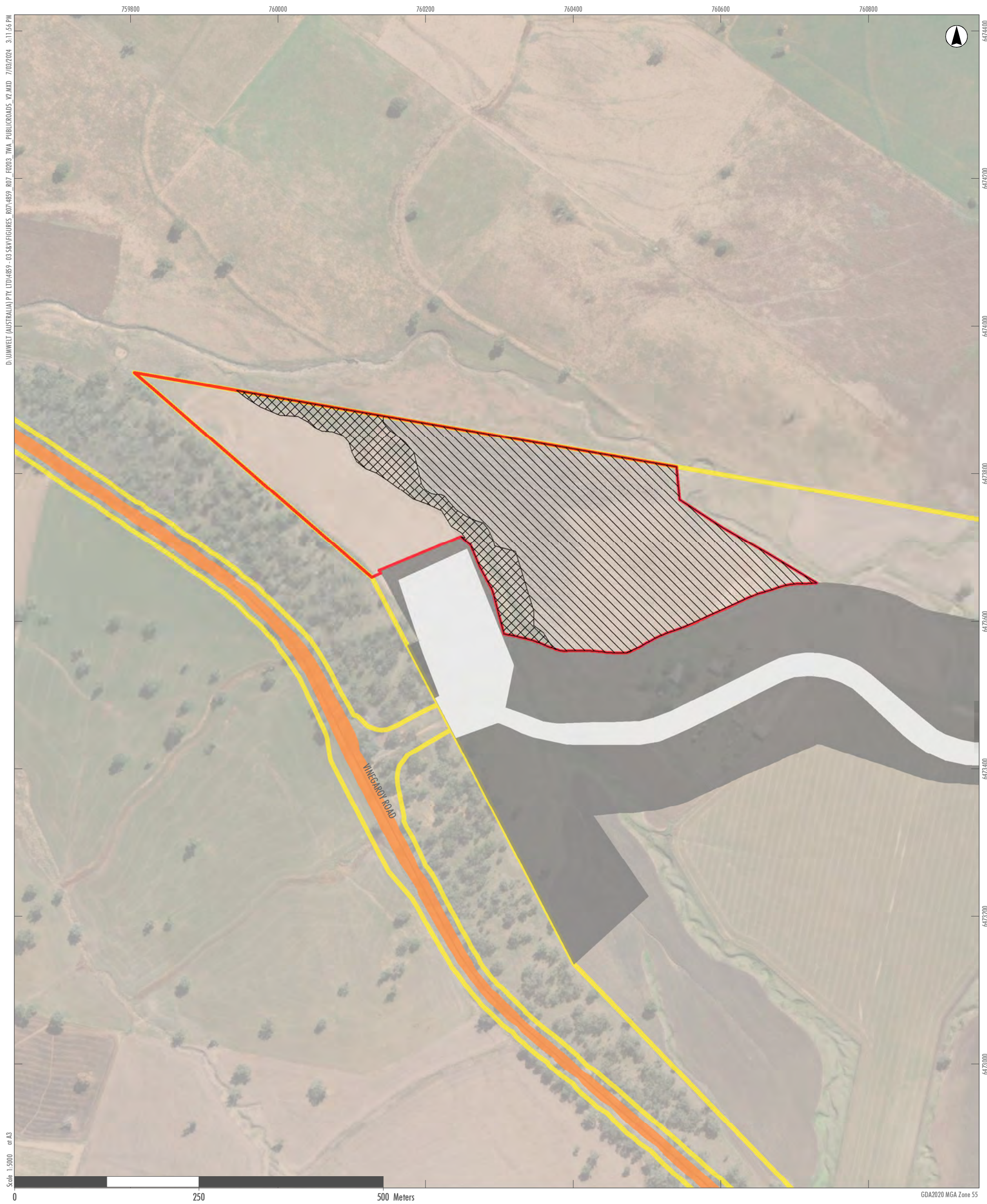
Access to the TWA Facility would be off Vinegaroy Road via an existing property access road that bisects Travelling Stock Reserve (Crown Reserve Number R362 James West). The existing access road from Vinegaroy Road TWA Facility has been assessed in the Referred Action and the BDAR (Umwelt 2023a) as it provides access to the wind farm.

The preferred water supply method is to tap into an existing potable water supply; however this is not available at this site. Groundwater is generally in plentiful supply in the local area, and recent groundwater drilling tests have confirmed the presence of groundwater at a depth of approximately 60 m (refer to **Section 4.2.7**). Further tests are underway to confirm the yield and quality of the groundwater encountered at the site. In the event other water sources are required to supply the TWA Facility, rainwater harvesting, wastewater recycling, and trucking water to site would be utilised in that order.

A Waste Management Plan will be developed for management of waste and where possible any waste will be collected and recycled through existing recycling centres in the local community. General waste would be managed on-site via waste collection and recycling facilities, and then transported to a licenced landfill facility by an appropriately licenced contractor. Wastewater would be collected on site and either treated on-site or removed for treatment at a licenced wastewater treatment facility. On-site sewage treatment plant may be provided in a modular wastewater treatment solution packaged in a standard shipping container. A system built into a conventional 40 foot container can achieve the required capacity (up to 75 Kl/day for a 600 room facility). Confirmation of wastewater management will be subject to detailed design.

Subject to authority approvals, stormwater discharge off the buildings may be harvested and reused on site for laundry and/or irrigation. Site stormwater runoff would typically be directed to stormwater detention pits (or tanks) where it is slowly released into the existing stormwater system. The stormwater design must not adversely affect any adjoining properties or alter the current status of discharge. The design will be subject to authority approval and detail specialist engineering design.

The TWA Facility would be progressively built in a sequenced manner to accommodate the construction workforce. Following completion of the construction of the Liverpool Range Wind Farm project, the TWA Facility would be decommissioned, and the site rehabilitated. Due to the transportable nature of the buildings, this can include either removal and disassembled or moved to another project/location (if required). The site will be rehabilitated to form a safe, stable and non-polluting landform, restoring the land capability of the previous agricultural land use.



Scale: 1:5000 at A3

- Legend**
- Proposed Action Area
 - Development Corridor**
 - Development Corridor - Wind Farm
 - Development Corridor - TWA Facility

- Indicative Development Footprints**
- Indicative Development Footprint - Wind Farm
 - Indicative Development Footprint - TWA Facility
 - Indicative Development Footprint - Public Road Upgrades

- No-Go-Area
- Road

FIGURE 2.3

Liverpool Range Wind Farm -
Temporary Workforce
Accommodation Facility

2.2.3 Potential Alternate Transmission Line Connection

As discussed in **Section 1.6**, the Approved Action is a renewable energy project located within the CWO REZ. The CWO REZ Transmission Line project includes a 330 kV transmission line between Merotherie Energy Hub and the Liverpool Range Wind Farm (EnergyCo 2023b) shown in **Figure 1.4**.

In circumstances where the Proposed Action connects into the CWO REZ Transmission Line, the proposed External Transmission Line connection to Ulan (approximately 50 kilometres in length) which forms part of the Proposed Action, would no longer be required and all impacts associated with the external transmission line would be avoided. However, given that the CWO REZ Transmission Line is yet to be approved, the External Transmission Line remains part of the Proposed Action to ensure that the Proposed Action can still connect to the national electricity grid in the unlikely event that the delivery timeframes for the CWO REZ Transmission Line project do not align.

As noted in **Section 2.1**, in the event the Proposed Action connects into the CWO REZ Transmission project the following components will be either revised or not required:

- The external transmission line to Ulan would no longer be required.
- The associated connection substation/switching station at Ulan would no longer be required.
- The southern collector substation located off Rotherwood Road Cassilis will convert to a connection substation.

Where the delivery timeframe for the CWO REZ Transmission project aligns with the Proposed Action, approval is being sought to connect the Proposed Action to the proposed CWO REZ Transmission Line coordinated by EnergyCo. EnergyCo's proposal includes a transmission line between the proposed Merotherie Energy Hub to the substation off Rotherwood Road, Cassilis that is included in this Proposed Action as shown in **Figure 1.4**.

2.3 Avoidance Area

Since the Proponent took ownership of the Approved Action in 2019, changes to design have been made with a focus on avoiding and minimising environmental impacts as far as practicable with a significant effort invested in avoiding or minimising impacts to biodiversity values, in particular White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community listed under the EPBC Act (Commonwealth Box Gum Woodland CEEC). Detailed discussion of avoidance of the Commonwealth Box Gum Woodland CEEC is provided in **Section 6.1**.

Design and layout changes to avoid impacts to the community and the environment, including biodiversity values, are discussed in detail in the Amendment Report submitted as part of the NSW application (Umwelt 2023d) and are summarised in **Section 2.2**.

Due to the nature of wind farm projects, whereby their impact footprints are finalised at such late stages, understanding the values in surrounding land is essential to facilitating avoidance and minimisation measures through refinement and finalisation of the development footprints. The proponent is committed to further avoiding and minimising impacts to additional biodiversity values where feasible.

A range of avoidance and minimisation measures have been incorporated into the design layout of the Proposed Action and will be implemented through management plans to manage threats to biodiversity. Avoidance measures specific to MNES are provided in **Section 6.1**. Outlines of management plans are provided in **Section 6.3**.

2.4 Project Development Stages

2.4.1 Construction

2.4.1.1 Pre-construction Works

Prior to commencement of construction (commencement of Proposed Action), pre-construction works will be undertaken where such activities will have no adverse impact on MNES or their habitat to allow for:

- pre-clearance surveys
- mobilisation of staff, plant and equipment, materials, and machinery prior to the start of construction.

The pre-construction works prior to the commencement of the Proposed Action may include the following where such activities will have no adverse impact on MNES or their habitat:

- fencing and signage associated with the Proposed Action
- building/road dilapidation surveys
- geotechnical investigations
- surface salvage in accordance with permits
- cadastral surveys with no clearance of native vegetation
- pre-clearance surveys
- commencement of establishment of the TWA Facility to support commencement of construction of the Proposed Action
- establishing temporary site office (in locations meeting the criteria identified in the conditions of approval)
- installation of environmental impact mitigation measures such as sedimentation and erosion controls
- repairs/upgrades of roads in consultation with the local councils and/or TfNSW where no native vegetation clearance is required.

These works would be undertaken without triggering commencement of the Proposed Action.

The key construction activities and designs presented in this PER are based on the assessments and design development to date. Further design refinement may occur at the detailed design stage as the Proposed Action is further developed with early construction contractor involvement and additional stakeholder engagement. Construction contractors tendering to construct the Proposed Action may offer infrastructure design refinements that incorporate innovative approaches in design, technology, operations or construction techniques.

2.4.1.2 Wind Farm and External Transmission Line

The Approved Action allowed for progressive rollout of construction. Construction phase of the Proposed Action is likely to occur over approximately four years. An Environmental Management Plan (EMP) and Biodiversity Management Plan (BMP) would be prepared by the Proponent setting out the approach to manage aspects of construction and environmental impacts.

As is typical of most wind farms, the generation infrastructure and the external transmission line may be constructed by different contractors, owned and maintained by different entities. The Proponent may control the delivery and ongoing maintenance of the wind farm and internal transmission line components of the Proposed Action.

The wind farm component could potentially be delivered in stages, either sequentially or concurrently. This would be determined during the detailed design stage. Construction would commence with site preparation and establishment, upgrade and/or construction of internal access tracks and all other civil works, including preparation of hardstand areas, and laying of cable to allow for delivery of components and servicing. This would be followed by preparation of concrete and steel reinforced foundations. It is likely that construction of the wind farm will commence with construction of the southernmost wind turbine clusters.

Public road upgrades would be completed progressively concurrent with a restricted commencement of road use and the commencement of on-site wind farm construction works. The Proponent will develop the approach to delivering the required road upgrades in a timely manner to facilitate construction and will work closely with the relevant road authorities to ensure the relevant safety, performance and longevity outcomes for public roads are maintained and disruptions to other road users, particularly residents, is minimised as far as practicable.

Ultimately all road upgrade works, and on-site construction would be managed in compliance with the relevant approvals and management plans.

The Approved Action includes connect to the NEM at TransGrid's existing 330 kV Wollar to Wellington transmission line. The network supplier may control the delivery and ongoing maintenance of the external transmission line component of the Proposed Action, including compliance requirements and environmental management. In the event that the alternate transmission line alignment proposed by EnergyCo is adopted by the Proposed Action, the external transmission line included as part of the Proposed Action would not be required.

2.4.1.3 TWA Facility

Construction and use of the TWA Facility is proposed to align with the overall construction program of the Proposed Action, which has an estimated construction timeframe of approximately four (4) years. Commencement of construction of the TWA Facility is proposed to begin as part of pre-construction minor works parallel with the commencement of public road upgrades for the broader Proposed Action. The TWA Facility would be progressively built in a sequenced manner to accommodate the construction workforce.

The TWA Facility buildings would be modular style, fabricated off-site and transported to the TWA site for installation. The modules may either arrive complete or as a system of modules that can be connected together to increase internal floor area as required. The construction phase of the TWA Facility requires all building foundations and in-ground service connect points for sewer, water, power and communications to be constructed and in place when the modular buildings are transported to site and installed.

A high-level overview of the construction sequence of the TWA Facility is as follows:

- Establishment of temporary road access.
- Earthworks, service trenches and foundations for the TWA Facility.
- Connection to temporary service plant.
- Site bulk earthworks.
- Installation of water and sewerage treatment plants.
- Installation of buildings and key components of the TWA Facility (e.g. accommodation modules, service and administration modules, and amenity facilities).
- Install first stage roads, hardstand, car parking, pathways, street lighting and landscaping.

All TWA Facility buildings and associated services would be designed to meet relevant building code requirements, to address accessibility and fire rating standards.

2.4.2 Operation

2.4.2.1 TWA Facility

During operation of TWA Facility, a range of general activities would be undertaken to support the functions of the facility, such as general grounds maintenance, deliveries and waste removal, and worker movements. Importantly any operational impacts from the TWA Facility coincide with construction of the Proposed Action not operation of the Proposed Action.

The operation and management of the TWA Facility will either be undertaken by the Proponent's construction contractors or will be outsourced to a third-party that specialises in managing such a facility. Specialist activities in relation to the ongoing operation of the TWA Facility, including but not limited to food delivery, handling and service, housekeeping and laundry services provide opportunities for local and regional engagement of existing suppliers that are capable of providing these services.

For safety and ease of movement, all areas of the TWA Facility will require artificial lighting. The main road, internal circulation roads and all car parking must be provided with lighting designed to the relevant Australian Standards and in accordance with the Dark Sky Planning Guideline (DPE, 2023a). Pathway lighting may be a mixture of overhead streetlights and low-level bollards. The selection of light type will be designed to avoid excessive light spillage onto the accommodation rooms and surrounding areas. Space between and around the accommodation units will be appropriately illuminated to avoid attracting insects and wildlife.

The management of the TWA Facility will consider the safety of residents as a key consideration. As an extension of the workplace, codes of conduct and acceptable behaviour must be strictly adhered to. Any consumption of alcohol will be controlled, and should alcohol be available at the facility, responsible service of alcohol requirements will apply within designated social areas with set operating times to ensure the wellbeing of employees is appropriately managed.

The use of shuttle buses to transport workers between construction compounds and the TWA Facility to help minimise potential traffic impacts on the local roads will be considered during the detailed design phase of the Proposed Action. The large proportion of traffic movements between the TWA Facility and construction compounds would typically occur at the start and end of the working day with peak AM traffic movements expected to occur around 7 am, while peak PM traffic movements would occur around 6 pm.

The TWA Facility will be accessed by personnel and construction vehicles via the proposed SAP along Vinegaroy Road (SAP ID# 113/114). This SAP will be established with consideration of Austroads design requirements as well as the existing traffic volumes and the anticipated number of heavy and light vehicles required to operate the TWA Facility.

2.4.2.2 Wind Farm Operation

The Proposed Action will provide approximately 40 full time jobs over its estimated 30 year operational life.

The wind turbines and other equipment would require regular inspection and maintenance. During the initial operating years, operator attendance may be more regular while the wind farm operation is being fine-tuned and optimised. Regular scheduled maintenance is required generally at three (3), six (6) and 12 monthly intervals. It is possible that major unexpected or unscheduled equipment failures could take place during the life of the wind farm.

An Operational Environmental Management Plan (OEMP) will be developed during detailed design and would contain specific monitoring program and reporting requirements.

During operations, site access points to the External Transmission Line will only be accessed periodically to complete inspections and maintenance.

Key activities that will occur during operation will include:

- On-site civil maintenance works for internal access roads, crane pads, laydown areas, wind turbine footings and cable trenching.
- Maintenance of OSOM components/materials.
- Maintenance of wind turbines using cranes when required.
- Maintenance of electrical substations.
- Use of site control room and operations and maintenance facilities.
- Maintenance of electrical transmission lines.

2.4.3 Decommissioning

2.4.3.1 TWA Facility

The TWA Facility would be decommissioned following the completion of construction of the Proposed Action. Due to the modular, transportable nature of the built form, most buildings can be either removed or disassembled and sold on or moved to another project/location.

The rehabilitation criteria and final landform requirements would be subject to both requirements of the landowner agreement for the TWA Facility and rehabilitation requirements of temporary infrastructure. At a minimum, the TWA Facility will be rehabilitated to a safe, stable and non-polluting landform that restores the land capability of the previous land use prior to the establishment of the TWA Facility.

There may be an opportunity to leave infrastructure (on-site or in/around nearby communities), that is important to the landholder and the local community, in place once construction has ceased and the construction workforce has demobilised. This could include groundwater bores (for firefighting purposes for instance), potential water / sewerage treatment facilities, housing or community infrastructure.

It is not proposed to repurpose or convert the TWA Facility to a permanent facility or allow it to be used for a different use following the completion of construction of the Proposed Action. Should this be considered in the future, an agreed alternative use would need to be negotiated and approved by appropriate authorities and the landowner.

2.4.3.2 Wind Farm

The expected commercial life of the wind farm will be approximately 30 years. Decommissioning involves dismantling and removing the wind turbines, removing related infrastructure, covering and rehabilitating access road and foundations. Key construction activities that will occur during decommissioning will include similar staging as construction. The decommissioning period is likely to be significantly shorter at around 12 to 18 months and with significantly fewer truck movements than the construction phase.

Decommissioning would involve reinstating similar road access arrangements to construction and would require access for large cranes and transport vehicles to dismantle and remove the turbines. Internal access roads may be retained where requested by landowners.

In the event that internal access roads are to be decommissioned the gravel topping and sub layers, drainage structures, culverts and crossings will be removed and transported to an appropriate location for reuse or disposal. Hardstand areas would be treated the same as for access roads.

All underground electrical cables would be deactivated and remain in situ. Should underground electrical cabling need to be removed, they will be removed in such a way as to minimise impact on the surrounding area as much as possible.

All underground foundations would remain in situ. All above ground infrastructure including protruding electrical cabling, conduit and other structures would be removed and the foundations covered.

All overhead electrical cabling and powerlines will be dismantled, removed and materials reused or sold where possible. Powerline poles will be removed. In locations where potential environmental damage from complete removal of the powerline pole outweighs the benefits, the pole will be cut off at ground level.

It is expected that buildings used for operation and maintenance facilities will be retained on site by the landowner. If the buildings are to be demolished and removed, this would be undertaken in accordance with standard demolition practices for buildings.

Decommissioning the wind farm at the end of its commercial life is the Proponent's obligation and would be completed at their cost. Agreements with involved landowners ensure that the wind farm operator is responsible for decommissioning of the wind farm including the associated costs and site clean-up.

An outline of rehabilitation following cessation of operations is provided in **Section 7.1**.

2.4.3.3 Wind Turbines

At the end of the operational life of the Proposed Action, all above ground infrastructure will be dismantled and removed and the land will be returned to near prior condition. After the assets are removed, most of the materials will be reclaimed or recycled, given the significant value of the steel, copper, aluminium and other materials. It should be noted, based on current market data, that the scrap value of turbines and other equipment is expected to be more than sufficient to cover the costs of their dismantling and site restoration.

Wind turbine blades are constructed from composite materials including glass fibre, carbon fibre, polyester and epoxy resins. Current technologies for wind turbine generator blades require a complex recycling process for recovery due to their materials. The purpose is to separate the polymer (resin) and fibre composites. Once separated, the resins are usually used for energy production while the fibre composites can be reused or recycled. Currently, Germany has the world's only industrial-scale factory for reprocessing wind turbine blades. The blades are sawn and chopped into chunks then shredded and hammered into 5 cm long fragments. These are mixed with other wet waste material and used as fuel in a cement kiln.

In 2023 the Clean Energy Council published a report entitled *Winding Up: Decommissioning, Recycling and Resource Recovery of Australian Wind Turbines*. According to this report approximately 85 to 94 per cent of a wind turbine (by mass) is recyclable and can currently be recycled in Australia. The wind industry is seeking to go further and avoid any disposal of waste, with a commitment by wind turbine manufacturers to develop zero-waste turbines by 2040 (Clean Energy Council 2023).

Examples of how turbine blades could be recycled/repurposed include:

- sound barriers
- shredded fibreglass filling in cement production
- pedestrian bridges
- playground equipment
- geotechnical blocks for road strengthening
- use of resin to separate bonded composites to return materials' integrity for new applications.

It is noted that the technology in wind turbine generator manufacture as well as in recycling processes evolves quickly and the market is expected to expand in Australia as wind farms reach the end of their life expectancy in coming years. The Proponent is committed to the adoption of best practice to reuse, recycle and dispose of turbine components at the time of decommissioning.

2.5 Feasible Alternatives

Detailed discussion of alternatives to the Approved Action were provided in the environmental impact assessment for the Approved Action. The following discussions have focused on alternatives to the Proposed Action as described in the EPBC Referral (EPBC 2022/09416) and the NSW Mod-1 Application exhibited in late 2022. Alternatives considered in relation to ancillary infrastructure such as the TWA Facility are also described.

2.5.1 No Action

As discussed in **Section 1.8**, the alternative of not taking the Proposed Action is that the Proponent may proceed to construct the Approved Action. This outcome is not without greater costs and potentially more impacts on some environmental values as well as more social impacts particularly given that the Approved Action is not constructable, includes more wind turbines and a layout that impacts on biodiversity values that have been avoided in the Proposed Action. Impacts of the Approved Action and alternatives on MNES are assessed further in **Section 2.5.4**.

The Proposed Action is one of the Candidate Foundation Generator projects within the CWO REZ. If the Proposed Action or the Approved Action did not proceed, a replacement project may likely result in delays in delivery of the transition to renewable energy from the CWO REZ.

2.5.2 Alternative Configuration

A range of landholder agreements are in place to enable the construction and operation of the Proposed Action. Having undertaken a detailed layout review and design optimisation process, including making amendments in response to agency and public consultation, the Proponent has sought to minimise changes to the approved infrastructure layout as far as practicable.

The key changes to the Referred Action since the referral, in late 2022, include an overall reduction in the number of turbines and increased distances between individual turbines. While multiple turbines were removed from all turbine clusters to, amongst other things, minimise impacts to native vegetation, there was a particular focus on removing turbines within F-Cluster to avoid/minimise impacts to the highest quality areas of Box Gum Woodland CEEC. Three turbines were relocated to avoid impacts to NSW Telco's proposed communication link across the Proposed Action Area. Detailed discussion of how alternative configurations and design refinements have been considered to avoid impacts on MNES, particularly Commonwealth Box Gum Woodland CEEC is provided in **Section 6.1** of this report and in Section 4 of the BDAR (Umwelt 2023a). A summary of the key turbine removals and relocations is provided in **Table 2.3**. A comparison between the EPBC Referral turbine layout and the layout in the Proposed Action is shown in **Figure 2.4**.

Overall, the number of turbines in the Proposed Action has been reduced by 35 when compared to the Referred Action, as at late 2022.

Table 2.3 Reasons for key turbine removals and relocations

Turbine ID No.	Reason for Removal/Relocation
A7, A8, A9, A11, A12, A13, B22, B23, B28, C10, D56, E30, E41, E42, and E49	Removed to minimise ground disturbance and impacts to native vegetation.
B12, B15 and B17, E19, E27, F18, F23, F27, F29 F36, F37, F38 F39, F40 and F41	Removed to minimise ground disturbance and avoid impacts to Box Gum Woodland CEEC.
C19, C20, C21, D60, D61	Removed to reduce visibility from Pinnacle Lookout, reduce potential turbine noise impacts within Coolah Tops National Park, avoid impacts to a sensitive area of cultural heritage, and avoid impacts to native vegetation.
D40, D43 and E31	Relocated to avoid impact to NSW Telco’s proposed communication link across the site.

There have also been changes to ancillary infrastructure proposed in the Referred Action, generally as a result of further design effort. These were made to ensure constructability, reduce potential environmental impacts, and ensure efficient operational performance. **Table 2.4** identifies changes to components of the wind farm that have occurred that avoid or minimise impacts to MNES. The location of these components in the EPBC Referral and the Proposed Action are shown in **Figure 2.5**.

Table 2.4 Ancillary infrastructure changes that avoid or minimise impacts to MNES

Component	Reason for Removal/Relocation
Collector substations	Revisions have been made to their location, size, and orientation to reduce impacts to Box Gum Woodland CEEC, respond to landholder concerns, and achieve minimum operational requirements.
Internal transmission line	Alignment revised in response to changes to collector substation resulting in a reduction in length by 2.2 km. Changes have been made to reduce impacts to Box Gum Woodland CEEC, respond to landholder concerns, and achieve minimum operational requirements.
Site access points and tracks	Removal of duplicate site access points and access tracks from public roads, reducing total length of internal wind farm access track by approximately 13.5 km.

The only key change to the alignment of the External Transmission Line between the Referred Action and the Proposed Action is a minor realignment to avoid impacts to a section of Durrigere State Conservation Area near Turill. Just 2.1 km (or six per cent) of the External Transmission Line alignment of the Proposed Action occurs outside of the Approved Action Development Corridor.

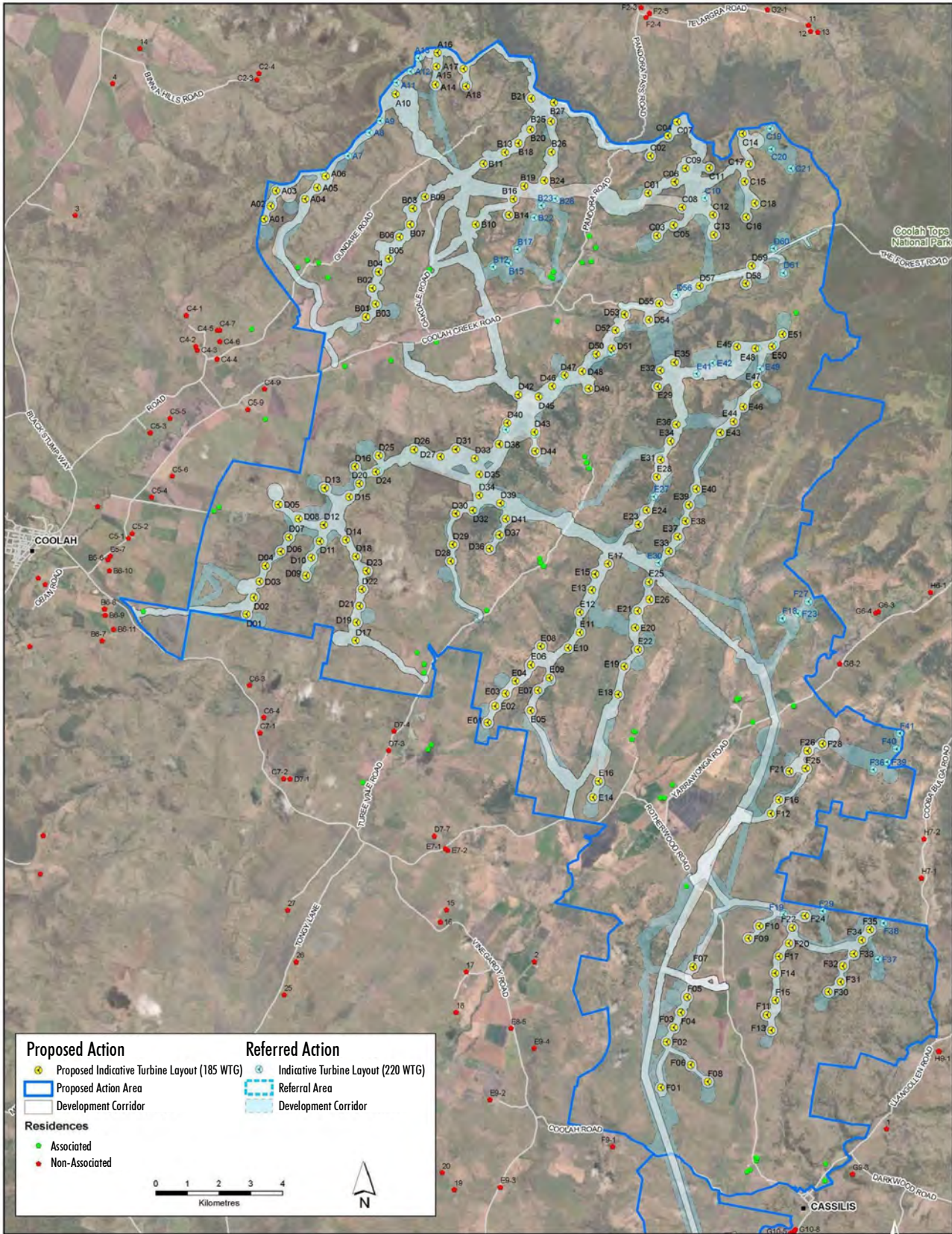


FIGURE 2.4

Comparison between the Referred Action Turbine Layout and the Proposed Action Turbine Layout

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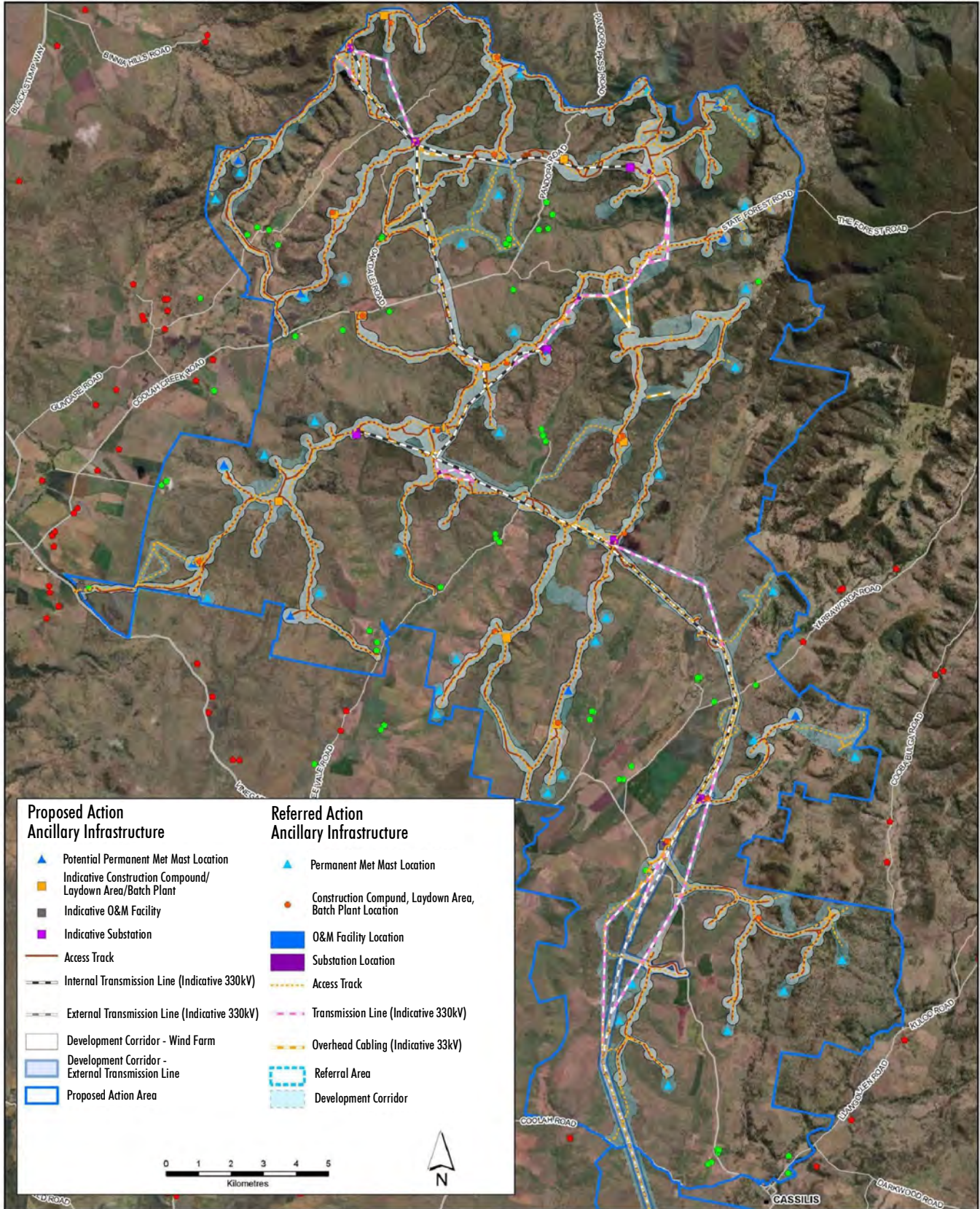


FIGURE 2.5

Comparison between Referred Action Ancillary Infrastructure Layout and Proposed Action Ancillary Infrastructure

2.5.3 TWA Facility Alternatives

For the TWA Facility, the alternatives considered included:

- Do nothing. This is not considered a feasible alternative for the Proposed Action as the existing short-term rental accommodation could only house up to approximately 100 construction workers without impacting on the tourism industry and other accommodation users in the region. The TWA Facility is a necessary component to enable construction of the Proposed Action.
- A number of alternative sites were considered for the TWA Facility in the vicinity of Coolah and Cassilis. The site selection process and selection criteria are described further below. Importantly all alternative TWA Facility sites were selected to avoid impacts to biodiversity values, particularly native vegetation, threatened ecological communities and threatened species as listed under the BC Act and the EPBC Act.

The Proponent investigated multiple potential sites for the TWA Facility within the vicinity of the Coolah and Cassilis townships. Many of the sites were identified as having potential environmental and social constraints and were removed from consideration early in the assessment process. Following initial investigation and consultation with both Warrumbungle and Upper Hunter Council two potential TWA Facility sites (currently proposed TWA Facility site near Coolah and an alternate TWA Facility site near Cassilis) were subject to detailed analysis and community consultation. The Cassilis TWA Facility site is located south of the Cassilis township, approximately 800 m from the Cassilis Road/Golden Highway intersection.

The Proponent applied the selection criteria of satisfied, partially satisfied and not satisfied to assist with the site selection process to the two potential TWA sites. The results of the analysis are provided in **Table 2.5** and more details are provided in the Amendment Report (Umwelt 2024) prepared for Amendment 2 of the NSW Mod-1 Application.

Table 2.5 TWA Facility Selection Criteria Analysis

Aspect	Selection Criteria	Assessment Outcome – Coolah	Assessment Outcome – Cassilis
Land use / zoning	Freehold land with minimal land use restrictions (preferably in a Rural Zone).	Satisfied	Satisfied
Land area	Minimum of 6 ha to accommodate a TWA Facility with a capacity of approximately 600 personnel	Satisfied	Satisfied
Proximity to work sites	Travel time to construction site less than 30 minutes wherever possible	Satisfied	Partially Satisfied
Hazards (flooding and bushfire)	Minimal hazard potential when compared to surrounding areas. Largely cleared of tree vegetation. Allows for siting infrastructure outside of 1 per cent annual exceedance probability (AEP) flood depths.	Satisfied	Satisfied
Ecological constraints	No impacts to listed threatened flora species or threatened ecological communities under relevant State and Commonwealth legislation	Satisfied	Satisfied

Aspect	Selection Criteria	Assessment Outcome – Coolah	Assessment Outcome – Cassilis
Heritage constraints	Minimal presence of Aboriginal and non-Aboriginal heritage items or sites	Satisfied	Satisfied
Accessibility	Connectivity to existing road network to facilitate construction and use of facility. Limited use of local road network.	Satisfied	Partially Satisfied
Available services / utilities	Existing access to electricity essential. Access to water, sewer services, and mobile reception preferable.	Satisfied	Satisfied
Topography	Minimal slope to avoid excessive earthworks in establishing the facility.	Satisfied	Satisfied
Contamination	Low risk of contaminated soils and acid sulphate soils.	Satisfied	Satisfied
Social impact (noise and visual)	Maximise distance to nearby dwellings and sensitive land uses (e.g. nursing homes, child care) to avoid/minimise impacts on nearby residents and the local community.	Satisfied	Partially Satisfied
Community engagement and support	The facility is considered to be generally acceptable by nearby residents and the local community.	Satisfied	Not Satisfied

Following community consultation in Coolah and Cassilis between 4 and 26 October 2023, feedback was received from the community which indicated only 8.8 per cent of the 93 respondents recommended the Cassilis site for the TWA Facility. Additionally, approximately 45 per cent of respondents ranking the potential negative impacts of the Cassilis site for the TWA Facility as ‘extremely significant’. Following further analysis of the feedback received, the Proponent is proceeding with the Coolah site as the proposed TWA Facility.

2.5.4 Comparison of Impacts of Feasible Alternatives

Changes in the design and layout of the Proposed Action have resulted in changes to the extent of native vegetation/habitat within the Development Corridor as well as the extent of impact to MNES compared to what was assessed for the Referred Action.

Multiple turbines have been removed from all turbine clusters to, amongst other things, minimise impacts to native vegetation. There was a particular focus on removing turbines within the F Cluster of turbines located in the southern portion of the wind farm to avoid/minimise impacts to the highest quality areas of the BC Act listed White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions Critically Endangered Ecological Community (NSW Box Gum Woodland CEEC) and the Commonwealth Box Gum Woodland CEEC. These turbine removals have resulted in a reduction in the extent of NSW and Commonwealth Box Gum Woodland CEEC located across the Development Corridor (i.e. micro-siting buffer) and a reduction in the estimated impacts to the NSW and Commonwealth Box Gum Woodland CEEC compared to the Referred Action.

A comparative analysis of the impacts of the Approved Action, the Referred Action and the Proposed Action is provided in **Table 2.6** for MNES assessed in **Section 5.0** of this PER.

For some of the MNES, the changes in layout and design, as well as revision of the Development Corridor, have avoided large areas of potential habitat through reducing impacts on areas of moderate/good condition habitat. Additional targeted surveys completed by Umwelt in early 2023 have identified increased areas of low condition and derived native grassland condition vegetation zones potentially impacted, and therefore, despite the avoidance and minimisation measures adopted by the Proponent, this hasn't resulted in an overall reduction in the extent of impacts to some MNES.

The inclusion of the TWA Facility does not impact on any MNES and does not result in any changes to impacts on MNES compared to the Referred Action. Due to ongoing cropping practices, the Indicative Development Footprint – TWA Facility does not support native vegetation, derived or otherwise. It is dominated by exotic vegetation, in the form of crops, with low conservation value grassland along the waterway intersecting the Development Corridor – TWA Facility. The low conservation value grassland area will be designated as a no-go-area and excluded from the proposed development design to avoid impacts to the grassland. Vegetation within the Development Corridor – TWA Facility (excluding the no-go-area) meets the definition of Category 1 – Exempt Land under the NSW *Local Land Services Act 2013* (LLS Act), as it has been cleared of all native vegetation from all strata and is used for cropping. There are no paddock trees, logs, rock piles or surface rock present for threatened species in the Indicative Development Footprint – TWA Facility.

As highlighted in **Table 2.6** the redesign of the Referred Action in development of the Development Corridor and Indicative Development Footprints for the Proposed Action have avoided:

- Potential habitat and reduced the impact for Commonwealth Box Gum Woodland CEEC, white-throated needletail (*Hirundapus caudacutus*), swift parrot (*Lathamus discolor*), large-eared pied bat (*Chalinolobus dwyeri*) and Corben's long-eared pied bat (*Nyctophilus corbeni*).
- Potential habitat in the Development Corridor for the regent honeyeater (*Anthochaera phrygia*), south-eastern glossy black-cockatoo (*Calyptorhynchus lathami lathami*), greater glider (*Petauroides volans*), yellow-bellied glider (*Petaurus australis*) and koala (*Phascolarctos cinereus*) however, there has been an increase in the area of potential habitat in the Indicative Development Footprint for these species.

For Commonwealth Box Gum Woodland CEEC importantly, the Proposed Action avoids approximately 12 ha of moderate/good condition Vegetation Zone 6 reducing impact to that community by 43 per cent relative to the Referred Action.

Further discussion of avoidance measures for the Proposed Action are provided in **Section 6.1**.

Table 2.6 Comparison of Impacts of Feasible Alternatives on MNES

Threatened or migratory species	Approved Action		Referred Action (2022)		Proposed Action (2024)		Likelihood of Occurrence	Discussion
	DC	IDF	DC	IDF	DC	IDF		
Commonwealth Box Gum Woodland	not available	10.37 ha	362.5 ha	42.1 ha or 12% of potential habitat in DC (change +31.7 ha)	174.1 ha (change 188.4 ha or 52% avoided)	31.6 ha or 18% of potential habitat (10.5 ha avoided)	Known	<p>Potential habitat identified in the Development Corridor and Indicative Development Footprints of the Referred Action and Proposed Action are greater than the Approved Action. This difference may be an artefact of increased survey coverage and a more realistic estimate of impacts. It also includes impact associated with public road upgrades which were not considered in the Approved Action.</p> <p>Redesign of the Referred Action has avoided 188.4 ha or 52% of Commonwealth Box Gum Woodland CEEC in the Proposed Action Development Corridor that was in the Referred Action Development Corridor.</p> <p>The impact to Commonwealth Box Gum Woodland in the Proposed Action has decreased by 10.5 ha or 25% relative to the Referred Action, as a result of avoidance and design layout refinement.</p>
Regent honeyeater	not available	234.7 ha	4,384.2 ha	577.8 ha or 13% of potential habitat in DC (increase impact by 343.1 ha)	3,233.4 ha (change 1,150 ha or 26% avoided)	603.9 ha or 19% of potential habitat in DC (increase impact by 26.1 ha)	Moderate	<p>Redesign of the Referred Action has avoided 1,150.8 ha of potentially suitable habitat in the Proposed Action Development Corridor that was in the Referred Action Development Corridor.</p> <p>There is however an increase in extent of impact of ecosystem credit habitat in the Proposed Action relative to the Referred Action due to refinement of the vegetation mapping undertaken for the Proposed Action as part of the response to submissions phase (Amendment 1 of the NSW Mod-1 Application).</p> <p>No area of important habitat for the regent honeyeater is mapped in Development Corridor.</p>

Threatened or migratory species	Approved Action		Referred Action (2022)		Proposed Action (2024)		Likelihood of Occurrence	Discussion
	DC	IDF	DC	IDF	DC	IDF		
Gang-gang cockatoo	Not assessed	Not assessed	Not assessed	Not assessed	45.7 ha	13.4 ha or 29% of potential habitat	Low	Species identified for assessment in the PER by DCCEEW. Not previously assessed.
South-eastern glossy black-cockatoo (breeding habitat)	Not assessed	Not assessed	14.7 ha	1.1 ha or 7% of potential habitat	5.4 ha (9.3 ha or 63% avoided)	2.0 ha or 37% of potential habitat (Impact increased by 0.9 ha)	High	Redesign of the Referred Action has reduced area of potential habitat in the Proposed Action Development Corridor by 9.3 ha. There has been an increase in impact area in the Proposed Action.
Painted honeyeater	Not assessed	Not assessed	4,384.2 ha	584.9 ha or 13% of potential habitat	3,407.5 ha (976.7 ha or 22% avoided)	627.6 ha (Impact increased by 42.7 ha)	Known	Redesign of the Referred Action means that the Proposed Action Development Corridor has avoided 976.7 ha of potentially suitable habitat. There is however an increase in extent of impact of habitat in the Proposed Action relative to the Referred Action due to refinement of the vegetation mapping undertaken for the Proposed Action as part of the response to submissions phase (Amendment 1 of the NSW Mod-1 Application).
White-throated needletail	Not assessed	13,273 m ² rotor swept area	-	7,619,920 m ² rotor swept area	-	4,298,475 m ² Reduced by 3,321,445 m ²	Known	Rotor swept area reduced by 44% in Proposed Action with design and layout changes.
Swift parrot	Not available	256.3ha	4,073.4 ha	471.7 ha or 12% of potential habitat	1,653 ha (2,420.4 ha or 59% reduction)	302.5 ha or 18% of potential habitat (169.2 ha or 36% avoided)	Moderate	Redesign of the Referred Action has resulted in a significant reduction in area of potential habitat (2,420.4 ha) avoided by variation to Development Corridor. There is also a significant decrease (169.2 ha or 36%) in the impact area in the Proposed Action relative to the Referred Action.

Threatened or migratory species	Approved Action		Referred Action (2022)		Proposed Action (2024)		Likelihood of Occurrence	Discussion
	DC	IDF	DC	IDF	DC	IDF		
Superb parrot	Not assessed	Not assessed	Not assessed	Not assessed	124.2 ha	22.9 ha or 18% of potential habitat in DC	Low	Species identified for assessment in the PER by DCCEEW. Not previously assessed.
Large-eared pied bat	Not available	19 ha	1,573.7	284.5 ha or 18% of potential habitat	572 ha (1,001.7 ha or 64% reduction)	106.7 ha (177.8 ha or 62% avoided)	Known	Redesign of the Referred Action has resulted in a significant reduction in area of potential habitat (1,001.7 ha) avoided by variation to Development Corridor. There is also a significant decrease in the impact area in the Proposed Action.
Spotted-tail quoll	Not assessed	Not assessed	Not assessed	Not assessed	941.4 ha	193.9 ha or 21% of potential habitat in DC	High (call heard)	Species identified for assessment in the PER by DCCEEW. Not previously assessed.
Corben's long-eared bat	Not available	19 ha	2,341.9 ha	338.6 ha or 14% of potential habitat	721.5 ha (1,620.4 ha or 69% of habitat avoided)	156.8 ha or 22% of potential habitat (181.8 ha or 54% avoided)	Known	Redesign of the layout of the Referred Action has resulted in a significant reduction in the area of potential habitat in the Development Corridor (1,620.4 ha) and the proposed impact area (-181.8 ha) of the Proposed Action.
Greater glider	Not assessed	Not assessed	273.1 ha	18.3 ha or 7% of potential habitat	111.3 ha (161.8 ha or 60% of habitat avoided)	19.3 ha or 17% (+1 ha or 5% increase)	Known	Redesign of the layout of the Referred Action has resulted in a significant reduction in the area of potential habitat in the Development Corridor (161.8 ha) of the Proposed Action. There has been a negligible increase in impact area.
Yellow-bellied glider	Not assessed	Not assessed	102.5 ha	11 ha or 11% of potential habitat	87.4 ha (15.1 ha or 15% reduction)	15.2 ha of 19% of potential habitat (+4.2 ha or 38% increase)	Known	Redesign of the layout of the Referred Action has resulted in a significant reduction in the area of potential habitat in the Development Corridor (15.1 ha) of the Proposed Action. There has been an increase in impact area.

Threatened or migratory species	Approved Action		Referred Action (2022)		Proposed Action (2024)		Likelihood of Occurrence	Discussion
	DC	IDF	DC	IDF	DC	IDF		
Koala	Not assessed	Not assessed	5,110 ha	672.3 ha or 13% of potential habitat	3,725.7 ha (1,384.3 ha or 27% reduction)	720.6 ha or 19% of potential habitat (+48.3 ha or 7% increase)	High	Redesign of the layout of the Referred Action has resulted in a significant reduction in the area of potential habitat in the Development Corridor (1384.3 ha or 27% reduction) of the Proposed Action. There has been a minor increase in impact area.
Grey-headed flying-fox	Not assessed	Not assessed	Not assessed	Not assessed	1,731.4 ha	312.0 ha or 18% of potential habitat in DC	Known (Recorded overhead)	Species identified for assessment in the PER by DCCEEW. Not previously assessed.

This use of Development Corridor is a global term that refers to the combined “Development Corridor – Wind Farm and Development Corridor – External Transmission Line” that was assessed as part of the Referred Action.

² *This use of Impact Area is a global term that refers to the combined “Indicative Development Footprint – Wind Farm, Indicative Development Footprint – External Transmission Line and Indicative Development Footprint – Public Road Upgrades” that was assessed as part of the Referred Action.*

³ *This use of Development Corridor is a global term that refers to the combined “Development Corridor – Wind Farm, Development Corridor – External Transmission Line and Development Corridor – TWA Facility” that is being assessed as part of the Proposed Action.*

⁴ *This use of Impact Area is a global term that refers to the combined “Indicative Development Footprint – Wind Farm, Indicative Development Footprint – External Transmission Line, Indicative Development Footprint – Public Road Upgrades and Indicative Development Footprint – TWA Facility” that is being assessed as part of the Proposed Action.*

3.0 Description of the Environment

3.1 General Description of the Existing Environment

3.1.1 Bioregion

The Proposed Action is located across two mapped Interim Biogeographic Regionalisation Area (IBRA) Bioregions and three subregions as shown in **Figure 3.1**:

- Brigalow Belt South Bioregion:
 - Brigalow Belt South – Liverpool Range IBRA subregion.
 - Brigalow Belt South – Pilliga IBRA subregion.
- Sydney Basin Bioregion:
 - Sydney Basin – Kerrabee IBRA subregions.

3.1.2 Climate

The Proposed Action Area occurs mainly within the Brigalow Belt South bioregion (refer to **Figure 3.1**). The Brigalow Belt South bioregion extends from Dubbo to mid-Queensland coast and is located within the eastern subhumid region of Australia. At this end of the bioregion, the climate is described broadly as subhumid with no dry season and a hot summer with some patches in the temperate zone, with no dry season and a warm summer (NPWS 2003a).

The southern half of the Development Corridor – External Transmission Line occurs at the outer edge of the Sydney Basin bioregion, extending from the central coast of NSW to almost as far west as Mudgee. The climate of the Sydney Basin bioregion is mainly temperate with warm summers and no dry season (NPWS 2003a).

3.1.3 Soils, Geology and Topography

Soils in the Development Corridor are predominantly comprised of stony red brown loams on the ridges, shallow stony clay soils on the steeper slopes, and thick deep black earths and self-mulching clays on lower slopes. The Development Corridor is underlain by the Bow, Ant Hill, Argowen, Cranbourne, Galla Gilla, Merriwa River, Kindamindi, Erin, Coober-Bulga, Curryall, Dunwell, Warung, Yarramoor, Sandy Hollow, Summer Hill, Tingaroo, Durrigere, Hands on Rock and Pigeon Box soil landscapes, as shown in **Figure 3.2**. Soil depth can vary from very shallow to shallow (<25–50 cm) on crests, upper slopes and benches, moderately deep to deep (<50–150 cm) on hillslopes, drainage channels and stream channels to very deep (150–500 cm) on lower slopes, floodplains, and some crests and slopes (eSPADE 2020). The majority of these soil profiles are erosional on crests and slopes and alluvial bordering key watercourses.

The underlying geology in the Development Corridor – Wind Farm is Liverpool Range Beds (comprising basalts and dolerite) across much of the elevated landforms, giving way to Pillaga Sandstone (comprising quartz sandstone, conglomerate and claystone) on slopes trending towards drainage lines and areas from upper slope towards drainage lines and Quaternary alluvium (alluvium, sand and gravel) in low inclination landforms associated with drainage lines (refer to Gilgandra 1:250,000 Geological Sheet).

Along the Development Corridor – External Transmission Line the geology is more variable with a higher representation of Pillaga Sandstone Formation, Purlawaugh Formation (siltstone, mudstone, lithic quartz, sandstone) Illawarra Coal Measures (sandstone, mudstone, claystone, coal, rhyolitic tuff and conglomerate), Narrabeen Group (sandstone and mudstone) and Quaternary alluvium.

Most of the Proposed Action Area is located in a plateaued region of the Great Dividing Range. This area consists of multiple dissected plateau/crest landforms, ridges and spurs and is generally comprised of undulating plateau tops with steep margins, grading to long slopes of moderate to steep gradients and drainage depressions. The Coolah Tops National Park contains the highest point in the surrounding area, and although not within the Proposed Action Area, it represents the dominating landform.

Elevation over most of the Development Corridor is between 400 m and 500 m above sea level. Substantial elevation rises are evident mostly in the Development Corridor – Wind Farm particularly in the north-east where it reaches up to 900 m above sea level (ASL). Coolah Tops National Park contains the highest point in the surrounding area.

The majority of landforms in the Development Corridor – Wind Farm comprise crests and slopes with a relatively high frequency of moderate (between 5°45' to <18°) to very steep (>30°) slopes. Low (between 0 to 5°45' slope) inclination slopes are generally limited to areas bordering major watercourses, the Coolaburragundy and Talbragar Rivers (refer to **Figure 3.3a**).

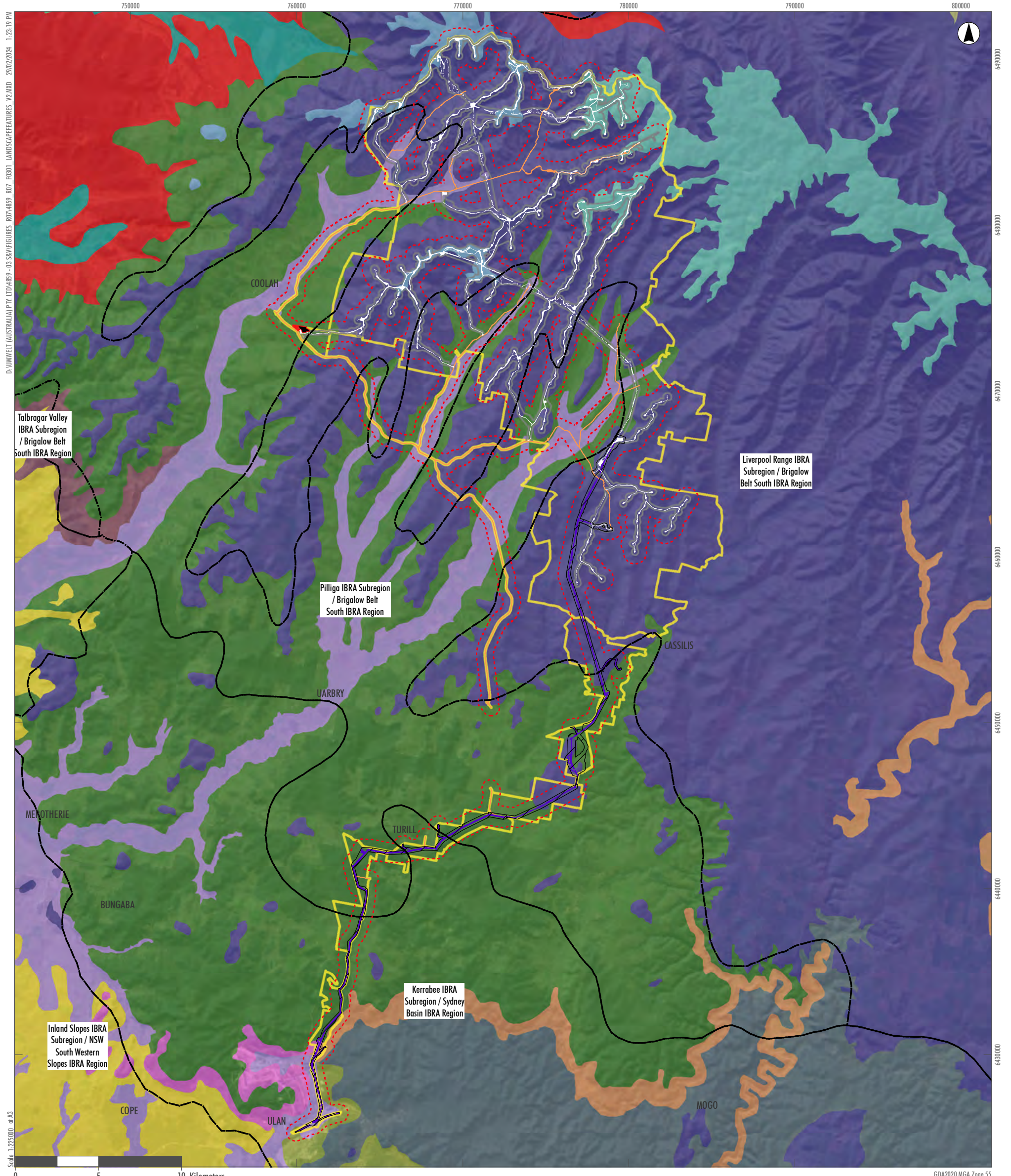
South of Cassilis, in the area of the Development Corridor – External Transmission Line, the land is typically flatter, with a combination of undulating topography generally at lower elevations and bordered by less steep inclined slopes (refer to **Figure 3.3b**).

3.1.4 Mitchell Landscapes

NSW landscapes or Mitchell Landscapes are a system of ecosystem classification based on geology, soils, topography and vegetation. They are an important component of the NSW BAM.

The Mitchell Landscapes for the Proposed Action Area are shown in **Figure 3.1** and listed in **Table 3.1** grouped in meso-ecosystems sharing topography and geology.

The dominant landscape is the Liverpool Range Valleys and Footslopes which occurs downslope of the Liverpool Tops landscape and Coolah Tops landscape. Liverpool Range Valleys and Footslopes is an over cleared landscape with an estimated 81 per cent cleared of native vegetation. At the southern end of the Development Corridor – External Transmission Line near Ulan, the Development Corridor occurs in landscapes associated with the Goulburn River and Upper Macquarie River catchment.



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Scale: 1:225000 at A3

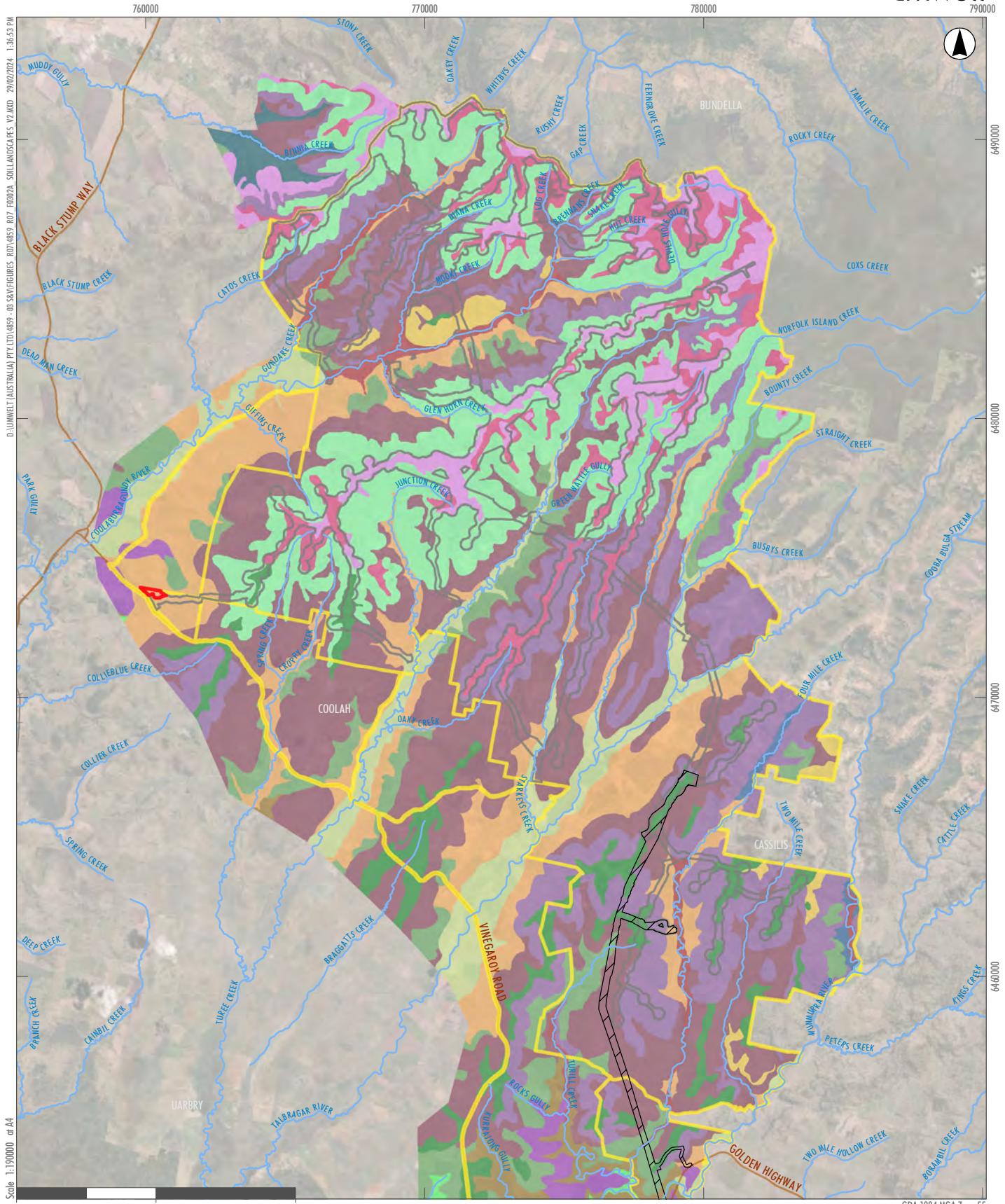
Legend

- | | | |
|---|---|--|
| <ul style="list-style-type: none"> Proposed Action Area 500m Buffer IBRA Subregion / Region <p>Development Corridor</p> <ul style="list-style-type: none"> Development Corridor - Wind Farm Development Corridor - TWA Facility Development Corridor - External Transmission Line <p>Indicative Development Footprints</p> <ul style="list-style-type: none"> Indicative Development Footprint - Wind Farm Indicative Development Footprint - TWA Facility Indicative Development Footprint - External Transmission Line Indicative Development Footprint - Public Road Upgrades | <p>Mitchell Landscapes</p> <ul style="list-style-type: none"> Cassilis Slopes Coolah Tops Cope Hills Granite Goulburn River Channels and Floodplains Goulburn River Gorges Lees Pinch Foothills Liverpool Alluvial Plains | <ul style="list-style-type: none"> Liverpool Range Valleys and Foothills Liverpool Tops Merrygoen Hills and Slopes Mollyan Hills Talbragar - Upper Macquarie Terrace Sands and Gravels Trinkey Plateau Upper Castlereagh Alluvial Plains Upper Goulburn Valleys and Escarpment |
|---|---|--|

FIGURE 3.1

Landscape Features

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022)



- Legend**
- Proposed Action Area
 - Road
 - Watercourses
 - Development Corridor**
 - Development Corridor - Wind Farm
 - Development Corridor - TWA Facility
 - Development Corridor - External Transmission Line

- Soil Landscapes**
- | | | |
|---|--|---|
| Ant Hill | Curryall | Merriwa River |
| Ant Hill variant a | Erin | Munmurra |
| Bow | Galla Gilla | Pigeon Box |
| Coober Bulga | Kindamindi | Summerhill |
| Cranbourne | Longs Neck | Summerhill variant a |
| | Lever Gully | Warung |
| | | Yarramoor |

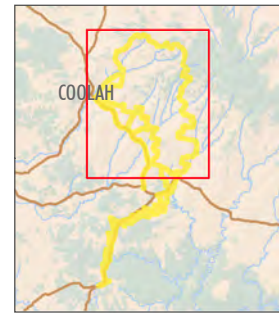
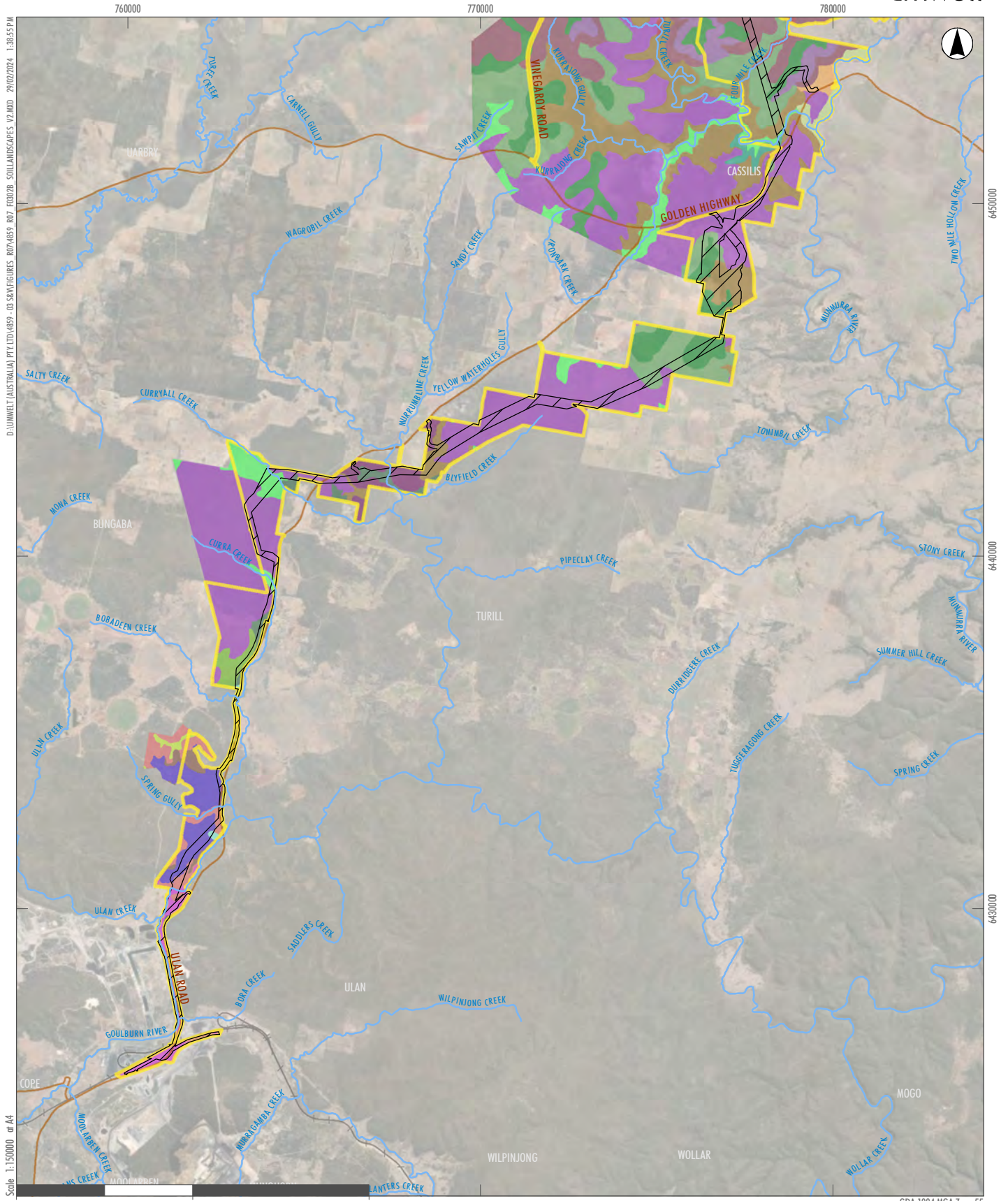


FIGURE 3.2A
Soil Landscapes



Legend

- Proposed Action Area
- Road
- Watercourses
- Development Corridor**
- Development Corridor - Wind Farm
- Development Corridor - TWA Facility
- Development Corridor - External Transmission Line

Soil Landscapes

- | | | |
|---|---|--|
| <ul style="list-style-type: none"> Ant Hill Ant Hill variant a Argowen Bow Cranbourne Curryall Disturbed Terrain | <ul style="list-style-type: none"> Dunwell Durrigere Erin Hand on Rock Lees Pinch Merriwa River Munghorn Plateau Munmurra | <ul style="list-style-type: none"> Sandy Hollow Summerhill Summerhill variant a Tinagroo Ulan Ulan variant b Wagrobil Wollangambe Yarramoor |
|---|---|--|

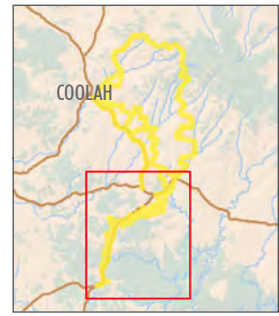
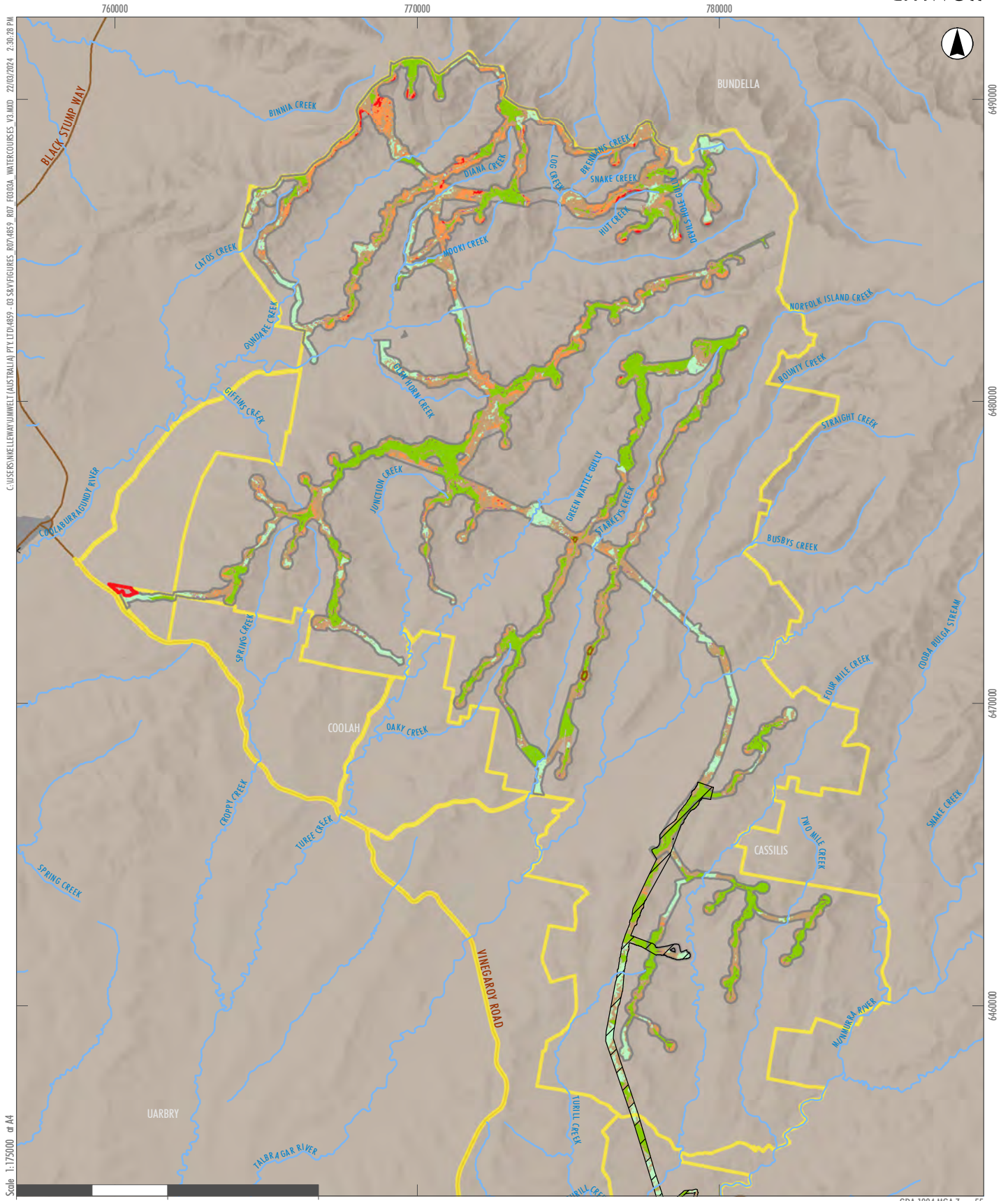


FIGURE 3.2B
Soil Landscapes

Image Source: ESRI Basemap (2021) Data source: NSW DFSI (2020)



- Scale 1:175000 at A4
- 0 5,000 10,000 Metres
- Legend**
- Proposed Action Area
 - Road
 - Watercourses
- Development Corridor**
- Development Corridor - Wind Farm
 - Development Corridor - TWA Facility
 - Development Corridor - External Transmission Line
- Landform Classification**
- Level - Gently Inclined
 - Moderately Inclined
 - Steep
 - Very Steep - Precipitous
 - Drainage Lines
 - Crest - Level - Gently Inclined
 - Crest - Moderately Inclined
 - Ridgelines

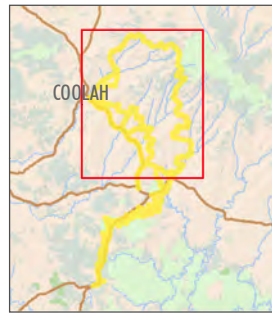
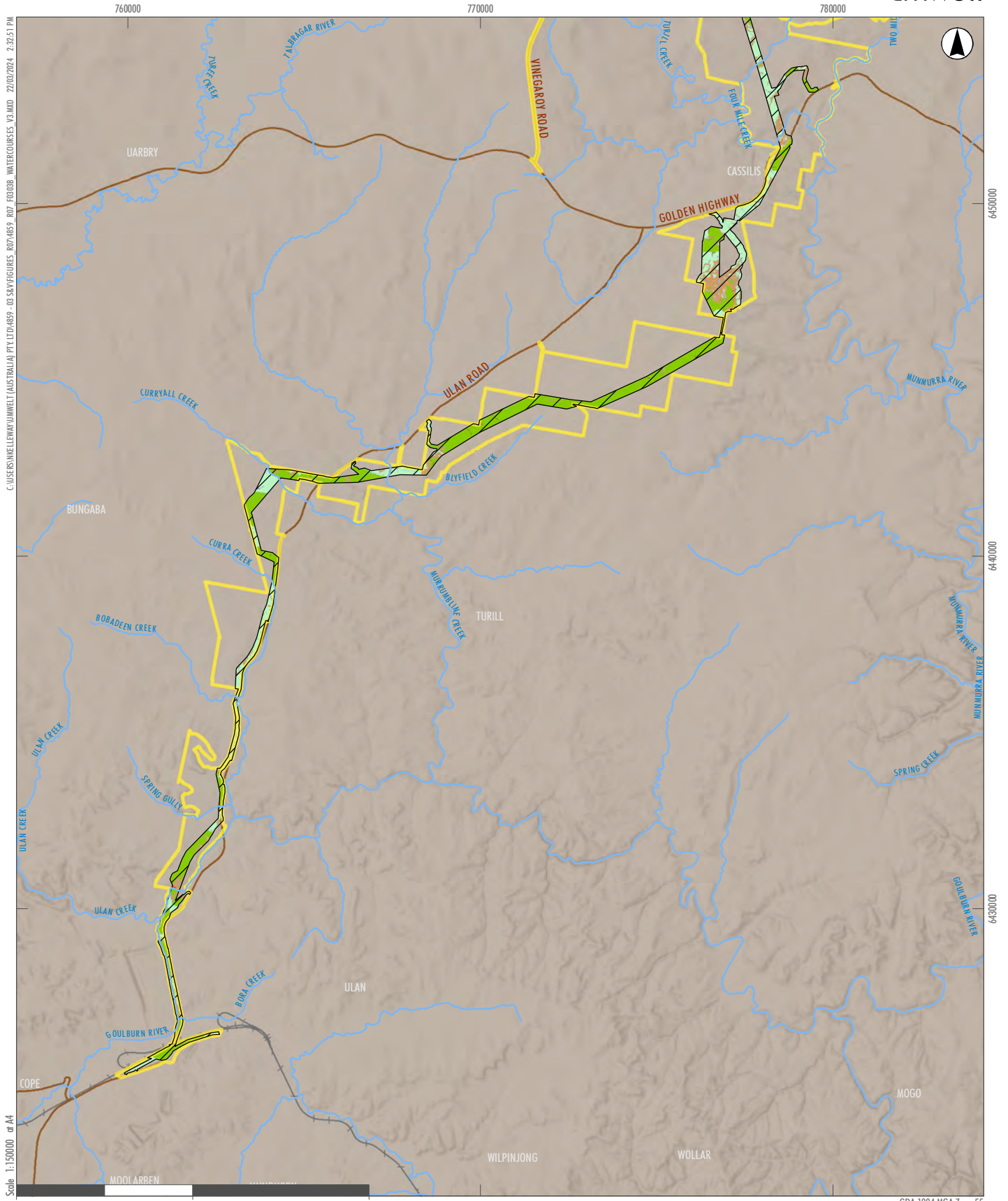


FIGURE 3.3A
Hydrology and Landforms

Image Source: ESRI Basemap (2021) Data source: NSW DFSI (2020)



- Legend**
- Proposed Action Area
 - Road
 - Watercourses
 - Railway
- Development Corridor**
- Development Corridor - Wind Farm
 - Development Corridor - TWA Facility
 - Development Corridor - External Transmission Line
- Landform Classification**
- Level - Gently Inclined
 - Moderately Inclined
 - Steep
 - Very Steep - Precipitous
 - Drainage Lines
 - Crest - Level - Gently Inclined
 - Crest - Moderately Inclined
 - Ridgelines

FIGURE 3.3B
Hydrology and Landforms

Image Source: ESRI Basemap (2021) Data source: NSW DFSI (2020)

Table 3.1 Mitchell Landscapes in Development Corridor

Mitchell Landscape	Description ¹	Estimated over cleared land fraction ²
Meso: Brigalow Belt South Liverpool Range		
Liverpool Tops	<p>Undulating plateau top above 1000 m ASL on Tertiary basalt with steep margins grading down to the Liverpool Range Valleys and Foothills ecosystem, local relief 200 to 500 m. Stony red brown loams, open forest of silvertop stringybark (<i>Eucalyptus laevopinea</i>), manna gum (<i>Eucalyptus viminalis</i>), mountain gum (<i>Eucalyptus dalrympleana</i>) with snow gum (<i>Eucalyptus pauciflora</i>) in cold air drainage hollows. Small areas of dry rainforest in sheltered locations with southern aspects on the eastern end of the range.</p> <p>Dominates the Coolah Tops National Park.</p>	0.25
Liverpool Range Valleys and Foothills	<p>Multiple Tertiary basalt flows with intervening sediments and ash fall material, overlying Jurassic quartz sandstones and shale. Long slopes below the Liverpool Tops ecosystem, general elevation 450 to 1000 m, local relief to 400 m. Shallow stony clay soils on steep slopes grading to deep black earths on lower slopes. Tall wood (<i>Eucalyptus microcorys</i>), blackbutt (<i>Eucalyptus pilularis</i>) and blue gum (<i>Eucalyptus globulus</i>) on basaltic eastern slopes with small areas of vine forest. White box (<i>Eucalyptus albens</i>) with rough-barked apple (<i>Angophora floribunda</i>), belah (<i>Casuarina cristata</i>) in the creeks on northern aspects. Yellow box (<i>Eucalyptus melliodora</i>), manna gum (<i>Eucalyptus viminalis</i>), Blakely's red gum (<i>Eucalyptus blakelyi</i>) and sweet pittosporum (<i>Pittosporum undulatum</i>) on southern aspects. Warm temperate rainforest elements of brown beech (<i>Pennantia cunninghamii</i>) with fern understorey along creek lines at the eastern end of the range. Sandstone gullies with grey gum (<i>Eucalyptus punctata</i>), narrow-leaved stringybark (<i>Eucalyptus sparsifolia</i>), broad-leaved ironbark (<i>E. fibrosa</i> ssp. <i>Fibrosa</i>), currawang (<i>Acacia doratoxylon</i>), forest phebalium (<i>Phebalium ambiens</i>), Australian boxthorn (<i>Bursaria spinosa</i>), and hopbush (<i>Dodonaea</i> sp.). River oak (<i>Casuarina cunninghamiana</i>) along lower streams. Extensive open areas with grasslands merging to the Liverpool Alluvial Plains Ecosystem.</p> <p>Dominates the Development Corridor.</p>	0.81
Coolah Tops	<p>High ridge top plateau remnants on the western end of the Liverpool Range on Tertiary basalt flows. General elevation 1000 to 1250 m, local relief 75 m. Shallow stony self-mulching dark coloured clay loams and clays. Open grasslands with silvertop stringybark (<i>Eucalyptus laevopinea</i>), mountain gum (<i>Eucalyptus dalrympleana</i>), manna gum (<i>Eucalyptus viminalis</i>) and snow gum (<i>Eucalyptus pauciflora</i>) on crests, rough-barked apple (<i>Angophora floribunda</i>), yellow box (<i>Eucalyptus melliodora</i>), apple box (<i>Eucalyptus bridgesiana</i>) and blackwood (<i>Acacia melanoxylon</i>) on lower slopes.</p>	0.61

Mitchell Landscape	Description ¹	Estimated over cleared land fraction ²
Meso: Brigalow Belt South Pilliga		
Cassilis Slopes	Undulating hills with dendritic drainage on sub-horizontal Jurassic and Triassic quartz sandstone, siltstone and shale. General elevation 400 to 600 m, local relief 100 m. Topographically below the Liverpool Range basalts but partly influenced by them on some valley floors. White box (<i>Eucalyptus albens</i>), yellow box (<i>Eucalyptus melliodora</i>), Blakely's red gum (<i>Eucalyptus blakelyi</i>), and rough-barked apple (<i>Angophora floribunda</i>), with grasses.	0.62
Meso: NSW South West Slopes Upper Slopes		
Talbragar – Upper Macquarie Terrace Sands and Gravels	Sandy Quaternary alluvial sediments on the floodplains and terraces of the Talbragar River, general elevation 350 to 500 m, local relief 30 to 40 m. Red-brown and red-yellow earthy sands with some yellow texture-contrast soils on the valley margins. River red gum (<i>Eucalyptus camaldulensis</i>) along the channels, yellow box (<i>Eucalyptus melliodora</i>) and rough-barked apple (<i>Angophora floribunda</i>) with white cypress pine (<i>Callitris glaucophylla</i>) on the plain.	0.93
Meso: Sydney Basin Kerrabee		
Upper Goulburn Valleys and Escarpment	Steep hills and sandstone escarpments with cliffs, rock outcrop and long debris slopes on Permian and Triassic quartz sandstone, lithic sandstone, conglomerate and shale, general elevation 250 to 700 m, local relief to 250 m. Stony coarse textured rubbly earths and harsh texture-contrast soils. Woodland of; grey box (<i>Eucalyptus moluccana</i>), forest red gum (<i>Eucalyptus tereticornis</i>), white box (<i>Eucalyptus albens</i>), yellow box (<i>Eucalyptus melliodora</i>) and grasses. Rainforest elements in protected sites.	0.57
Goulburn River Gorges	Incised gorge with steep slopes through Triassic and Jurassic quartz sandstones, shale and conglomerate, general elevation 250 to 400 m, local relief 80 m. Rock outcrop and stony colluvium with coarse sand matrix on the slopes, sandy alluvium on the valley floor. Slopes carry woodland of red ironbark (<i>Eucalyptus sideroxylon</i>), grey gum (<i>Eucalyptus punctata</i>), blue-leaved stringybark (<i>Eucalyptus 56andowner5656</i>), narrow-leaved stringybark (<i>Eucalyptus sparsifolia</i>), black cypress pine (<i>Callitris endlicheri</i>) and forest oak (<i>Allocasuarina torulosa</i>). Yellow box (<i>Eucalyptus melliodora</i>) and river oak (<i>Casuarina cunninghamiana</i>) along the stream channel.	0.30
Goulburn River Channels and Floodplains	Channel, floodplain terraces and valley foothills on Quaternary alluvium and colluvium, general elevation 150 to 250 m, local relief 30 m. Deep gravelly coarse textured red and brown earths on upper slopes, harsh yellow-brown texture-contrast soils on terraces, gradational and uniform sands and loamy sands on the floodplain. Grassy woodland of white box (<i>Eucalyptus albens</i>), yellow box (<i>Eucalyptus melliodora</i>), forest red gum (<i>Eucalyptus tereticornis</i>) and rough-barked apple (<i>Angophora floribunda</i>).	0.81

¹ Descriptions from Mitchell (2002); ² Estimate of over cleared land status fraction from NSW (Mitchell) Landscapes – Version 3.1 (DPE 2017).

3.1.5 Hydrology

The Proposed Action is located in the Liverpool Ranges and extends across three catchment management areas being the Namoi to the north of the Liverpool Range, the Central West to the south-west and Hunter Central Rivers to the east.

The main waterways in the Proposed Action Area drain in a south-west direction, covering a total catchment area of 1,224 km² at the confluence with the Talbragar River, part of the Macquarie River and Darling River Basin.

In the Proposed Action Area, the Coolaburragundy River is the western most catchment, Talbragar River (central) and Munmurra River (eastern most). The catchments flow south, with the Coolaburragundy River outfalling to the Talbragar River (Macquarie River and Darling River Basin) and Munmurra River outfalling to the Goulburn River (Hunter River catchment) south-east of Cassilis (refer to **Figure 3.3a** and **Figure 3.3b**).



Photo 3.1 View along Coolaburragundy River in the Proposed Action Area

Waterways in the upper ranges near the proposed wind turbines are predominantly first order streams with some second order streams. Named waterways include Coolah Creek, Tureevale Creek, Yarrawonga Creek and Corella Creek (refer to **Figure 3.3a**).

No significant waterbodies or wetlands have been identified within or around the Development Corridor – Wind Farm however, some small stock dams are interspersed across the area.

Wind turbines are predominantly located on higher ground and the access tracks and underground cabling generally follow the higher ground locations. The layout of the wind turbines, the access tracks and underground cabling has been designed to avoid crossing known watercourses where possible.

South of the Golden Highway, there are a number of named watercourses that intersect with the Indicative Development Footprint – External Transmission Line including Ulan Creek, Spring Gully, Bobadeen Creek, Curra Creek, Curyall Creek, Murrumblin Creek and Four Mile Creek just upstream of the confluence with the Munmarra River on Golden Highway near Cassilis. **Photo 3.2** shows an example of a waterway in the south of the Proposed Action Area. One major watercourse, the Goulburn River, intersects with the Indicative Development Footprint – External Transmission Line near Ulan (refer to **Figure 3.3b**). The Goulburn River is a second order stream in this location and has been heavily modified having been re-aligned as part of the nearby mining operations.



Photo 3.2 Waterways intersecting sandstone in the south of the Proposed Action Area

3.1.6 Land Use

The Proposed Action Area is an extensive site covering approximately 51,638.6 ha, extending about 67.5 km from the most northern to the most southern end. The Proposed Action Area north of Rotherwood Road is dominated by primary agricultural land on the valley floor and low rises, with cropping being the dominant activity. Where agricultural practices extend onto the steeper slopes and tabletops, cropping is replaced with stock grazing, including cattle, sheep and goats. The private landowners typically own large rural landholdings and generally either live on their property and run agricultural enterprises or lease their land to other local residents.

Agricultural land use has dominated the local region historically. These practices have resulted in the extensive clearing of native vegetation (refer to **Photo 3.3** and **Photo 3.4**), and those patches that do persist have been permanently degraded. Large patches of remnant vegetation are predominantly restricted to public land (including road reserves and conservation areas), upper slopes and gullies (refer to **Photo 3.5**).



Photo 3.3 Agricultural land use on the lower slopes of the Development Corridor



Photo 3.4 Agricultural land use on the upper slopes and ridges of the Development Corridor – Wind Farm



Photo 3.5 Modified and remnant vegetation on the upper slopes and ridges of the Development Corridor-Wind Farm

The Development Corridor – Wind Farm occurs generally north-east of Vinegaroy Road, Coolah, and north of Rotherwood Road, Cassilis and extends across a series of ridgelines and valleys that are used typically for agricultural purposes such as wool production, sheep and cattle agistment, and cropping. The Development Corridor – Wind Farm is primarily located on freehold land but intersects with several Crown land parcels including road reserves and waterways. The Development Corridor – Wind Farm is primarily rural zoned land (RU1 Primary Production) under the Warrumbungle Local Environmental Plan (LEP) 2013 and Upper Hunter LEP 2013 (refer to **Figure 3.4**).

The Development Corridor – External Transmission Line extends south of the Golden Highway across relatively flat and undulating landscape forms with a mix of sparsely and densely vegetated areas, including conservation areas, road reserves and waterways. Parts of the Development Corridor – External Transmission Line include existing transmission lines (refer to **Photo 3.6**). Open cut mines dominate land use in and around Ulan locality at the southern end of the Development Corridor – External Transmission Line. The Development Corridor – External Transmission Line is primarily rural zoned land (RU1 Primary Production) under the Upper Hunter LEP 2013 and Mid-Western Regional LEP 2012. Other land zonings include: RU3 Forestry, C1 National Parks and Nature Reserves, C3 Environmental Management and SP2 Infrastructure (refer to **Figure 3.4**).

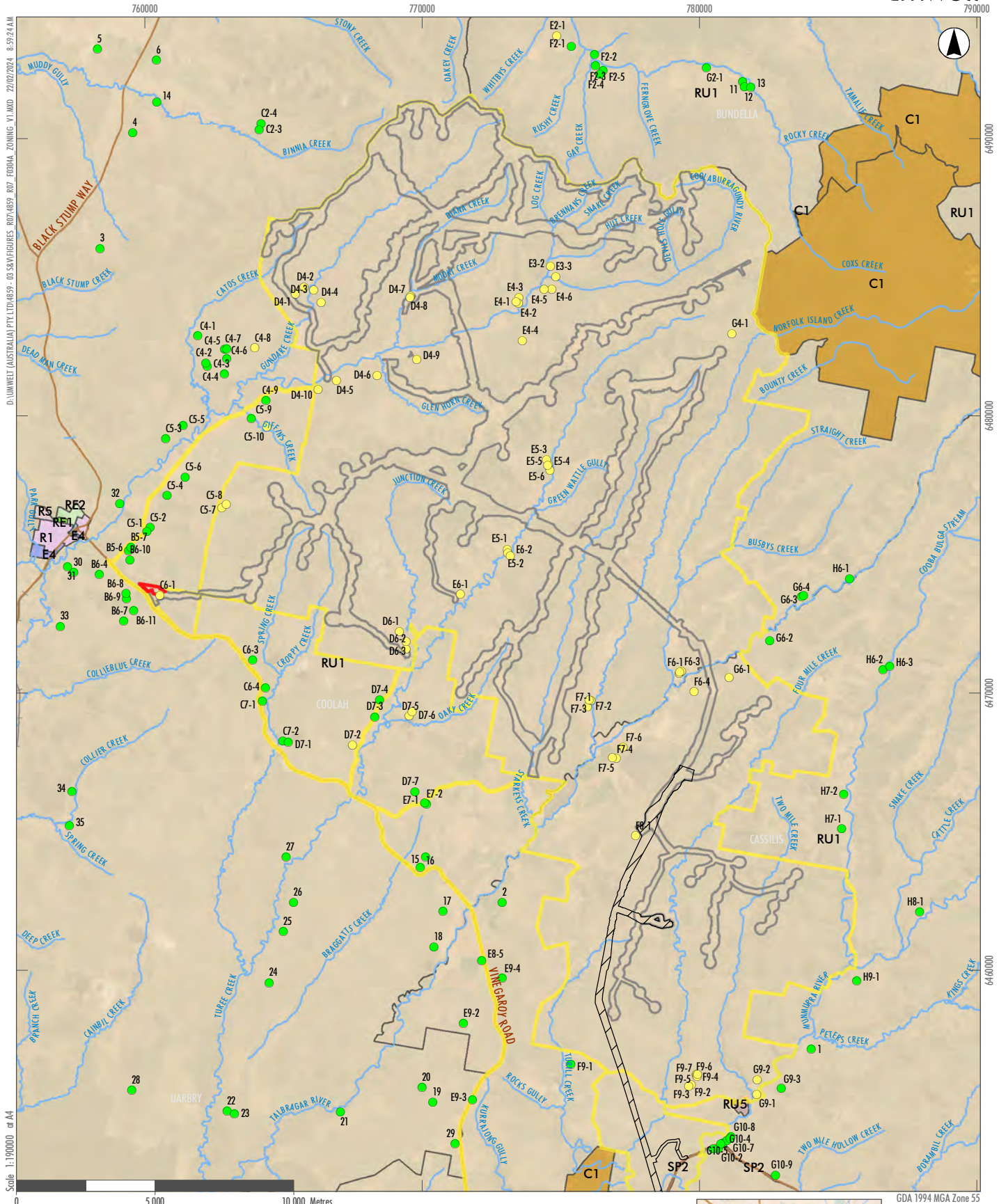


Photo 3.6 Existing transmission line

The key public roads that intersect with the Proposed Action Area include Vinegaroy Road, Coolah Creek Road, Turee Vale Road, Rotherwood Road, Coolah Road and Ulan Road.

The Development Corridor intersects with a mixture of freehold and Crown lots. A full list of all land parcels are provided in the Schedule of Land (refer to **Appendix C**). There are 115 residences (59 associated residences and 56 non-associated residence) located within 5 km of a proposed wind turbine (refer to **Figure 3.4a**).

The townships of Coolah and Cassilis are the most proximal communities to the Proposed Action. With a population of 1,262, Coolah is a small rural town in the north-eastern corner of the Warrumbungle LGA. The Coolah community is largely based around farming with the two largest industries of employment being beef cattle farm and sheep beef cattle farming (Umwelt 2023e), although historically the area also had a large timber industry. Cassilis, with a population of 278, is a small heritage-listed village located on the western fringe of the Upper Hunter Shire Council LGA. Farming is the main employer in the town with the two largest industries of employment the same as nearby Coolah.



Legend

- Proposed Action Area
- Road
- Watercourses
- Non-associated Dwelling
- Associated Dwelling
- Development Corridor**
- Development Corridor - Wind Farm
- Development Corridor - TWA Facility
- Development Corridor - External Transmission Line

Zoning

- C1, National Parks and Nature Reserves
- E1, Local Centre
- E4, General Industrial
- R1, General Residential
- R5, Large Lot Residential
- RE1, Public Recreation
- RE2, Private Recreation
- RU1, Primary Production
- RU5, Village
- SP2, Infrastructure

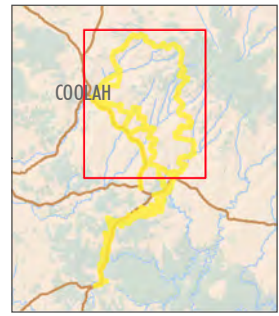
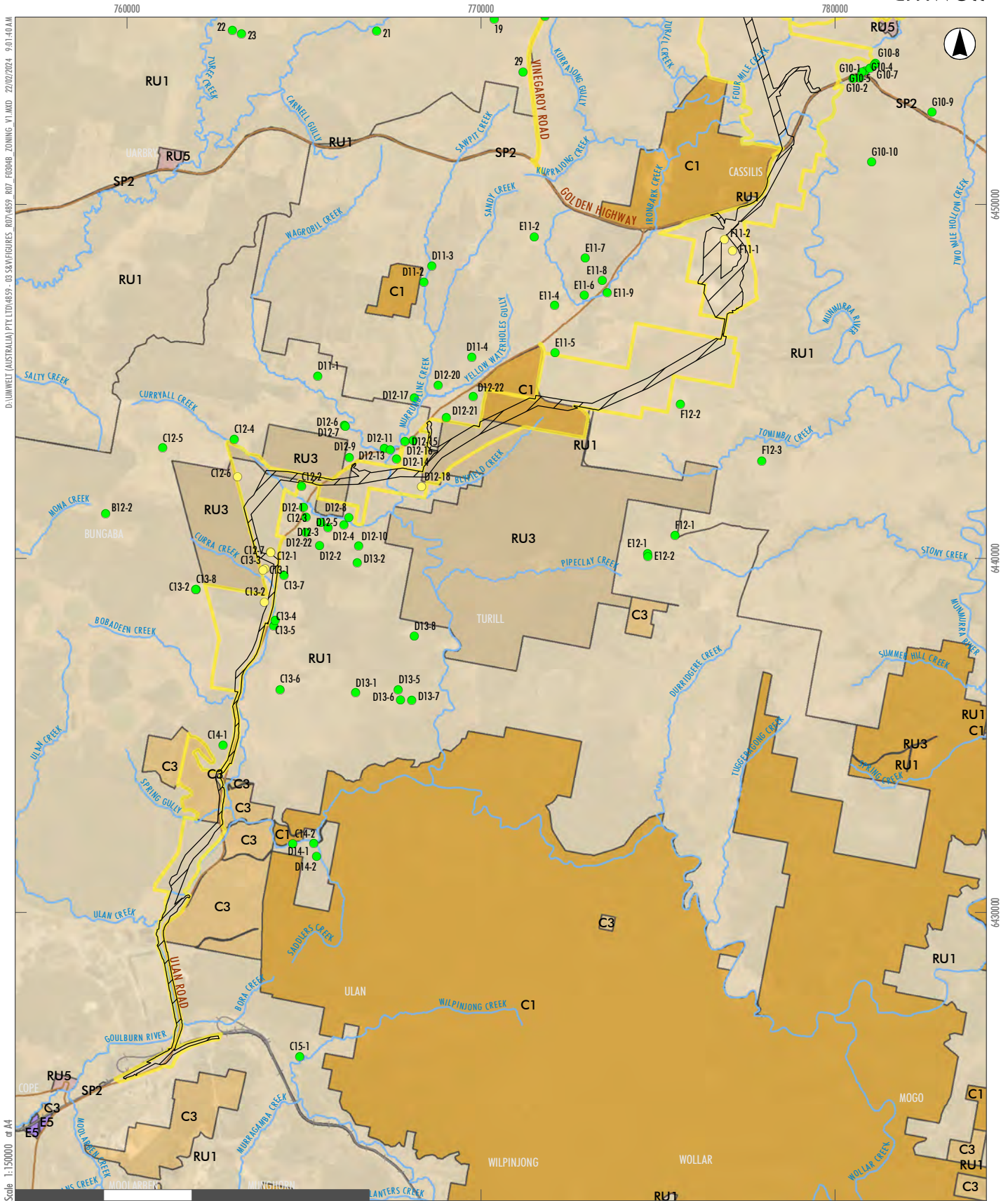


FIGURE 3.4A
Land Zoning

Image Source: ESRI Basemap (2021) Data source: NSW DFSI (2020)



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Legend

- | | |
|---|---|
| <ul style="list-style-type: none"> Proposed Action Area Road Watercourses ● Non-associated Dwelling ● Associated Dwelling Development Corridor Development Corridor - Wind Farm Development Corridor - TWA Facility Development Corridor - External Transmission Line | <p>Zoning</p> <ul style="list-style-type: none"> C1, National Parks and Nature Reserves C3, Environmental Management E5, Heavy Industrial RU1, Primary Production RU3, Forestry RU5, Village SP2, Infrastructure |
|---|---|

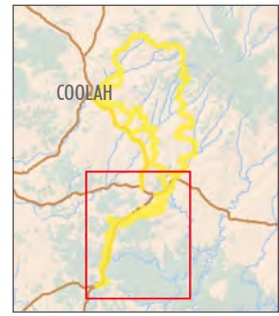


FIGURE 3.4B
Land Zoning

Image Source: ESRI Basemap (2021) Data source: NSW DFSI (2020)

3.1.7 Protected Areas

The Proposed Action Area is largely dominated by agricultural land use however there are a number of conservation areas protected under the NSW *National Parks and Wildlife Act 1974* (NPW Act) and managed by the NSW National Parks and Wildlife Service within or immediately adjacent to the Proposed Action Area.

The dominant conservation area in the vicinity is the Coolah Tops National Park located to the north-east of the Proposed Action Area (refer to **Figure 3.1**). Coolah Tops National Park is located at the junction of the Liverpool Range and the Warrumbungle Range and forms the upper catchment boundary of the Central West, Namoi and Hunter-Central Rivers catchments. The Coolah Tops National Park was reserved in 1996 including the former Bundella and Warung State Forests and some areas previously cleared for agriculture.

The Coolah Tops National Park is an isolated basaltic plateau in an otherwise lower and largely cleared landscape with most of the park above 1,000 m ASL. The Coolah Tops National Park is dominated by the Liverpool Tops Mitchell Landscape grading into the Liverpool Range Valleys and Foothills Mitchell Landscape (refer to **Figure 3.1** and **Table 3.1**).

The Coolah Tops National Park contains old growth areas of snow gum (*Eucalyptus pauciflora*), mountain ribbon gum (*Eucalyptus nobilis*) and silvertop stringybark (*Eucalyptus laevopinea*) (EcoLogical 2019). EcoLogical recently mapped vegetation in the Coolah Tops National Park to inform management practices and identified five Plant Community Types (PCTs) that account for more than 80 per cent of the total area, namely (EcoLogical 2019):

- PCT 490 Silvertop Stringybark – Forest Ribbon Gum very tall moist open forest, covering 32 per cent.
- PCT 492 Silvertop Stringybark – Yellow Box – Apple Box – Rough-barked Apple shrub grass open forest, covering 18 per cent.
- PCT 494 Snow Gum – Mountain Gum – Silver Wattle tall open forest, covering 15 per cent.
- PCT 393 White box shrubby woodland, covering 10 per cent.
- PCT 1551 Forest Ribbon Gum – Snow Gum – Snow Grass grassy open forest, covering 5 per cent.

The dominant vegetation class of the Coolah Tops National Park was New England Grassy Woodlands and dominant formation was grassy woodlands (EcoLogical 2019).

Coolah Tops National Park provides habitat for a large population of greater gliders (*Petauroides volans*) and has records of the critically endangered regent honeyeater (*Anthochaera phrygia*) and vulnerable large-eared pied bat (*Chalinolobus nigrogriseus*) from the 1990s (NPWS 2002). Recent preliminary thermal drone and dog surveys have identified a population of 42 koalas (*Phascolarctos cinereus*) in the Coolah Tops National Park and adjoining land (DPE 2023b).

Recently, NPWS presented to the Coolah District Development Group the methods and results of thermal drone surveys that they undertook within the Coolah Tops National Park (pers. Comm Tilt Renewables 2023). The full details of this survey program are unknown, however it is understood to have covered approximately 10-15 per cent of the Coolah Tops National Park (pers. Comm Tilt Renewables 2023).

The NPWS survey program identified the following threatened fauna species (pers. Comm Tilt Renewables 2023):

- Koala (42 individuals), with extrapolation of these results it is estimated that approximately 100 koala individuals reside in the Coolah Tops National Park.
- Greater glider (1,358 individuals).

The Development Corridor – External Transmission Line intersects with large tracts of native vegetation in and around Durrigere State Conservation Area and Community Conservation Area Zone 3 in the locality of Turill (refer to **Figure 3.1**), and through remnant vegetation in private land holdings to the north of Ulan, NSW.

Durrigere State Conservation Area comprises six disconnected portions of land, extending about 6,172 ha of mostly dry sclerophyll forest with undisturbed rocky rises and a patch of rainforest vine thicket (NPWS 2014). It was previously used for hardwood timber harvesting (Curryall State Forest and Durrigere State Forest) up until it was reserved in December 2005. Durrigere State Conservation Area provides habitat for a number of listed threatened birds and mammals including the EPBC Act listed painted honeyeater (*Grantiella picta*), Corben’s long-eared bat (*Nyctophilus corbeni*) and the large-eared pied bat (*Chalinolobus dwyeri*) (NPWS 2014).

At the southern end of the Development Corridor – External Transmission Line there are a number of protected areas in the locality, but not within the Development Corridor, including:

- Goulburn River State Conservation Area (The Drip Gorge) and adjoining Goulburn River National Park are located to the east of Ulan Road (refer to **Figure 3.1**).
- Munghorn Gap Nature Reserve.

Goulburn River National Park covers about 74,129 ha within the Sydney Basin Bioregion and partly in Brigalow Belt South Bioregion. The Goulburn River National Park conserves woodlands and forests associated with sandstone plateau and is known to provide habitat for the brush-tailed rock wallaby (*Petrogale penicillata*), New Holland mouse (*Pseudomys novaehollandiae*), large-eared pied bat (*Chalinolobus dwyeri*), swift parrot (*Lathamus discolor*), regent honeyeater (*Anthochaera phrygia*) and malleefowl (*Leipoa ocellata*) (NPWS 2003b).

In 2022, the Collaborative Australian Protected Areas Database (CAPAD) calculated that in NSW about 10.19 per cent of the state was subject to terrestrial protection (DCCEEW 2022a). In 2022, 8.96 per cent of the Brigalow Belt South bioregion in NSW was within terrestrial protected areas with 53,428 ha in gazetted national parks, 124,278 in nature reserves and 1,158 ha in state conservation areas (DCCEEW 2022a) (refer to **Table 3.2**). In 2022, 2,718 ha of the Brigalow Belt South Bioregion was under biodiversity stewardship agreements (DCCEEW 2022a). The Coolah Tops National Park and a large part of Durrigere State Conservation Area are within the Brigalow Belt South Bioregion.

The remainder of Durrigere State Conservation Area is within the Sydney Basin bioregion. In 2022, about 45.78 per cent of the Sydney Basin Bioregion was protected in terrestrial reserves, including 9,142 ha in biodiversity stewardship agreements, 1,293,188 ha in national park, 30,330 ha in nature reserves and 152,732 ha in state conservation areas (DCCEEW 2022a).

Table 3.2 Terrestrial Protected Areas by Bioregion and Subregion

IBRA region/ subregion	Area in NSW (ha)	Area protected (ha)	Percentage of protected area in bioregion / subregion
Brigalow Belt South Bioregion	5,623,054	503,807	8.96
Liverpool Range Subregion	541,960	23,199	2.25
Pillaga Subregion	1,732,137	287,676	16.61
Sydney Basin Bioregion	3,622,939	1,528,942	42.20
Kerrabee Subregion	437,384	200,256	45.78

Source: DCCEEW 2022a.

The conservation lands described above provide important habitat for protected and threatened fauna with a large number of threatened species records in the locality occurring within the conservation lands.

3.1.8 Corridors and Connectivity

The Proposed Action Area is located in a setting that has been extensively disturbed as a result of a long history of agricultural land uses with remnant vegetation now associated mainly with road reserves and upper slopes and ridgetops (refer to **Section 3.1.6** for further information). Fauna habitats include open pasture and native grassland with scattered remnant trees, open woodland, dry forest and riparian/aquatic zones. The woodland and forest habitats support hollow-bearing trees, fallen timber and rocky outcrops. Habitat condition is variable due to disturbance history and current land management.

Figure 3.1 shows the landscape features in the Proposed Action Area including location of the Development Corridor relative to conservation reserves, watercourses and habitat corridors.

Habitat corridors within the Development Corridor – Wind Farm have been previously compromised by agricultural land use including long term grazing of cattle, sheep and goats, cropping, logging and clearing. Connectivity from the Development Corridor – Wind Farm to remnant vegetation to the north and east is along the ridgelines however even these patches have been degraded to varying degrees due to the long history of agriculture. The Proposed Action will remove habitat within some of these corridors.

Remnant vegetation and corridors occur to the north and east of the Development Corridor – Wind Farm on private land holdings and in tall montane forests on the basaltic plateau of the Coolah Tops National Park. The biodiversity values of Coolah Tops National Park are described above in **Section 3.1.6**.

The Development Corridor – External Transmission Line intersects with large tracts of native vegetation in and around Durrigere State Conservation Area, Community Conservation Area Zone 3 in the locality of Turill, and through remnant vegetation in private land holding to the north of Ulan.

Towards the south end of the Development Corridor – External Transmission Line, the Development Corridor is located in remnant vegetation that is continuous with the Goulburn River State Conservation Area (The Drip Gorge) and adjoining Goulburn River National Park, to the east of Ulan Road.

The southern end of the Development Corridor – External Transmission Line is just to the north of the Mudgee-Wollar Important Bird Area (IBA). The Mudgee-Wollar IBA covers about 162,656 ha of land in and around Goulburn River National Park (about 70,323 ha), Munghorn Gap Nature Reserve (about 5,934 ha) and private land west to Gulgong and Mudgee (Birdlife International 2023a). The site was identified as important in 2009 because it was regularly supporting significant populations of a number of threatened birds including the critically endangered (EPBC Act) regent honeyeater (*Anthochaera phrygia*) which was identified as a resident species (1996-2006) with population estimate of 50 individuals (Birdlife International 2023). Other threatened birds known from the Mudgee-Wollar IBA are the vulnerable (EPBC Act) painted honeyeater (*Grantiella picta*) (considered a regular breeding visitor) and the critically endangered (EPBC Act) swift parrot (*Lathamus discolor*) (occasional records).

Immediately to the south of and contiguous with the Mudgee-Wollar IBA is the Greater Blue Mountains IBA which covers 1,040,407 ha, which includes the whole Greater Blue Mountains World Heritage Area comprising eight protected areas including most of the Hawkesbury Sandstone massif inland of Sydney (Birdlife International 2023b).

3.2 Ecological Investigations

3.2.1 Overview

Extensive ecological surveys have been completed since 2012 till 2023 in the Proposed Action Area to assess the Referred Action and changes in layout and design for the Proposed Action. These extensive ecological surveys were completed initially (prior to 2020) by NGH Environmental (NGH), and since 2020 by Umwelt.

Surveys were completed by NGH for the Approved Action, as part of the original development application under the EP&A Act and the original referral under the EPBC Act, across multiple months and years (NGH 2013a, 2013b and 2017). The timing and nature of each survey is summarised in **Section 3.2.2.1**.

Surveys have been completed by Umwelt since early 2020. The timing and nature of each survey is summarised in **Section 3.2.2.2**. Surveys undertaken by Umwelt have been undertaken in accordance with the BAM (DPIE 2020a) as required under the Biodiversity Offset Scheme established under the BC Act.

The Proposed Action meets the definition of a Linear-shaped Development under BAM (DPIE 2020a), being “development that is generally narrow and extends across the landscape...”. The extent of the Proposed Action spans approximately 66 km from its northern to southern tip with the majority of the Development Corridor consisting of linear corridors.

The site context of the Indicative Development Footprints was calculated by assessing the native vegetation cover and patch size within the Indicative Development Footprints in accordance with Section 4.33 of the BAM (DPIE 2020a). A 500 m buffer area was determined based on the outer extent of the Indicative Development Footprints. The buffer covers the full extent of all works associated with the Proposed Action and includes the full extent of the Development Corridor. Native vegetation cover was mapped within the buffer area using several regional vegetation mapping products in combination with manual GIS mapping updates to ensure consistency.

Ecological survey approach was developed in consultation with the NSW Biodiversity Conservation and Science Directorate (BCS) of the Environment and Heritage Group in the NSW DCCEEW, as well as the Commonwealth DCCEEW. A key component of the agency consultation was to discuss the application of the BAM to the targeted threatened species survey strategy in light of the existing State and Federal approvals. Following consultation with the former DPIE and BCS, it was agreed that the application of BAM requirements for species-credit species would only be required within sections of the Development Corridor where it occurred substantially outside the Approved Development Corridor. The approach and survey methodology are described in full in Section 2 of the BDAR (Umwelt 2023a) provided in **Appendix D**.

Since public exhibition of the NSW Mod-1 Application (and associated BDAR (Umwelt 2022a), additional surveys have been completed for changes to the Action.

Weather conditions and survey limitations for surveys completed since 2020 for the Proposed Action are described in Section 2.5.4 of the BDAR (refer to **Appendix D**).

3.2.2 Field Survey Methodology

3.2.2.1 Ecology Surveys as part of the Approved Action

Extensive ecological surveys were completed by NGH for the Approved Action, as part of the original development application under the EP&A Act and the original referral under the EPBC Act, across multiple months and years:

- 2012 to 2013 for the original biodiversity assessment for the wind farm project and transmission line project – extensive field program including vegetation mapping and targeted flora and fauna surveys. Described in detail in NGH 2013a and 2013b and summarised in **Table 3.3**.
- March 2015 for biodiversity assessment of new areas of transmission line focused on Turill State Forest and the Durrigere State Conservation Area. Described in NGH 2017 and summarised in **Table 3.3**.
- October 2016 for biodiversity assessment of new areas of wind farm and transmission line. Rapid survey that involved vegetation mapping, targeted threatened flora transects and recording fauna habitat values. Described in NGH 2017 and summarised in **Table 3.3**.

The timing and nature of each survey is summarised in **Table 3.3**. The survey effort completed by NGH for the wind farm and transmission line study areas of the Approved Action is provided in **Table 3.4**.

The location of surveys by NGH are shown in **Figure 3.5**.

Table 3.3 Summary of Survey Effort by NGH 2012–2016

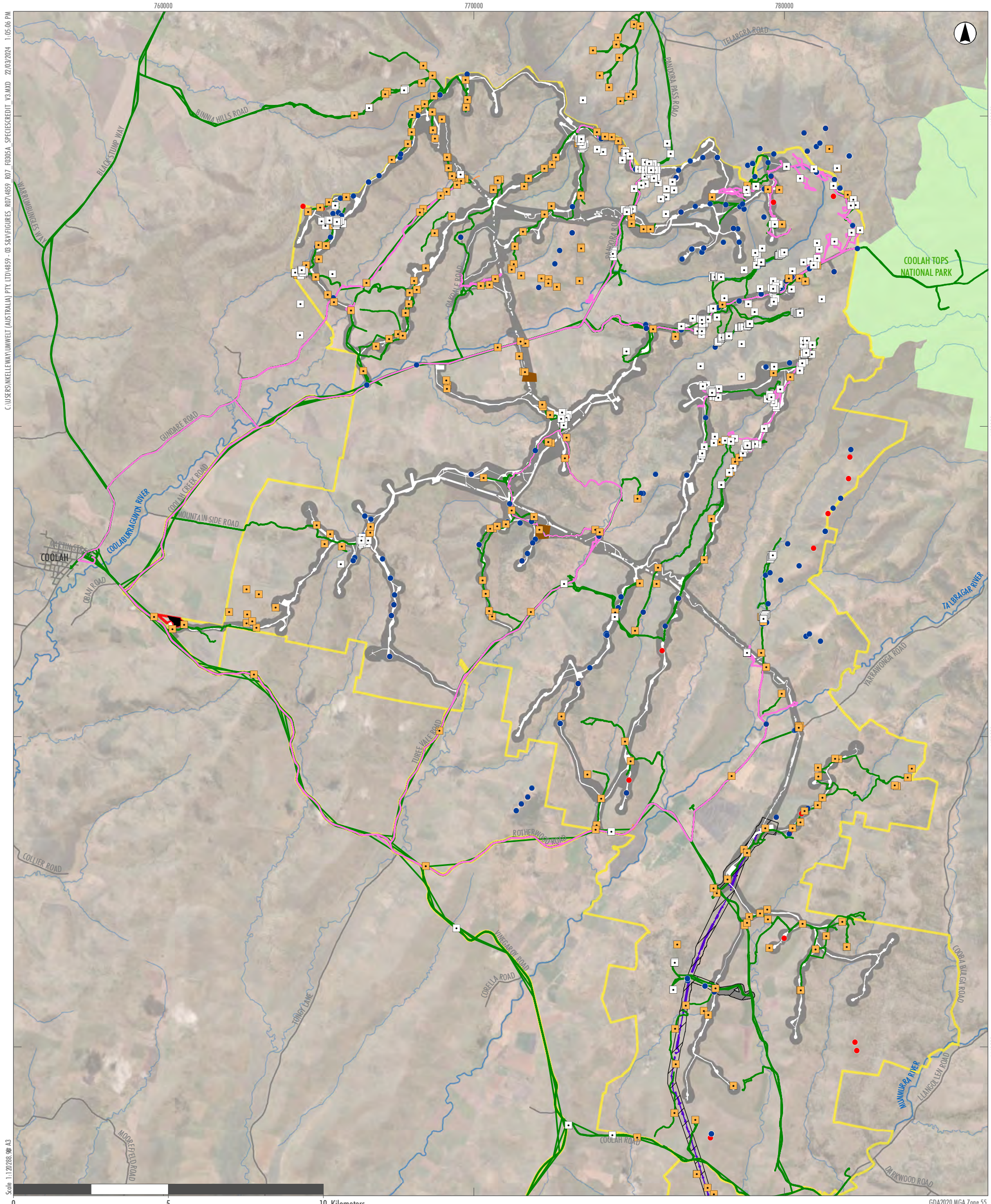
Date	Flora	Fauna
8–19 October 2012	Random meanders, including targeted searches for all potential species	Habitat assessment, including hollow-bearing tree survey
		Bird survey
		Herpetofauna search, targeting pink-tailed worm-lizard (<i>Aprasia parapulchella</i>)
		Bird utilisation survey
	Inspection searches	Extended herpetofauna search

Date	Flora	Fauna
		Nocturnal survey, including stag watching / evening listening, spotlighting (on foot and vehicle based) and call playback.
		Anabat
1–9 October 2013	Random meanders, including targeted searches for all potential species	Habitat assessment, including hollow-bearing tree survey
		Bird survey
		Herpetofauna search
		Bird utilisation survey
	Inspection searches	Extended herpetofauna search
		Nocturnal survey, including stag watching / evening listening, spotlighting (on foot and vehicle based) and call playback.
		Anabat
		Remote Infrared Survey Camera
20–23 March 2015	Flora plots / random meanders	Habitat assessment and hollow-bearing tree survey
		Bird utilisation survey
	Biometric plots	Nocturnal survey, including spotlighting (on foot), call playback
		Anabat
4–6 October 2016	Rapid vegetation assessments and survey points	Key habitat feature assessment
	Random meanders	

Table 3.4 Survey Effort Summary October 2012, 2013, March 2015, October 2016

Survey Technique	Target species	No of surveys	Effort (hours)
Flora			
Random meanders including targeted flora searches	All flora species	316	139.1
Inspection searches	All flora species	166	27.7
Biometric plots	All flora species	2	1.5
Fauna			
Habitat assessment, including hollow-bearing tree survey	All species	230	76.7
Bird survey	All birds	220	36.7
Herpetofauna search	All reptiles	214	35.7
Bird utilisation survey	All birds	84	41.3
Extended herpetofauna search	All species	39	19.5
Nocturnal survey – stagwatching	All nocturnal fauna	36	24
Nocturnal survey – spotlighting on foot	All nocturnal fauna	39	75
Nocturnal survey – spotlighting vehicle based	All nocturnal fauna	30	30
Nocturnal survey – call playback	All nocturnal fauna	34	23
Anabat	Microchiropteran bats	57	456
Remote Cameras	All nocturnal fauna	67	536

Source: NGH (2017).



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- Legend**
- Proposed Action Area
 - Development Corridor**
 - Development Corridor - Wind Farm
 - Development Corridor - TWA Facility
 - Development Corridor - External Transmission Line
 - Indicative Development Footprints**
 - Indicative Development Footprint - Wind Farm
 - Indicative Development Footprint - TWA Facility
 - Indicative Development Footprint - External Transmission Line
 - Indicative Development Footprint - Public Road Upgrades

- Road
- Drainage Line
- National Parks (NPWS Estate)
- Umwelt General Vegetation Assessment - January 2023
- Umwelt Flora Survey
- Umwelt Fauna Survey
- Umwelt Flora Survey Tracks
- Umwelt Fauna Survey Tracks
- NGH Environmental Flora Plots
- NGH Environmental Fauna Survey

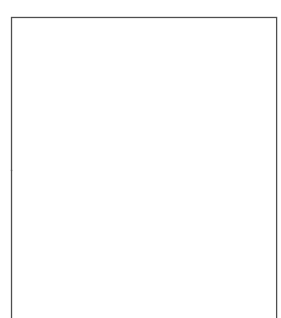
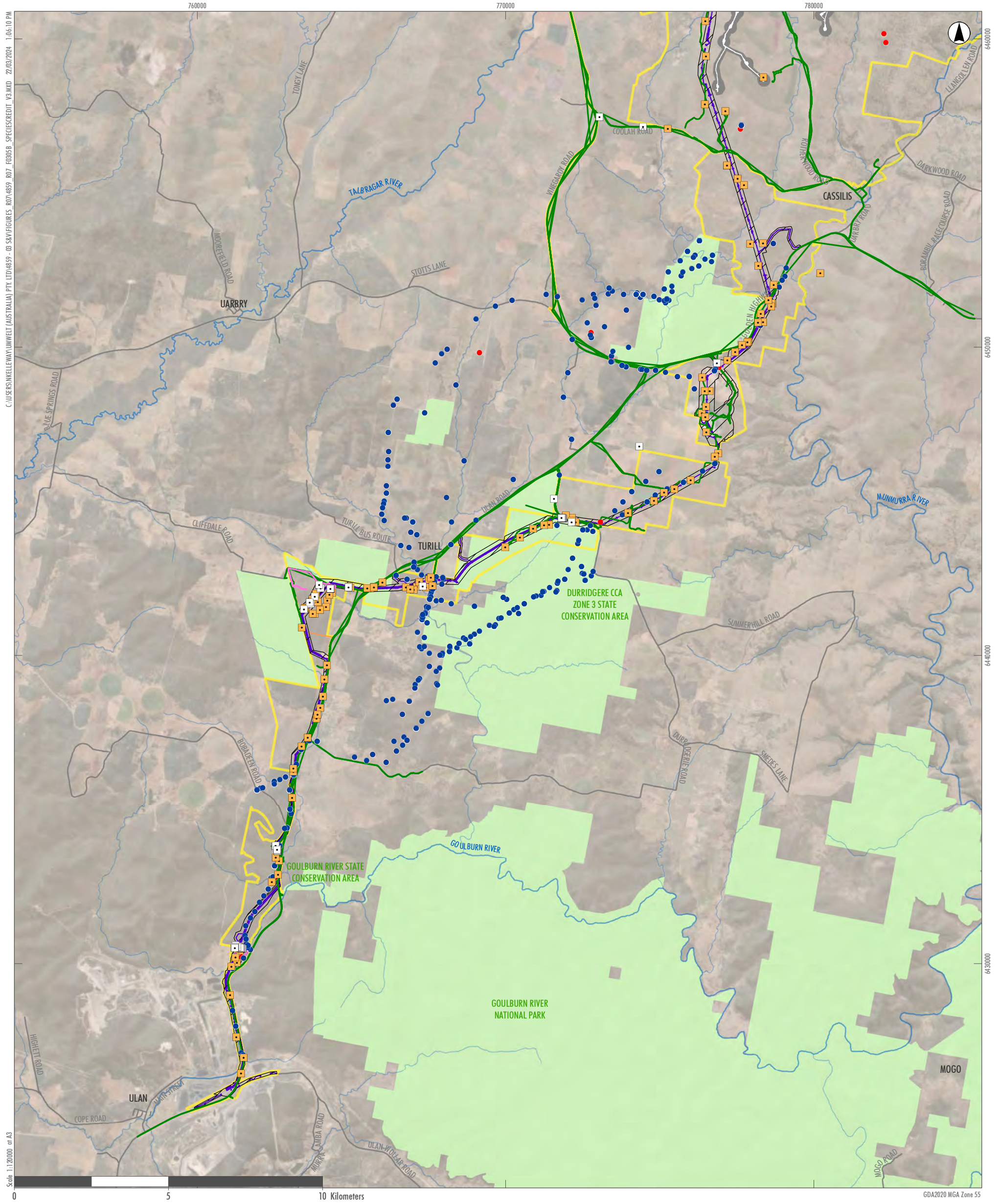


FIGURE 3.5A
Species-credit Survey Effort
(Umwelt and NGH Environmental)



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Legend

- Proposed Action Area
- Development Corridor**
- Development Corridor - Wind Farm
- Development Corridor - TWA Facility
- Development Corridor - External Transmission Line
- Indicative Development Footprints**
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - TWA Facility
- Indicative Development Footprint - External Transmission Line
- Indicative Development Footprint - Public Road Upgrades
- Road
- Drainage Line
- National Parks (NPWS Estate)
- Umwelt Flora Survey
- Umwelt Fauna Survey
- Umwelt Flora Survey Tracks
- Umwelt Fauna Survey Tracks
- NGH Environmental Flora Plots
- NGH Environmental Fauna Survey

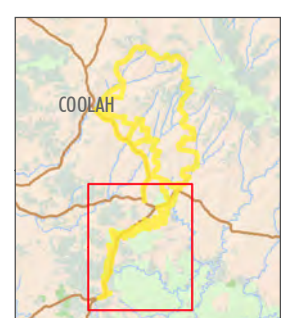


FIGURE 3.5B

**Species-credit Survey Effort
(Umwelt and NGH Environmental)**

Image Source: ESRI Base map (2022) Data source: NSW DSFI (2021), (NGH Environmental 2013a, 2013b and 2017)

3.2.2.2 Ecological Surveys as part of the Proposed Action

Ecological surveys for the Proposed Action have been completed by Umwelt in accordance with the BAM (DPIE 2020a) over the course of 2020 to 2023. A summary of the surveys completed for the Proposed Action is provided in the sections below, with more details provided in Section 2 of the BDAR (Umwelt 2023a) provided in **Appendix D**.

Key Government Guidelines and Resources

Key Government guidelines and resources used in completion of the biodiversity assessment and preparation of the BDAR include:

- Biodiversity Assessment Method (DPIE, 2020a).
- Biodiversity Assessment Method Operational Manual (Stage 2) (DPIE 2019a).
- Biodiversity Assessment Method Credit Calculator.
- Surveying threatened plants and their habitats, NSW survey guide for the Biodiversity Assessment Method (DPIE 2020b) and prior to April 2020 its predecessor NSW Guide to Surveying Threatened Plants (OEH 2016).
- Survey Guidelines for Australia's Threatened Orchids (DoEE 2013).
- 'Species Credits' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (OEH 2018).
- NSW Survey Guide for Threatened Frogs (DPIE 2020d).
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft) (DEC 2004).
- Guidance to assist a decision-maker to determine a serious and irreversible impact (DPIE 2019b).
- Vegetation Information System (VIS) Classification Database.
- Koala (*Phascolarctos cinereus*) Biodiversity Assessment Method Survey Guide (DPE 2022a).
- Koala Habitat Protection Guideline. Implementing State Environmental Planning Policy (Koala Habitat Protection) 2019 (DPIE 2020c).
- Survey guidelines for Australia's threatened birds. Guidelines for detecting birds listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010a).
- Survey guidelines for Australia's threatened bats. Guidelines for detecting bats listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010b).
- Survey guidelines for Australia's threatened mammal. Guidelines for detecting mammals listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (DSEWPaC 2011a).

The appropriate licences required to undertake the surveys are as follows:

- NSW Scientific Licence SL100198.
- NSW Animal Research Authority Licence No. 19/2103.

Category 1 Exempt Land Mapping

Under Section 6.8(3) of the BC Act, the assessment of the impacts, under the BAM (DPIE 2020a), of the clearing of native vegetation and loss of habitat on Category 1 exempt land, other than impacts prescribed by the Biodiversity Conservation Regulation 2017, are excluded from the NSW Biodiversity Offset Scheme (BOS).

Category 1 exempt land is defined in Section 60H of the NSW LLS Act as:

- land cleared of native vegetation as at 1 January 1990 or lawfully cleared of native vegetation after 1 January 1990
- land containing low conservation value grasslands or native vegetation identified as regrowth in a property vegetation plan or land prescribed by the regulations as Category 1 exempt land
- land is biodiversity certified under Part 8 of the BC Act.

A description of the methodology used to map Category 1 exempt land is provided in Section 2.1 of **Appendix D**.

Floristic and Vegetation Integrity Surveys

A total of 126 BAM Vegetation Integrity Plots have been conducted in accordance with the BAM (DPIE 2020a) including 85 for the Referred Action and an additional 41 completed in 2023 in response to a request from BCS as part of the Proposed Action. These BAM Vegetation Integrity Plots were undertaken over the following survey periods:

- 4 to 8 May 2020
- 15 to 19 June 2020
- 14 August 2020
- 18 to 22 January 2021
- 10 to 14 May 2021
- 20 to 24 September 2021
- 16 to 19 May 2023
- 23 to 25 May 2023.

Reference was made to the Vegetation Information System (VIS) Classification Database to identify PCTs, as well as reviews of other regional and local vegetation mapping and reporting when designing the field survey. The PCTs were stratified into condition states following the initial field survey of the site to determine the appropriate number of BAM Vegetation Integrity Plots required in accordance with the BAM (DPIE 2020a).

At each BAM Vegetation Integrity Plots, data was recorded in accordance with the BAM (DPIE 2020a) guidelines. Vegetation Integrity Plot locations to sample variation in vegetation condition across the zone were selected in keeping with guidance in the BAM (DPIE 2020a) that is away from ecotones, roads, disturbed areas or the zone boundary.

To ensure that the full extent of biodiversity assessment work undertaken for the Proposed Action has been included in the assessment, all BAM Vegetation Integrity Plots have been used including those not located in the Indicative Development Footprint. A number of BAM Vegetation Integrity Plots occur outside of the Indicative Development Footprint as a result of numerous design changes to the Proposed Action, some of which have occurred as direct avoidance and minimisation efforts relating to biodiversity values.

Table 3.5 provides a summary of the BAM Vegetation Integrity Plots requirement as set out in the BAM (DPIE 2020a) guidelines for each vegetation zone. The number of required BAM Vegetation Integrity Plots is determined by the area of each vegetation zone. While not required in accordance with the BAM (DPIE 2020a), BCS required that the BAM Vegetation Integrity Plot requirement was completed based on the area of each vegetation zone within each of the three IBRA Subregions. In doing so, a small shortfall of BAM Vegetation Integrity Plots for four (out of 18) vegetation zones occurred.

Further information on the survey approach and adequacy of survey coverage and sampling is provided in Section 2.4.3 in **Appendix D**.

Table 3.5 Adequacy of BAM Vegetation Integrity Plots

Veg Zone	PCT	Condition	Plots Required	Plots Completed	Complies with NSW BAM requirements?
1	PCT 84 – River Oak – Rough-barked Apple – red gum – box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion.	Moderate/ Good	5	4	Short 1 plot
2	PCT 281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion.	Moderate/ Good	6	6	Complies
4	PCT 479 – Narrow-leaved Ironbark- Black Cypress Pine – stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion.	Moderate/ Good	5	5	Complies

Veg Zone	PCT	Condition	Plots Required	Plots Completed	Complies with NSW BAM requirements?
5	PCT 481 – Rough-barked Apple – Blakely’s Red Gum – Narrow-leaved Stringybark +/- Grey Gum sandstone riparian grass fern open forest on in the southern Brigalow Belt South Bioregion and Upper Hunter region.	Moderate/ Good	5	5	Complies
6	PCT 483 – Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley.	Moderate/ Good	5	6	Exceeds
7	PCT 483 – Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley.	Low	14	17	Exceeds
8	PCT 483 – Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley.	Low Condition Derived Native Grassland	14	10	Short 4 plots
9	PCT 488 – Silvertop Stringybark – Yellow Box +/- Nortons Box grassy woodland on basalt hills mainly on northern aspects of the Liverpool Range, Brigalow Belt South Bioregion.	Moderate/ Good	6	7	Exceeds
10	PCT 488 – Silvertop Stringybark – Yellow Box +/- Nortons Box grassy woodland on basalt hills mainly on northern aspects of the Liverpool Range, Brigalow Belt South Bioregion.	Moderate/ Good-Shrubby	1	2	Exceeds
11	PCT 488 – Silvertop Stringybark – Yellow Box +/- Nortons Box grassy woodland on basalt hills mainly on northern aspects of the Liverpool Range, Brigalow Belt South Bioregion.	Low	10	19	Exceeds
12	PCT 488 – Silvertop Stringybark – Yellow Box +/- Nortons Box grassy woodland on basalt hills mainly on northern aspects of the Liverpool Range, Brigalow Belt South Bioregion.	Exotic	10	11	Exceeds
13	PCT 490 – Silvertop Stringybark – Forest Ribbon Gum very tall moist open forest on basalt plateau on the Liverpool Range, Brigalow Belt South Bioregion.	Moderate/ Good	3	3	Complies
14	PCT 495 – Brittle Gum – Silvertop Stringybark grassy open forest of the Liverpool Range, Brigalow Belt South Bioregion.	Moderate/ Good	4	3	Short 1 plot
15	PCT 1661 – Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin.	Moderate/ Good	5	9	Exceeds

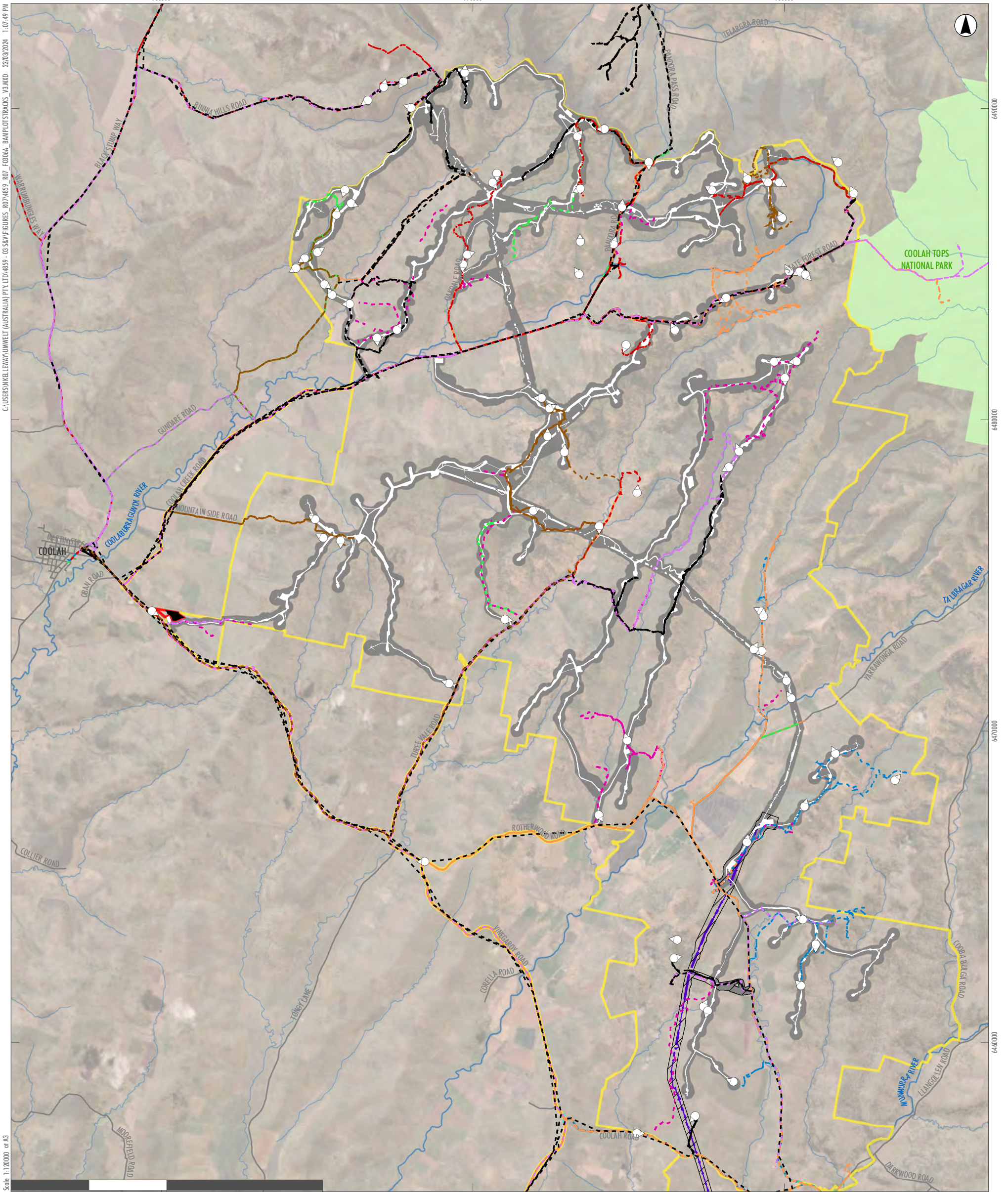
Veg Zone	PCT	Condition	Plots Required	Plots Completed	Complies with NSW BAM requirements?
16	PCT 1675 – Scribbly Gum – Narrow-leaved Ironbark – Bossiaea rhombifolia heathy open forest on sandstone ranges of the Sydney Basin.	Moderate/ Good	7	7	Complies
17	PCT 483 – Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley.	Derived Native Grassland	11	10	Short 1 plot
18	PCT 1661 – Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin.	Derived Native Grassland	2	2	Complies

In addition to BAM Vegetation Integrity Plots, meandering transects were walked across vast areas of the Development Corridor and Indicative Development Footprints where they occurred substantially outside of the Approved Development Corridor. Where they were undertaken, typically two ecologists walked parallel transects 10 m apart. Opportunistic sampling of vegetation was undertaken along these transects, particularly searches for threatened and otherwise significant species, endangered populations and TECs. Meandering transects enable floristic sampling across a much larger area than plot-based survey, especially where the number of plots is limited. Records along transects supplemented floristic sampling carried out in plots, however the data collected are in the form of presence records, rather than semiquantitative cover abundance scores. Where meandering transects revealed significant variation within a vegetation unit, or a potential new vegetation community, additional plot survey was undertaken.

Meandering transects provided invaluable information on spatial patterns of vegetation that informed vegetation community mapping of the Development Corridor and Indicative Development Footprints.

The location of the BAM Vegetation Integrity Plots and other surveys are shown in **Figure 3.6**.

Multiple revisions to the PCT and condition class mapping has occurred in 2023 in response to the submission from BCS for finer scale mapping of both woody and non-woody vegetation.



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Legend

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|---|---------------------|-------------------------------|
| Proposed Action Area | Flora Survey Tracks | Road |
| Development Corridor | April - 2020 | Drainage Line |
| Development Corridor - Wind Farm | May - 2020 | National Parks (NPWS Estate) |
| Development Corridor - TWA Facility | June - 2020 | BAM Vegetation Integrity Plot |
| Development Corridor - External Transmission Line | August - 2020 | |
| Indicative Development Footprints | October - 2020 | |
| Indicative Development Footprint - Wind Farm | January - 2021 | |
| Indicative Development Footprint - TWA Facility | April - 2021 | |
| Indicative Development Footprint - External Transmission Line | September - 2021 | |
| Indicative Development Footprint - Public Road Upgrades | January - 2023 | |

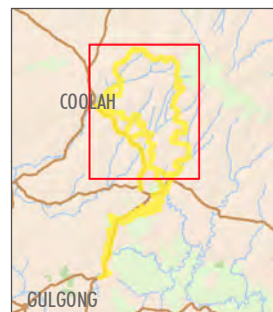
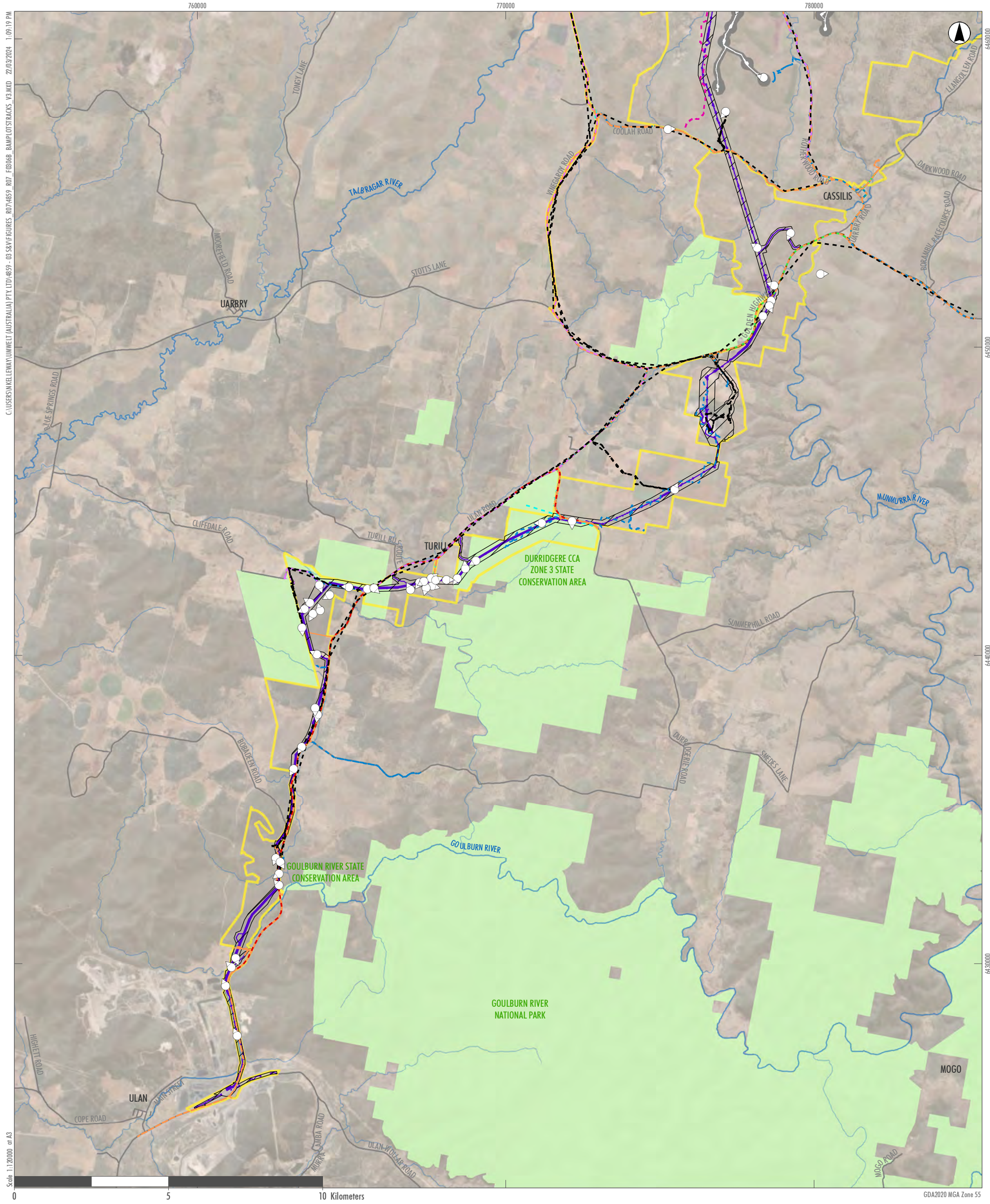


FIGURE 3.6A
BAM Vegetation Integrity Plots and Tracks



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|---|---------------------|-------------------------------|
| Proposed Action Area | Flora Survey Tracks | Road |
| Development Corridor | April - 2020 | Drainage Line |
| Development Corridor - Wind Farm | May - 2020 | National Parks (NPWS Estate) |
| Development Corridor - TWA Facility | June - 2020 | BAM Vegetation Integrity Plot |
| Development Corridor - External Transmission Line | August - 2020 | |
| Indicative Development Footprints | October - 2020 | |
| Indicative Development Footprint - Wind Farm | January - 2021 | |
| Indicative Development Footprint - TWA Facility | April - 2021 | |
| Indicative Development Footprint - External Transmission Line | September - 2021 | |
| Indicative Development Footprint - Public Road Upgrades | January - 2023 | |

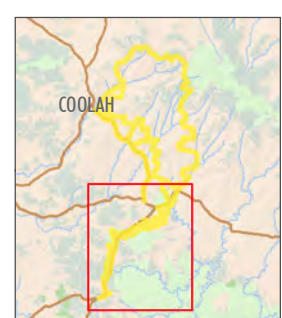


FIGURE 3.6B

BAM Vegetation Integrity Plots and Tracks

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2021), (NGH Environmental 2013a, 2013b and 2017)

Threatened Ecological Community Delineation

Vegetation communities identified in the Development Corridor were compared to TECs listed under the EPBC Act and an assessment of similarity was undertaken against the Commonwealth Threatened Species Scientific Committee Listing and Conservation Advice. The following approach was used:

- Full-floristic quadrat assessment, rapid assessments and meandering survey to determine floristic composition and structure of each ecological community.
- Comparison with published species lists, including lists of “important species” as identified on the listing/conservation advice provided by the Commonwealth Threatened Species Scientific Committee.
- Comparison with habitat descriptions and distributions for listed TECs.
- Assessment using guidelines and recovery plans published by the Commonwealth DCCEEW and the NSW BCS, where available.
- Comparison with other assessments of TECs in the region.

Vegetation communities identified and mapped during the biodiversity assessment were reviewed to identify if they conformed to TEC. This analysis used floristic data from the ecological surveys completed by Umwelt; and was compared against the respective determinations and listing/conservation advice. In summary, material changes to the outcomes of the TEC analysis of the existing approval were only completed by Umwelt where there was clear evidence to do so, such as conflicting field data, changes to vegetation community allocation and changes in condition of the PCT such that they now meet condition thresholds as specified in the listing advice.

Targeted Threatened Species Surveys

In keeping with BAM (DPIE 2020a), targeted surveys are required for threatened species as listed under the BC Act and identified in the BAM as candidate ‘species-credit species’ considered to have the potential to occur in the Development Corridor.

Other threatened species are defined in the BAM (DPIE 2020a) as ecosystem-credit species, that is species is predicted to occur by vegetation surrogates and landscape features.

Field surveys completed by Umwelt were in general accordance with the NSW BAM (DPIE 2020a) and the survey guidelines listed above. Surveys undertaken for species-credit species as defined under the BAM (DPIE 2020a) are listed in **Table 3.4**. This includes species listed under the BC Act. Those species listed as threatened under the EPBC Act are highlighted in bold.

Surveys completed in 2023 were undertaken in response to comments from NSW BCS following review of the BDAR (Umwelt 2022a). These surveys targeted the state listed pale-headed snake (*Hoplocephalus bitorquatus*), further refinement of TEC mapping and an area in the north-east corner of the Development Corridor – Wind Farm where it adjoins the Coolah Tops National Park. The surveys in the north-east corner of the Development Corridor – Wind Farm targeted the koala, greater glider and yellow-bellied glider.

The surveys identified in **Table 3.6** are in addition to targeted surveys completed by NGH in 2012, 2013, 2015 and 2016 (refer to **Table 3.3**).

The location of species-credit species surveys completed by Umwelt and by NGH are shown in **Figure 3.5**.

Table 3.6 Species-Credit Species Survey Methodology and Timing

Survey	Method	Species Targeted
8–9 April 2020 17 April 2020	Rapid vegetation assessments Parallel walked transects General meandering transects	Brush-tailed rock wallaby*, <i>Androcalva procumbens</i> *, <i>Dichanthium setosum</i> *, glossy black-cockatoo*, <i>Homoranthus darwinioides</i> *, koala*, <i>Tylophora linearis</i> *, Australian bustard, bush-stone curlew, Capertee stringybark, scant pomaderris
4–8 May 2020	BAM vegetation integrity plots Rapid vegetation assessments Parallel walked transects General meandering transects	Brush-tailed rock wallaby*, <i>Androcalva procumbens</i> *, <i>Dichanthium setosum</i> *, <i>Homoranthus darwinioides</i> *, glossy black-cockatoo*, koala*, <i>Tylophora linearis</i> * Australian bustard, bush-stone curlew, Capertee stringybark, scant pomaderris
	Habitat surveys	Glossy black-cockatoo*, large-eared pied bat*, barking owl, eastern bent-wing bat, eastern cave bat, masked owl, powerful owl
	Bird and Bat Utilisation Surveys (BBUS)	Grey falcon*, large-eared pied bat*, Australian bustard, eastern bent-wing bat, eastern cave bat, little eagle, red goshawk, southern myotis, square-tailed kite, white-bellied sea-eagle
25–29 May 2020	Forest owl stag-watching	barking owl, masked owl, powerful owl
	Call playback and nocturnal spotlighting	Greater glider*, koala*, grey-headed flying fox*, barking owl, masked owl, powerful owl, squirrel glider
15–19 June 2020	BAM vegetation integrity plots Rapid vegetation assessments Parallel walked transects General meandering transects	Brush-tailed rock wallaby*, <i>Homoranthus darwinioides</i> *, glossy black-cockatoo*, koala*, Australian bustard, bush stone-curlew, Capertee stringybark, scant pomaderris
17–21 August 2020	Winter bird surveys, including call playback	regent honeyeater*, swift parrot*
	Bird utilisation surveys	grey falcon*, Australian bustard, little eagle, red goshawk, square-tailed kite, white-bellied sea-eagle
	General meandering transects Rapid vegetation assessments	brush-tailed rock wallaby*, <i>Androcalva procumbens</i> *, <i>Homoranthus darwinioides</i> *, glossy black-cockatoo*, koala*, Major Mitchell’s cockatoo*, Ausfeld’s wattle, Australian bustard, bush stone-curlew, large-leafed monotaxis, little eagle, scant pomaderris, white-bellied sea-eagle
7–9 October 2020	Parallel walked transects Rapid vegetation assessments General meandering transects	brush-tailed rock-wallaby*, <i>Androcalva procumbens</i> *, <i>Homoranthus darwinioides</i> *, gang-gang cockatoo*, grey-headed flying-fox*, koala*, pine donkey orchid*, Major Mitchell’s cockatoo*, superb parrot*, gang-gang cockatoo*, <i>Tylophora linearis</i> *, Ausfeld’s wattle, Australian bustard, black-breasted buzzard, bush stone-curlew, Capertee stringybark, large-leafed monotaxis, little eagle, white-bellied sea-eagle, scant pomaderris, silky swainson-pea, square-tailed kite.
	Remote camera surveys	greater glider*, brush-tailed phascogale, eastern pygmy-possum, squirrel glider

Survey	Method	Species Targeted
18–22 January 2021	BAM vegetation integrity plots Rapid vegetation assessments Parallel walked transects General meandering transects	brush-tailed rock-wallaby*, <i>Androcalva procumbens</i> *, <i>Dichanthium setosum</i> *, finger panic grass*, gang-gang cockatoo*, koala*, <i>Tylophora linearis</i> *Ausfeld's wattle, Australian bustard, Austral toadflax, bush stone-curlew, Capertee stringybark, large-leafed monotaxis, square-tailed kite, scant pomaderris
10–14 May 2021	BAM vegetation integrity plots Rapid vegetation assessments Parallel walked transects General meandering transects	brush-tailed rock wallaby*, <i>Androcalva procumbens</i> *, <i>Dichanthium setosum</i> *, <i>Homoranthus darwinioides</i> *, glossy black-cockatoo*, koala*, <i>Tylophora linearis</i> *, Australian bustard, bush-stone curlew, Capertee stringybark, scant Pomaderris, white-bellied sea-eagle
	Remote camera surveys	brush-tailed phascogale, eastern pygmy-possum, squirrel glider
	Koala SAT searches	Koala*
	Call playback and spotlighting	Koala*, greater glider*, grey-headed flying fox*powerful owl, masked owl, barking owl, squirrel glider
20–24 September 2021	BAM Vegetation Integrity Plots Rapid Vegetation Assessments Parallel walked transects General meandering transects	brush-tailed rock-wallaby*, <i>Androcalva procumbens</i> *, <i>Homoranthus darwinioides</i> *, koala*, Major Mitchell's cockatoo*, pine donkey orchid*, superb parrot*, <i>Tylophora linearis</i> *, Ausfeld's wattle, Australian bustard, black-breasted buzzard, bush-stone curlew, large-leafed monotaxis, little eagle, scant Pomaderris, silky-swainson pea, white-bellied sea-eagle
16-20 January 2023	Bird and bat utilisation surveys (BBUS) Bird and bat habitat searches Rapid vegetation assessment Drone survey Anabat survey Song meter surveys Call playback Spotlighting transects	glossy black-cockatoo*, gang gang cockatoo*, yellow-bellied glider*, greater glider*, koala*, grey-headed flying fox*, powerful owl, baking owl, sooty owl, masked owl, and microbat species
	General waypoint survey Rapid vegetation assessment Walked meandering transects	brush-tailed rock-wallaby*, <i>Androcalva procumbens</i> *, <i>Dichanthium setosum</i> *, finger panic grass*, gang-gang cockatoo*, koala*, <i>Tylophora linearis</i> *Ausfeld's wattle, Australian bustard, Austral toadflax, bush stone-curlew, Capertee stringybark, large-leafed monotaxis, square-tailed kite, scant pomaderris
27 February to 3 March 2023	Spotlighting walked transects Drift fencing with remote camera surveillance	Pale-headed snake
16–25 May 2023	BAM vegetation integrity plots (habitat assessment)	brush-tailed rock wallaby*, <i>Androcalva procumbens</i> *, <i>Dichanthium setosum</i> *, <i>Homoranthus darwinioides</i> *, glossy black-cockatoo*, koala*, <i>Tylophora linearis</i> *, Australian bustard, bush-stone curlew, Capertee stringybark, scant pomaderris, white-bellied sea-eagle

* Denotes a species listed as threatened under the EPBC Act.

3.2.2.3 TWA Facility

As the Proposed Action is assessed as a State Significant Development (SSD) under the NSW approval pathway, modification of the NSW approval automatically triggers the NSW BOS established under the BC Act. The BOS requires the submission of a BDAR under the BC Act to assess potential impacts on native biodiversity unless the NSW Planning Agency Head (or delegate) and the NSW Environment Agency Head (or delegate) determine that the 'Project' (Proposed Action) is not likely to have any significant impact on biodiversity values.

A site inspection and consultation with the landowner was conducted in September 2023 of the proposed Development Corridor – TWA by two BAM Accredited Assessors to inform Amendment 2 of the NSW Mod-1 Application. No BAM vegetation integrity plots were completed as the preferred location for the TWA Facility was located on cropping land, rapid vegetation assessments were completed to verify vegetation condition and dominant species. This site inspection and consultation confirmed the proposed location of the TWA Facility was devoid of native vegetation due to the historical and ongoing agricultural land use. Specifically, the TWA Facility is proposed to occur on land that would meet the definition of Category 1 – Exempt Land and is therefore not required to have detailed biodiversity surveys and assessment completed.

An assessment of the biodiversity values and impact of the TWA Facility has been prepared by Umwelt accredited assessors under the BAM (DPIE 2020a) on behalf of the Proponent (Umwelt 2023d) and included in the Amendment 2 report for the NSW Mod-1 Application (Umwelt 2024).

3.2.3 Desktop Assessment

Desktop assessment included a review of previous documents and reports relevant to the Proposed Action and review of relevant publicly available databases. This included regional and sub-regional vegetation mapping reports, monitoring surveys, previous ecological surveys undertaken by NGH for the Approved Action and relevant ecological database searches.

Database searches were completed for the locality, defined as the Development Corridor with a five and 10 km buffer area (the locality). Searches included:

- Protected Matters Search Tool (PMST) accessed October 2021, March 2023 and September 2023. The updated PMST is provided in **Appendix E**.
- NSW BioNet including the BioNet Atlas, BioNet Vegetation Database and Threatened Biodiversity Data Collection (TBDC). The TBDC identifies habitat and ecology of the species including plan community types (PCTs) that species are associated with.
- NSW BAM – Credit Calculator predicted species reports for the Development Corridor that identified ecosystem credit species reliably predicted to utilise PCTs mapped within the area.
- Review of the modelled distribution of vegetation communities as part of the following four State Vegetation Type Maps:
 - State Vegetation Type Map – Border Rivers Gwydir / Namoi Region Version 2.0 VIS 4467.
 - State Vegetation Type Map – Central West / Lachlan Region Version 1.4 VIS 4468.

- State Vegetation Type Map – Upper Hunter v1.0 VIS 4894.
- State Vegetation Type Map – Central Tablelands Region Version 1.0 VIS 4778.
- Department of Primary Industries (DPI) Fisheries NSW Spatial Data Portal – Fish Freshwater Threatened Species mapping.

Documents prepared for the Proposed Action that were reviewed included:

- Liverpool Range Wind Farm Environmental Assessment (Epuron 2014).
- Biodiversity Assessment, Liverpool Range Wind Farm – Wind Farm Study Area (NGH 2013a).
- Biodiversity Assessment, Liverpool Range Wind Farm – Transmission Line Study Area (NGH 2013b).
- Biodiversity Addendum Report, Liverpool Range Wind Farm and Transmission Line Project (NGH 2017).
- Liverpool Range Wind Farm, Response to Submissions Report (Epuron 2017).
- Department of Planning, Industry and Environment (DPIE) (2018a) State Significant Development Assessment, Liverpool Range Wind Farm: Assessment Report (SSD 6696).
- Liverpool Range Wind Farm Biodiversity Development Assessment Report. August 2022 (Umwelt 2022a).
- Liverpool Range Wind Farm Response to Submissions Biodiversity Development Assessment Report (Umwelt 2023a) (see **Appendix D**).
- BDAR Waiver Request: Liverpool Range Wind Farm – Temporary Workers Accommodation (Umwelt 2023d) (see **Appendix E**).

The information obtained was used to inform the assessment of potentially occurring MNES as listed under the EPBC Act, particularly TECs, threatened and migratory species.

Approved Action Documentation:

- Development Consent (SSD 6696) (DPIE 2018a).
- State Significant Development Assessment, Liverpool Range Wind Farm: Assessment Report (DPIE 2018b).
- Liverpool Range Wind Farm Federal Approval, EPBC 2014/7136 (DoEE 2017a).

3.2.4 Reliance on Survey Data

The PER guidelines highlight the requirement that survey data for the listed MNES species be as recent as possible, and preferably not have been collected more than five years before the date of the referral, that is, it is preferred that surveys relied upon in the assessment of potential habitat and impact of the Proposed Action have been conducted between March 2018 and March 2023.

DCCEEW identifies that the justification for not accepting data that is more than five years old is because populations of species can change due to fires, drought, flooding and land management changes and/or species' ranges may shift due to climate change.

Within the locality of the Proposed Action, the main fire that impacted parts of the Development Corridor was the Sir Ivan Fire. A wildfire that impacted about 55,000 ha of land from east of Dunedoo, towards Coolah and Cassilis and south towards Durrigere State Conservation Area in February 2017 (refer to **Figure 3.7**) including a small portion of the Development Corridor – External Transmission Line near the Golden Highway. Further to these wildfires, prescribed burns have also been completed in national park estate throughout the past decade within the locality.

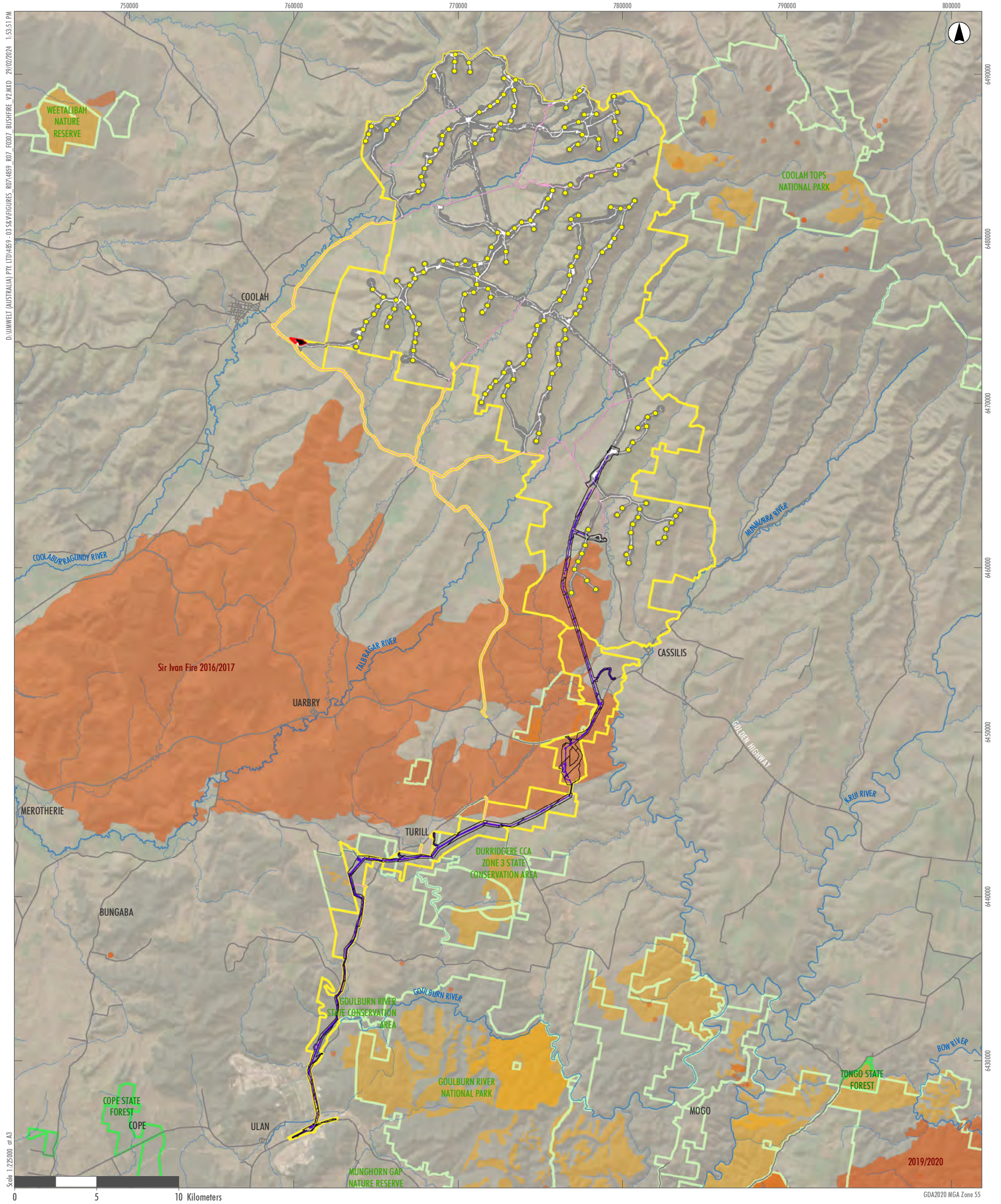
The 2019–2020 bushfires were the most widespread and extreme experienced in NSW, affecting 5.4 million hectares of NSW, including:

- 42 per cent of all NSW state forests
- 37 per cent of all NSW national park estate
- 81 per cent of the Greater Blue Mountains World Heritage Area
- 4 per cent of all NSW freehold land (DPIE 2020d).

Within the locality of the Proposed Action Area, large areas of the Goulburn River National Park and Wollemi National Park were burnt in the 2019/2020 wildfires. However, none of the Proposed Action Area was burnt during these 2019/2020 fire. There have been small, isolated wildfires in Coolah Tops National Park over the decade the largest up to 34 ha in 2013/2014 (refer to **Figure 3.7**).

As noted in **Section 3.1.6**, the dominant land use within and immediately adjoining the Proposed Action Area is rural, particularly north of the Golden Highway with conservation lands and open cut mining at the most southern end of the Proposed Action Area. Land management/use has not changed in and immediately adjoining the Proposed Action Area over the decade. Specifically, there has been no change in land management/use since biodiversity surveys were commenced by Umwelt in 2020; nor has the land management/use changes since NGH completed their surveys between 2012 – 2016 as part of the Approved Action.

Climatic conditions in the region of the Proposed Action over the years that biodiversity surveys have been undertaken are summarised in **Graph 3.1** for minimum and maximum annual temperature and **Graph 3.2** for annual mean rainfall. The data shown is from Merriwa to the east of the Proposed Action as this weather station provides the most complete data set and experiences similar climatic conditions as the Proposed Action Area.



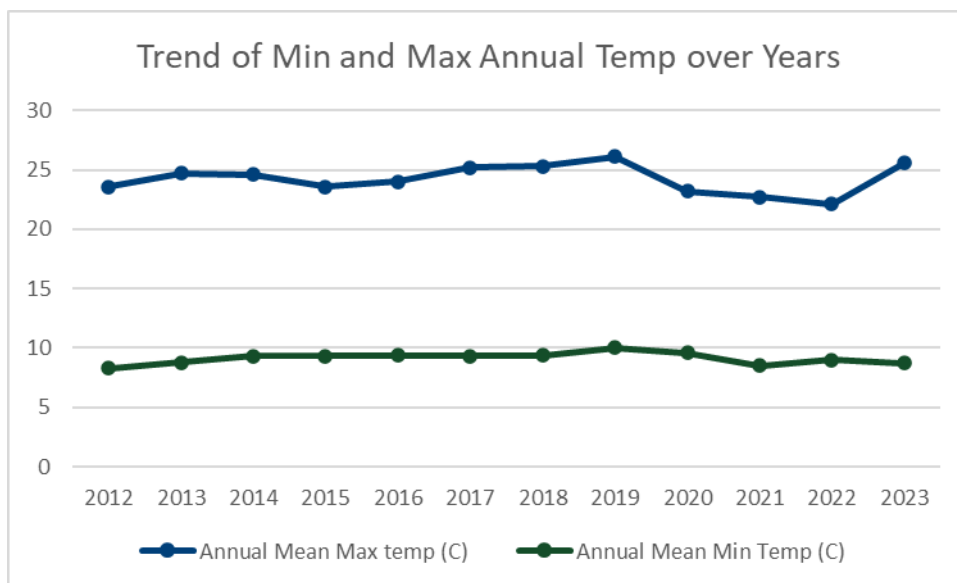
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|---|---|--|--|
| <ul style="list-style-type: none"> Proposed Action Area • Wind Turbines | <p>Indicative Development Footprints</p> <ul style="list-style-type: none"> Indicative Development Footprint - Wind Farm Indicative Development Footprint - TWA Facility Indicative Development Footprint - External Transmission Line Indicative Development Footprint - Public Road Upgrades | <p>Fire Type</p> <ul style="list-style-type: none"> Bushfire Prescribed Burn | <ul style="list-style-type: none"> National Parks (NPWS Estate) State Forest Road Drainage Line |
| <p>Development Corridor</p> <ul style="list-style-type: none"> Development Corridor - Wind Farm Development Corridor - TWA Facility Development Corridor - External Transmission Line | | | |

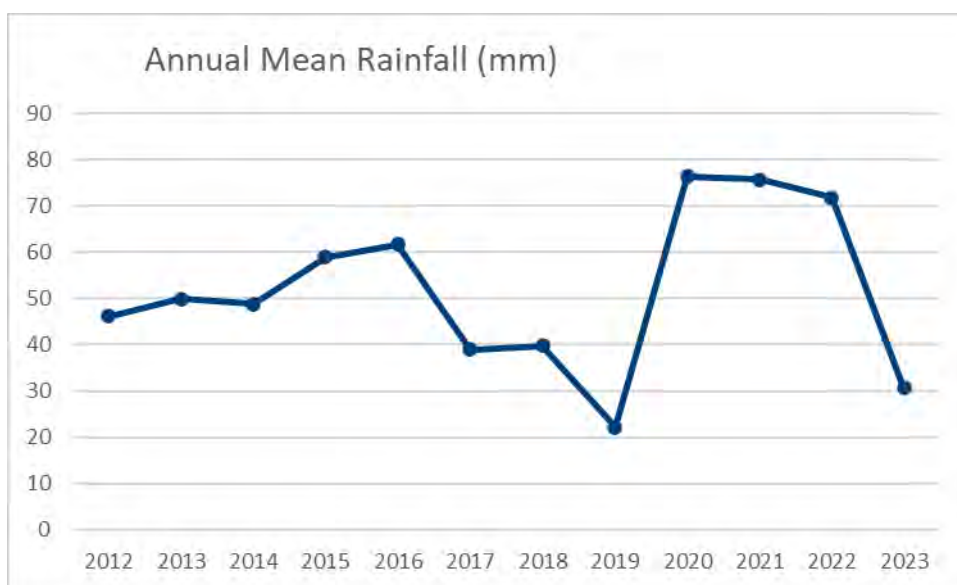
FIGURE 3.7

Historical bushfire boundaries in or near the Proposed Action Area

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022), NSW Government Spatial Hosting Portal (2024), Australian Research Data Commons (ARDC) Bushfire Data Challenge Project



Graph 3.1 Trends in Minimum and Maximum Annual Temperature from 2012 to 2023 at Merriwa (BOM Site 061278)



Graph 3.2 Annual mean rainfall (mm) from 2012 to 2023 at Merriwa (BOM Site 061287)

From 2020 to 2022, Australia went through a stronger and longer La Nina weather event, with higher rain events and lower temperatures across both minimum and maximum means as is indicated in **Graph 3.1** and **Graph 3.2**, respectively. Although the La Nina weather event was present during the time periods used for data recording, there does appear to be a liner trend of an upwards climb in temperature.

These trends are reflected in the Combined Drought Indicator data for Parishes within the Proposed Action Area. The Combined Drought Indicators shown in the following graphs show data collated by NSW Department of Primary Industries from December 2016 to September 2023, for a number of Parishes across the Proposed Action Area including:

- Warung Parish – in the north of the Proposed Action Area, including the western extent of the Coolah Tops National Park (**Graph 3.3**).
- Turill Parish – in the centre of the Proposed Action Area, including the intersections of Golden Highway with Vinegaroy Road and Ulan Road, and part of Durrigere State Conservation Area (**Graph 3.4**).
- Bobadeen Parish – in the south of the Proposed Action Area including the locality of Turill (**Graph 3.5**).

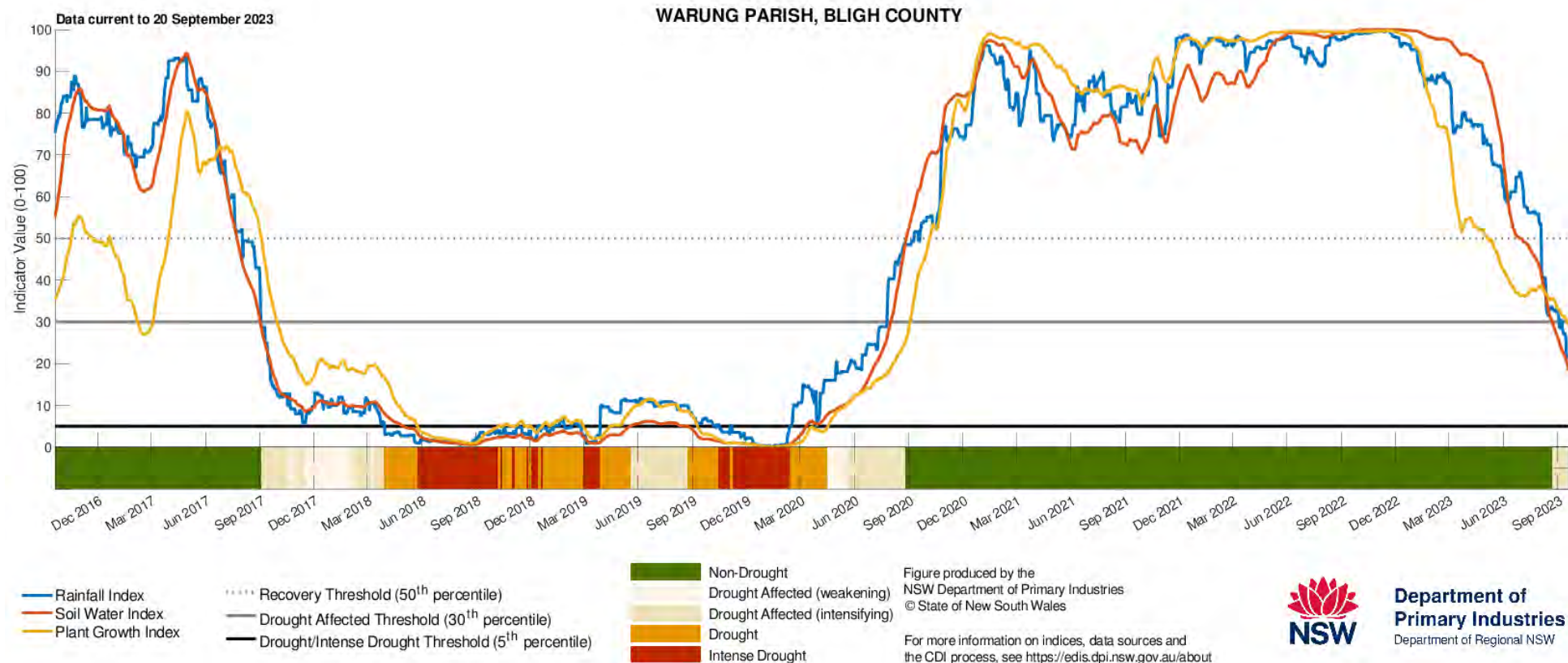
All three graphs show that in late 2016 the Proposed Action Area was not in drought, from the middle of 2017 drought affect was intensifying and by the second quarter of 2018 the area was experiencing intense drought conditions. A period of drought to intense drought persisted until about August to September 2020. Since that time the Proposed Action Area has not been in drought. Biodiversity surveys have been completed across the Development Corridor throughout the periods of drought and non-drought. Specifically, the vast majority of biodiversity surveys completed by Umwelt in accordance with the BAM have been completed in non-draught conditions.

Non-drought period prior to late 2016, extended back to the middle of 2015 with early 2015 fluctuating from non-drought to drought intensifying conditions. Combined drought index data prior to the start of 2015 for Parishes in the Proposed Action Area were not readily available to review, however it is noted that annual rainfall at Merriwa in 2012 was nearly as low as 2017 when the area was drought affected. Most of the surveys completed by NGH occurred between October 2012 and October 2013 in a period of increasing rainfall.

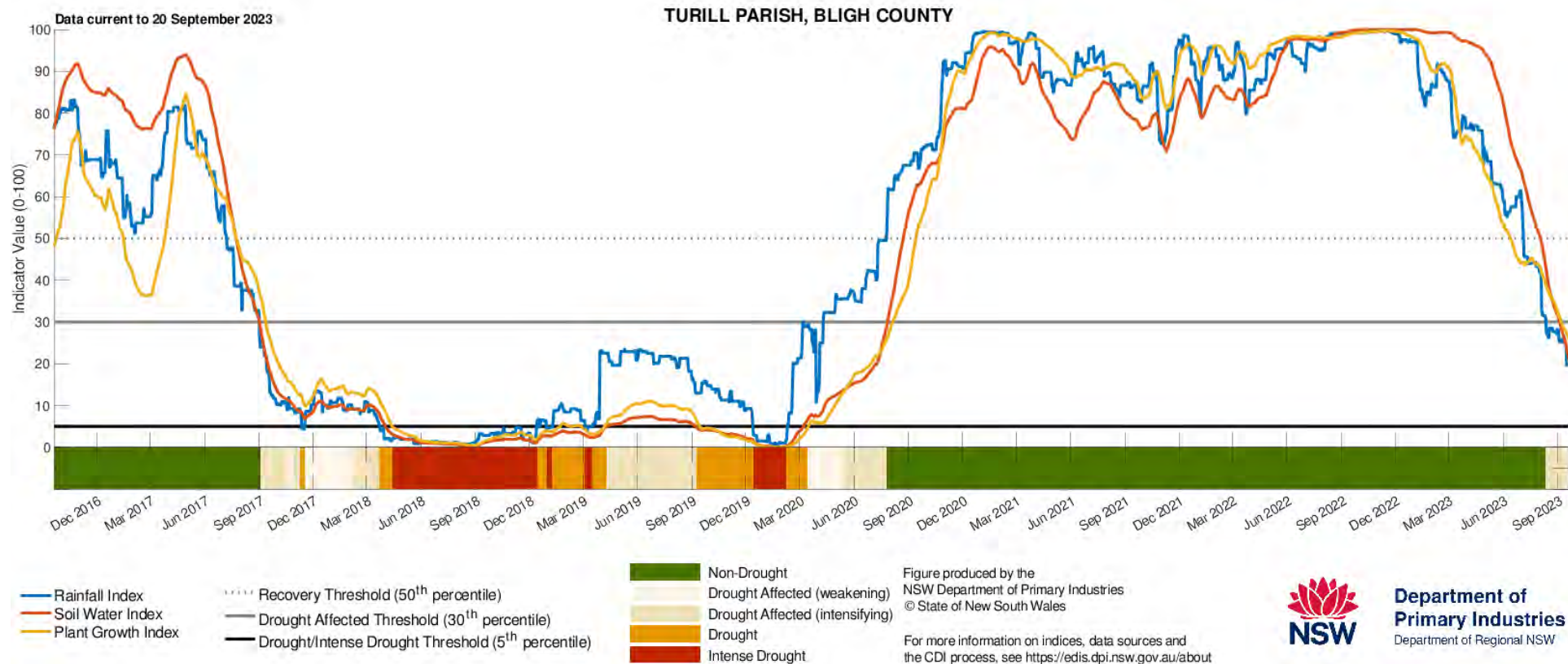
Vegetation surveys underpin the habitat assessments and assessment of likelihood of occurrence of threatened species and inform the design of targeted surveys for threatened species. While some of the BAM Vegetation Integrity Plots were collected by Umwelt over 11 days between May 2020 and August 2020, at the end of the extended period of drought, the majority of BAM Vegetation Integrity Plots were conducted from January 2021 to May 2023 during periods of non-drought.

As summarised in **Section 3.2.2.1**, ecological surveys completed by NGH commenced in the Proposed Action Area in October 2012 through to October 2016. Surveys completed by Umwelt, as discussed in **Section 3.2.2.2** and **Section 3.2.2.3**, have all been completed within five years of the referral date and within the period since March 2023.

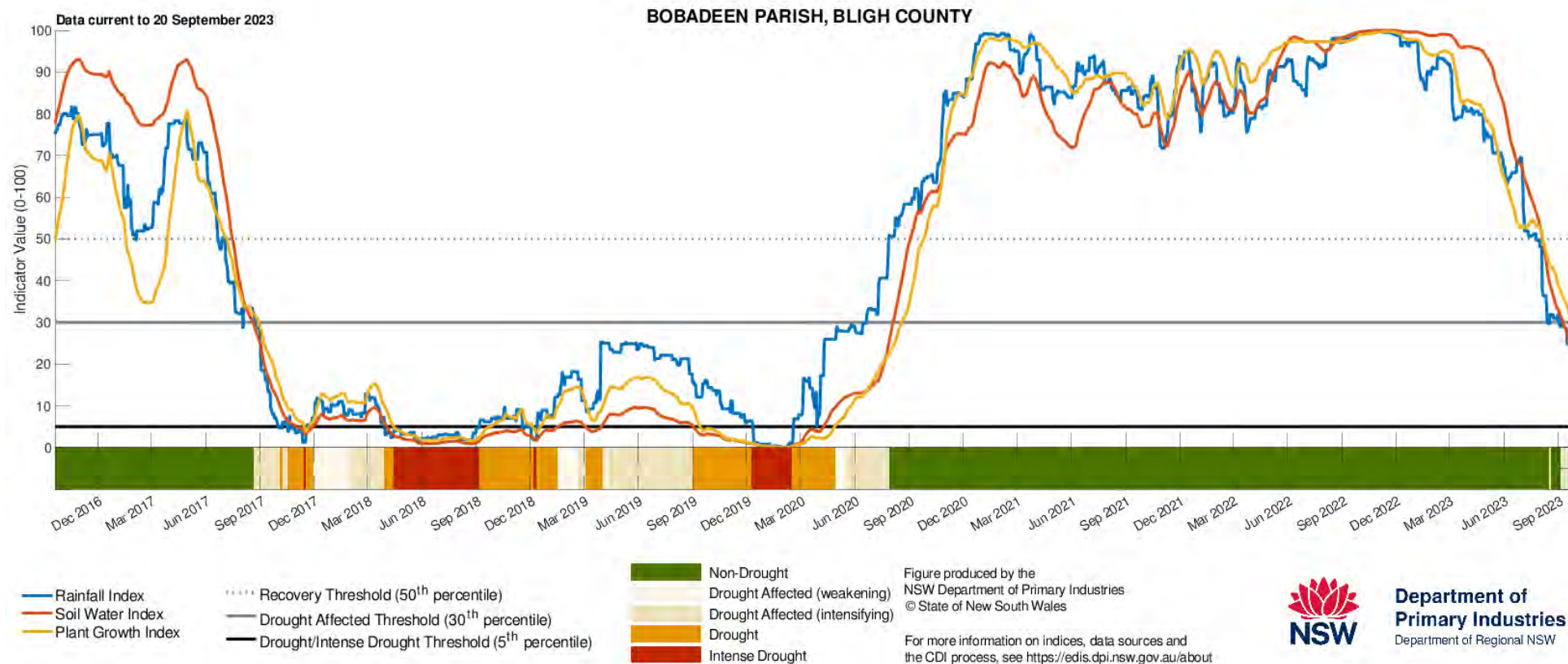
The survey data collected by NGH has been considered throughout the assessment in the same way that we rely upon reputable database records by others that predate March 2018. Surveys completed within the last five years verified presence of threatened and migratory species identified by NGH including greater glider. Surveys completed by Umwelt in the last five years did not verify the presence of some threatened species identified by NGH in the period before 2018 including the glossy black-cockatoo, painted honeyeater and large-eared pied bat. However, we have not dismissed these records and have adopted the precautionary principle and assumed that the species are still using habitat within the Development Corridors given the Development Corridor supports the same vegetation formations, land management is largely unchanged, climatic conditions and drought indexes are relatively similar.



Graph 3.3 Warung Parish Combined Drought Indicator December 2018 to September 2023



Graph 3.4 Turill Parish Combined Drought Indicator December 2018 to September 2023



Graph 3.5 Bobadeen Parish Combined Drought Indicator December 2018 to September 2023

Surveys completed by Umwelt in the last five years did identify the yellow-bellied glider (refer to **Section 3.8.5**) and the call of a spotted-tailed quoll was recorded in the north of the wind farm site (refer to **Section 3.8.2**). We note that neither of these species had been previously detected by NGH, to the best of our knowledge. However, it is also acknowledged that the yellow-bellied glider was listed as threatened under the BC Act and/or EPBC Act after the NGH surveys and the spotted-tailed quoll is a cryptic species assumed present where potential habitat occurs.

While recent surveys in January 2023 recorded two grey-headed flying-fox overhead no evidence of foraging or roosting has been detected over the last decade. Given this species is readily detected during nocturnal and diurnal surveys, it is unlikely that the species is reliant upon habitat in the Development Corridor for roosting habitat and the Proposed Action Area may be considered too far for nocturnal foraging trips from known roosting/camp sites (refer to **Section 3.8.7**).

It is important to note, the Proposed Action is not reliant on the NGH surveys which are evidently older than the preferred five-year age identified by DCCEEW. While the NGH surveys have been used to facilitate survey planning and formulating broad understanding of biodiversity values surrounding and within the Proposed Action Area, the recent surveys completed by Umwelt as part of the application of the NSW BAM (DPIE 2020) form the basis of the assessment and preparation of the BDAR (Umwelt 2023a) and this PER. All Umwelt surveys have been completed within the preferred five-year timeframe of survey data.

Pleasingly, despite the timeframe between NGH and Umwelt surveys, the overarching status and condition of biodiversity values within the Development Corridor of the Proposed Action Area compared with the Development Corridor of the Approved Action are similar. While there was some reallocation of PCTs compared with the Approved Action, this is likely to be the result of a differing opinion of the most suitably aligned PCTs rather than changes in species diversity or composition of vegetation communities. Further, no additional threatened species were identified as part of Umwelt surveys. Additional or more comprehensive assessment of particular species, such as greater glider for example, is merely a result of changes to listing status rather than changes in habitat presence or condition. The overarching outcome of the biodiversity assessment undertaken by Umwelt for the Proposed Action is consistent with the Approved Action and Referred Action, giving complete confidence that the original NGH surveys of the Approved Action are used for reference purposes of the Proposed Action. Umwelt firmly believe this approach is fair and reasonable given the observations and conclusions made and described above.

3.3 Vegetation

3.3.1 Wind Farm and External Transmission Line

The Development Corridor supports 10 PCTs across 17 condition classes. **Table 3.7** identifies the PCT, condition class occurrence and extent within the Development Corridor for each Vegetation Zone (VZ). The distribution of the Vegetation Zone and PCTs is provided in **Figure 3.8**.

Detailed descriptions of each Vegetation Zone are provided in Section 3.3.1.1 to Section 3.3.1.18 of the BDAR (Umwelt 2023a) in **Appendix D**.

Table 3.7 also provides a summary of occurrence of each Vegetation Zone in the Development Corridor-Wind Farm, Development Corridor – External Transmission Line and Development Corridor – TWA Facility. More details of the occurrence of each Vegetation Zone across the three IBRA sub-regions are provided in Tables 3.2 to Table 3.5 of the BDAR (Umwelt 2023a) in **Appendix D**.

Table 3.7 Vegetation Zones in Development Corridor

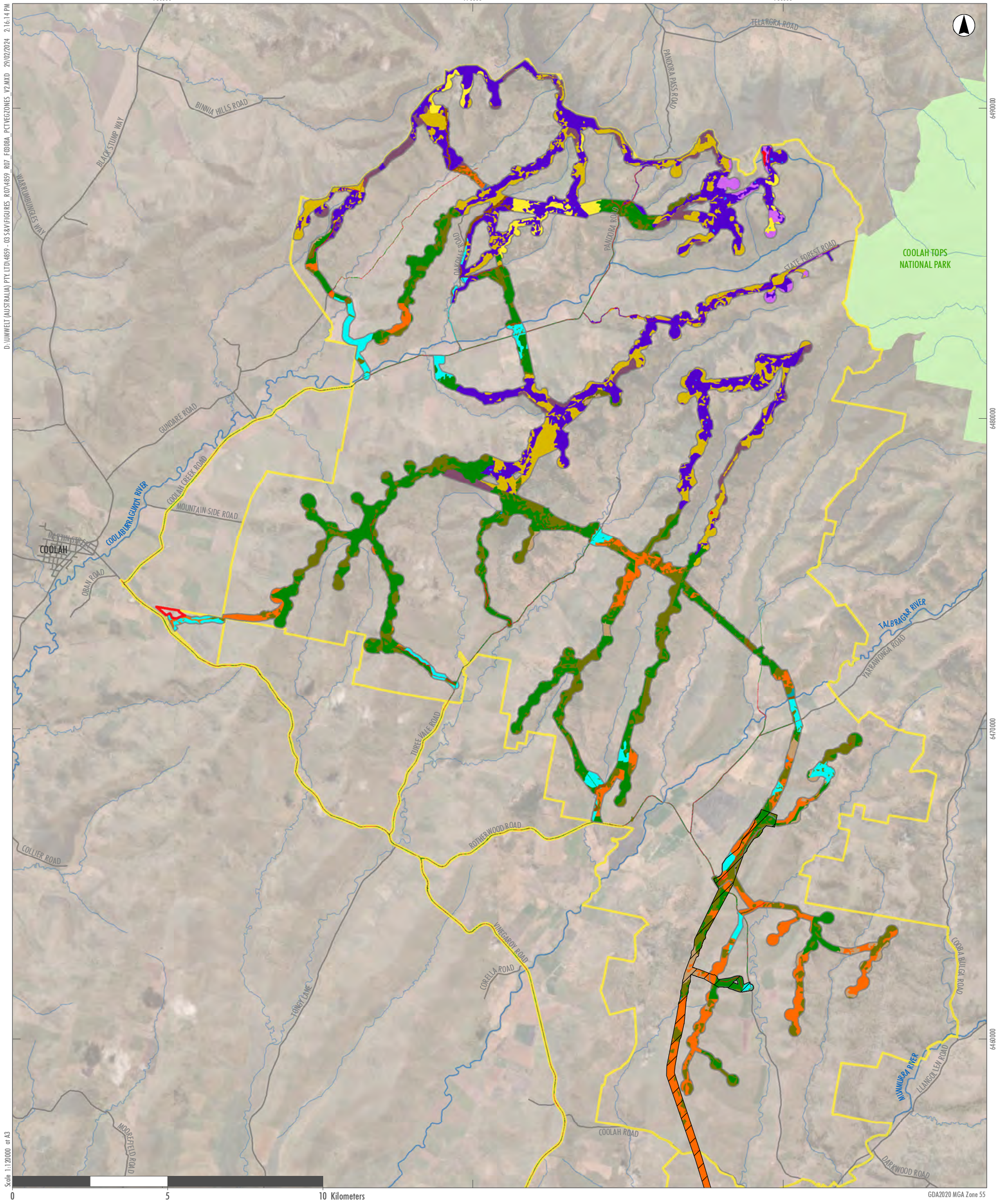
Veg Zone	Current PCT name and <i>condition</i>	Occurrence in the Development Corridor	Area in Development Corridor		
			Wind Farm	External Transmission Line	Total
1	PCT 84 – River Oak – Rough-barked Apple – red gum – box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion <i>Moderate/Good</i>	The primary forest vegetation occurring along all minor, moderate and major watercourses in the wind farm. Remnant and regenerating native forest with highly disturbed understorey.	78.5	0	78.5
2	PCT 281 – Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion <i>Moderate/Good</i>	Disturbed open forest on low alluvial plains close to several watercourses. Occurs mainly along Ulan Road in the south.	4.4	41.3	45.7
4	PCT 479 – Narrow-leaved Ironbark- Black Cypress Pine – stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion <i>Moderate/Good</i>	Restricted to transmission line alignment along Ulan Road. Continuous with large tracts in the national park, state forest and private land holdings.	0	54.8	54.8
5	PCT 481 – Rough-barked Apple – Blakely’s Red Gum – Narrow-leaved Stringybark +/- Grey Gum sandstone riparian grass fern open forest on in the southern Brigalow Belt South Bioregion and Upper Hunter region <i>Moderate/Good</i>	Restricted to transmission line alignment along Ulan Road. Continuous with large tracts in the national park, state forest and private land holdings.	0	48.8	48.8
6	PCT 483 – Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley <i>Moderate/Good</i>	Uncommon occurs in restricted pockets where historical and current agricultural activities have not substantially removed the canopy and midstorey. Ground layer somewhat disturbed.	90.3	26.7	117.0
7	PCT 483 – Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley <i>Low</i>	Thinned woodland with a highly degraded understorey dominated by introduced flora while still supporting a reasonable number of native grasses and forbs, albeit in low cover.	1,217.0	238.6	1,455.6

Veg Zone	Current PCT name and <i>condition</i>	Occurrence in the Development Corridor	Area in Development Corridor		
			Wind Farm	External Transmission Line	Total
8	PCT 483 – Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley <i>Low Condition DNG</i>	Highly degraded grassland likely derived from open woodland. Remnant canopy trees at very low densities. Native species in ground layer are almost entirely restricted to the hardier grasses and forbs. Occurs in the no-go-area in the Development Corridor – TWA.	1,593.4*	34.0	1,627.4
9	PCT 488 – Silvertop Stringybark – Yellow Box +/- Nortons Box grassy woodland on basalt hills mainly on northern aspects of the Liverpool Range, Brigalow Belt South Bioregion <i>Moderate/Good</i>	Uncommon occurs in restricted pockets where historical and current agricultural activities have not substantially removed the canopy and midstorey. Ground layer somewhat disturbed.	330.8	0	330.8
10	PCT 488 – Silvertop Stringybark – Yellow Box +/- Nortons Box grassy woodland on basalt hills mainly on northern aspects of the Liverpool Range, Brigalow Belt South Bioregion <i>Moderate/Good-Shrubby</i>	Restricted to one location in the north-west near Gundare Road.	3.0	0	3.0
11	PCT 488 – Silvertop Stringybark – Yellow Box +/- Nortons Box grassy woodland on basalt hills mainly on northern aspects of the Liverpool Range, Brigalow Belt South Bioregion <i>Low</i>	Thinned woodland with a highly degraded understorey dominated by introduced flora. Remnant canopy trees however patches of interconnected canopies are rare.	1,084.0	15.3	1,099.3
12	PCT 488 – Silvertop Stringybark – Yellow Box +/- Nortons Box grassy woodland on basalt hills mainly on northern aspects of the Liverpool Range, Brigalow Belt South Bioregion <i>Exotic</i>	Highly degraded grassland likely derived from open woodland. Remnant canopy trees at very low densities.	1,658.5	0	1,658.5
13	PCT 490 – Silvertop Stringybark – Forest Ribbon Gum very tall moist open forest on basalt plateau on the Liverpool Range, Brigalow Belt South Bioregion <i>Moderate/Good</i>	Tall moist open forest restricted to north-east corner of the Development Corridor.	87.4	0	87.4
14	PCT 495 – Brittle Gum – Silvertop Stringybark grassy open forest of the Liverpool Range, Brigalow Belt South Bioregion <i>Moderate/Good</i>	Shrubby forest restricted to protected slopes in the north of the Development Corridor.	174.2	0	174.2

Veg Zone	Current PCT name and <i>condition</i>	Occurrence in the Development Corridor	Area in Development Corridor		
			Wind Farm	External Transmission Line	Total
15	PCT 1661 – Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin <i>Moderate/Good</i>	Restricted to transmission line alignment along Ulan Road. Continuous with large tracts in the national park, state forest and private land holdings.	0	194.9	194.9
16	PCT 1675 – Scribbly Gum – Narrow-leaved Ironbark – <i>Bossiaea rhombifolia</i> heathy open forest on sandstone ranges of the Sydney Basin <i>Moderate/Good</i>	Restricted to transmission line alignment along Ulan Road. Continuous with large tracts in the national park, state forest and private land holdings.	0	114.3	114.3
17	PCT 483 – Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley <i>DNG</i>	Derived native grassland with very low density remnant canopy trees. Understorey moderately degraded from land use.	625.9	353.8	979.7
18	PCT 1661 – Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin <i>DNG</i>	Derived native grassland restricted to External Transmission Line along Ulan Road.	0	32.9	32.9
-	No vegetation cover (disturbed land)	-	40.7	52.3	93.0
-	No vegetation cover (water body)	-	7.5	12.2	19.7
-	Category 1 exempt land including vegetation that is not native and areas cropped/ploughed or significantly disturbed for agriculture and/or areas disturbed by approved activities.	Valley floors where agricultural practices were most intensive and regular. Legally cleared land as part of development approvals along Ulan Road.	341.4*	176.0	517.4
Total (ha)			7,336.9*	1395.9	8,732.8

NB Minor rounding discrepancies associated with area totals.

* The extent of these vegetation zones in the Proposed Action have increased from the Referred Action to include vegetation zones in the Development Corridor – TWA Facility. These increases have all been allocated to Development Corridor – Wind Farm as while they facilitate construction of the External Transmission Line, they are directly associated with the wind farm component of the Proposed Action and will be required regardless of whether or not the Proponent constructs the External Transmission Line or the alternative CWO REZ transmission line is adopted.



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Legend

- Proposed Action Area
- Development Corridor**
- Development Corridor - Wind Farm
- Development Corridor - TWA Facility
- Development Corridor - External Transmission Line
- PCTs – Vegetation Zones within the Development Corridor and Indicative Development Footprints**
- Zone-1 - PCT-84 - ModerateGood
- Zone-2 - PCT-281 - ModerateGood
- Zone-6 - PCT-483 - ModerateGood
- Zone-7 - PCT-483 - Low
- Zone-8 - PCT-483 - Low Condition DNG
- Zone-9 - PCT-488 - ModerateGood
- Zone-10 - PCT-488 - ModerateGood-Shrubby
- Zone-11 - PCT-488 - Low
- Zone-12 - PCT-488 - Exotic
- Zone-13 - PCT-490 - ModerateGood
- Zone-14 - PCT-495 - ModerateGood
- Zone-17 - PCT-483 - DNG
- Disturbed
- Land Category 1 - Exempt Land
- Water Body

- Road
- Drainage Line
- National Parks (NPWS Estate)

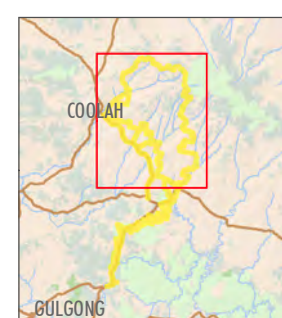
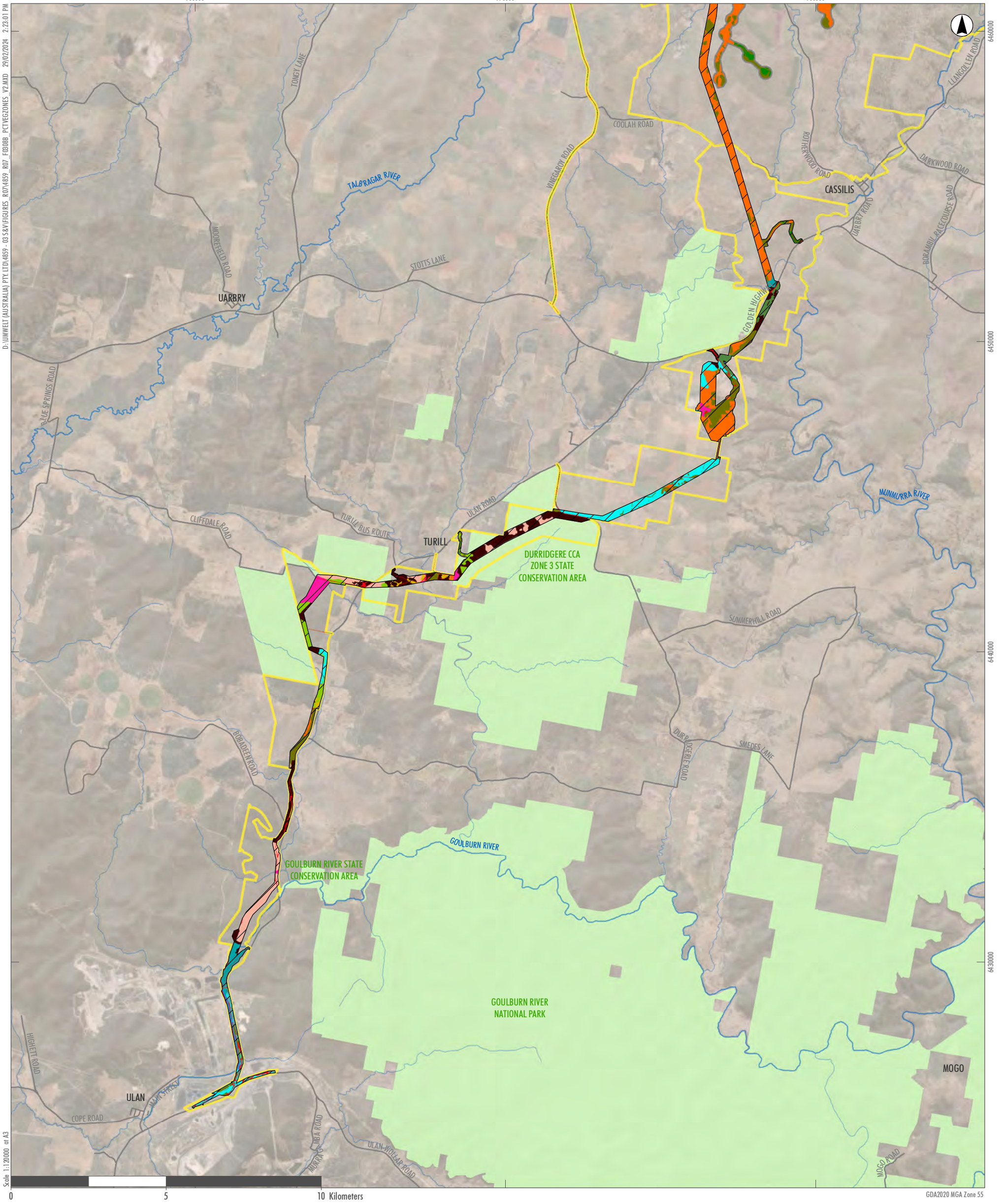


FIGURE 3.8A
PCTs and Condition Zones (Vegetation Zones)



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Legend

- Proposed Action Area
- Development Corridor**
- Development Corridor - Wind Farm
- Development Corridor - External Transmission Line
- PCTs – Vegetation Zones within the Development Corridor and Indicative Development Footprints**
- Zone-2 - PCT-281 - ModerateGood
- Zone-4 - PCT-479 - ModerateGood
- Zone-5 - PCT-481 - ModerateGood
- Zone-6 - PCT-483 - ModerateGood

- Zone-7 - PCT-483 - Low
- Zone-8 - PCT-483 - Low Condition DNG
- Zone-11 - PCT-488 - Low
- Zone-15 - PCT-1661 - ModerateGood
- Zone-16 - PCT-1675 - ModerateGood
- Zone-17 - PCT-483 - DNG
- Zone-18 - PCT-1661 - DNG
- Disturbed
- Land Category 1 - Exempt Land
- Water Body

- Road
- Drainage Line
- National Parks (NPWS Estate)

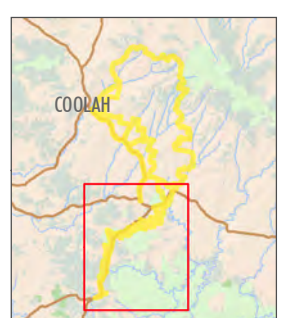


FIGURE 3.8B
PCTs and Condition Zones (Vegetation Zones)

Further finer scale mapping of both woody and non-woody vegetation was completed in early 2023 as requested by BCS as part of their formal submission on the NSW Mod-1 Application. This resulted in a review of the occurrence of PCT395 Vegetation Zone 3 that was described in the Referred Action. Vegetation Zone 3 was identified as PCT 395 Derived speargrass – wallaby grass – wire grass mixed forb grassland mainly in the Coonabarabran – Pilliga – Coolah region in moderate/good condition derived native grassland (DNG) with scattered mature canopy trees but no distinct patches of treed vegetation. Areas of PCT395 (Vegetation Zone 3) have been reassigned to condition classes with PCT 483 (Vegetation Zone 17) and PCT 488 (Vegetation Zone 12) (Umwelt 2023a).

Most of the vegetation in the Development Corridor has been historically modified by agricultural land use. In many areas of the Development Corridor – Wind Farm the canopy layer is present and a midstorey may be present but frequently there is no shrub layer, and the groundcover has been heavily disturbed. In the Development Corridor – Wind Farm, common pasture weeds associated with grazing are widespread and have invaded areas of more intact woodland and forest vegetation.

The Development Corridor - Wind Farm is dominated by PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley and PCT 488 Silvertop Stringybark – Yellow Box +/- Nortons Box grassy woodland on basalt hills mainly on northern aspects of the Liverpool Range, Brigalow Belt South Bioregion, low condition vegetation zones including derived native grassland (30 per cent) (refer to **Photo 3.7**), exotic grassland (23 per cent) (refer to **Photo 3.8**) and low condition woodland (17 per cent) (refer to **Photo 3.9**). About five per cent of the Development Corridor – Wind Farm is mapped as Category 1 – exempt land, that is legally cleared before 1990 and/or cropping land.

About 25 per cent of the Development Corridor – Wind Farm supports moderate/good condition woodland across five different PCTs. **Photo 3.10** show the most widespread PCT in moderate/good condition woodland in the Development Corridor – Wind Farm, that is Vegetation Zone 9 PCT 488, covering about 330 ha.



Photo 3.7 **Derived native grassland form of PCT 483 (Vegetation Zone 8)**



Photo 3.8 Exotic grassland form of PCT 488 (Vegetation Zone 12)



Photo 3.9 Low condition thinned woodland form of PCT 483 (Vegetation Zone 7)



Photo 3.10 Moderate/good condition woodland form of PCT 488 (Vegetation Zone 9)

South of Durrigere State Conservation Area (located off Ulan Road south of the Golden Highway), there are large areas of intact vegetation. The Development Corridor – External Transmission Line is characterised by derived native grassland (28 per cent), moderate/good condition open forest (22 per cent), moderate/good condition woodland (12 per cent) and thinned woodland (about 18 per cent). About 17 per cent of the Development Corridor – External Transmission Line is mapped as Category 1 – exempt land. As with the Development Corridor-Wind Farm the dominant PCT is PCT 483 low condition (Vegetation Zone 7).

There are two PCTs that occur at the southern end of the Development Corridor – External Transmission Line that do not occur in the remainder of the Development Corridor (refer to **Figure 3.8**), being PCT 1661 Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin (refer to **Photo 3.11**) and PCT 1675 Scribbly Gum – Narrow-leaved Ironbark – *Bossiaea rhombifolia* heathy open forest on sandstone ranges of the Sydney Basin (refer to **Photo 3.12**). Both PCTs occur as moderate/good condition and are continuous with large tracts of vegetation in national park, state forest and private land holdings.



Photo 3.11 Moderate/good condition of PCT 1661 (Vegetation Zone 15)



Photo 3.12 Moderate/good condition of PCT 1675 (Vegetation Zone 16)

The Indicative Development Footprint – Public Road Upgrades is dominated by disturbed land (43 per cent) with derived native grasslands covering about 40 per cent. The native grassland is dominated by Vegetation Zone 8 PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley Low Condition Derived Native Grassland. Woodland remnants in the Indicative Development Footprint – Public Road Upgrades include thinned woodland with native grassland (about 8 per cent), thinned woodland dominated by exotic groundcover (seven per cent) and only two per cent of the Indicative Development Footprint – Public Road Upgrades is moderate good condition woodland.

Vegetation Zones 2 and 6 have been assessed by Umwelt as conforming to the key diagnostic and condition thresholds of Commonwealth Box Gum Woodland CEEC. Vegetation Zone 9 was assessed as partially conforming to the to the key diagnostic and condition thresholds of Commonwealth Box Gum Woodland CEEC where patches in the north-east of the Development Corridor – Wind Farm were found to satisfy the canopy composition and support. The assessment is provided in full in Section 3.3.3.2 of the BDAR (Umwelt 2023a) in **Appendix D**.

The distribution of the Commonwealth Box Gum Woodland CEEC is shown in **Figure 3.9**.

Assessment of how other vegetation zones that may be representative of the Commonwealth Box Gum Woodland CEEC (that is vegetation zones 7, 9, 10, 11 and 17) did not conform with the listing advice is provided in detail in Section 3.3.3.2 of the BDAR (Umwelt 2023a) in **Appendix D**. All other vegetation zones were considered to not have the potential to conform to the Commonwealth Box Gum Woodland CEEC (or any other EPBC Act TEC), and therefore were not analysed against the condition thresholds. Further consideration of the Commonwealth Box Gum Woodland CEEC is provided in **Section 3.5.1**.

Threatened flora, listed under the BC Act, recorded within the Indicative Development Footprint during ecological surveys as part of the Approved Action included:

- Ausfeld’s wattle (*Acacia ausfeldii*), listed as vulnerable under the BC Act (NGH 2013a, 2013b and 2017).
- Silky swainson pea (*Swainsona sericea*), listed as vulnerable under the BC Act (NGH 2013a, 2013b and 2017).

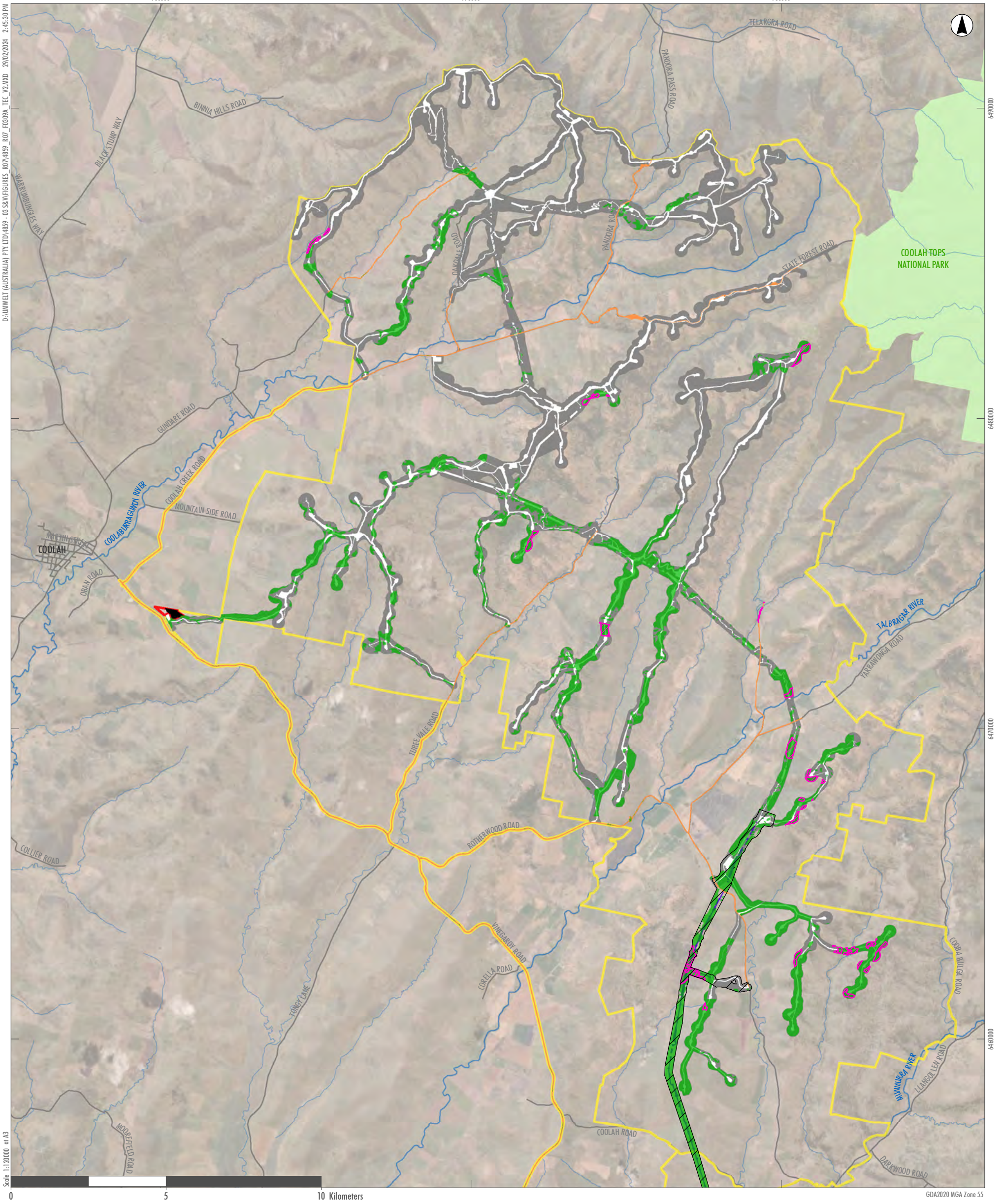
No threatened flora, listed under the EPBC Act, was recorded in the Indicative Development Footprints.

3.3.2 TWA Facility

The Development Corridor – TWA Facility is an extensively cleared rural block where intensive agricultural practises (i.e. cropping) are the primary land use (Umwelt 2023d). Due to it being subject to these ongoing land management practices, the Indicative Development Footprint – TWA Facility does not support native vegetation, derived or otherwise (refer to **Photo 3.13**). It entirely supports exotic vegetation in the form of current crop. Vegetation in the Development Corridor – TWA Facility meets the definition of Category 1 – Exempt Land (Umwelt 2023d). The no-go-area in the Development Corridor – TWA Facility is representative of PCT 483 Vegetation Zone 8 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter valley Low Condition Derived Native Grassland. The grassland is poor quality.



Photo 3.13 Exotic/cropped land (Category 1 – Exempt Land) in the Indicative Development Footprint – TWA Facility



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GDA2020 MGA Zone 55

Legend

- Proposed Action Area
- Development Corridor**
- Development Corridor - Wind Farm
- Development Corridor - TWA Facility
- Development Corridor - External Transmission Line
- Indicative Development Footprints**
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - TWA Facility
- Indicative Development Footprint - External Transmission Line
- Indicative Development Footprint - Public Road Upgrades
- Road
- Drainage Line
- National Parks (NPWS Estate)
- EPBC Act**
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (Commonwealth Box Gum Woodland CEEC)
- BC Act**
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (NSW Box Gum Woodland CEEC)

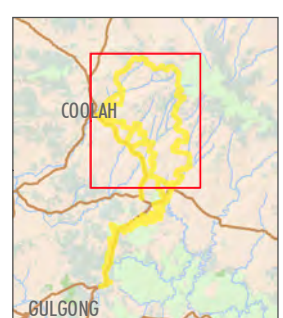
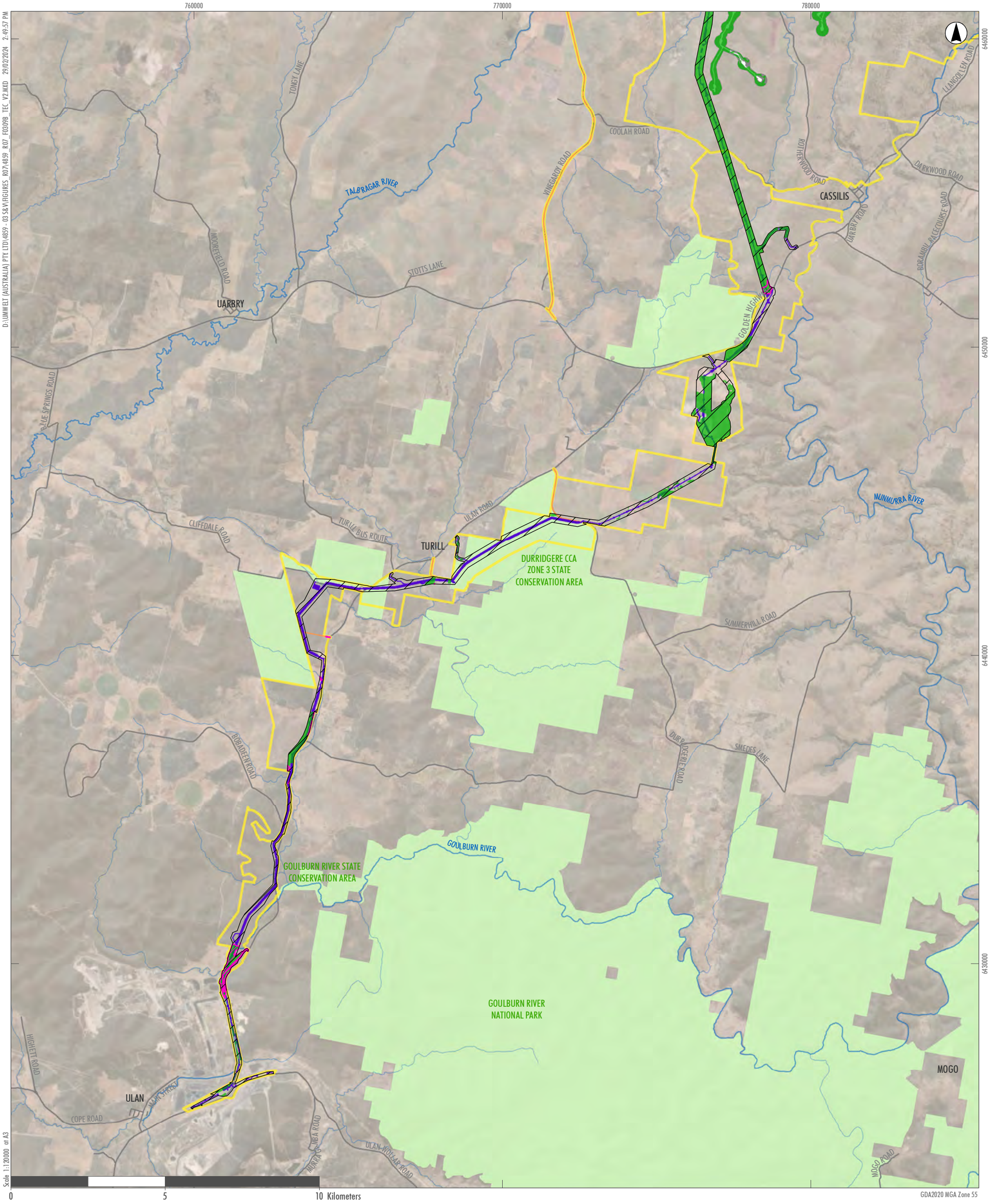


FIGURE 3.9A
Threatened Ecological Communities



Legend

- Proposed Action Area
- Development Corridor**
- Development Corridor - Wind Farm
- Development Corridor - TWA Facility
- Development Corridor - External Transmission Line
- Indicative Development Footprints**
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - TWA Facility
- Indicative Development Footprint - External Transmission Line
- Indicative Development Footprint - Public Road Upgrades
- Road
- Drainage Line
- National Parks (NPWS Estate)
- EPBC Act**
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (Commonwealth Box Gum Woodland CEEC)
- BC Act**
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (NSW Box Gum Woodland CEEC)

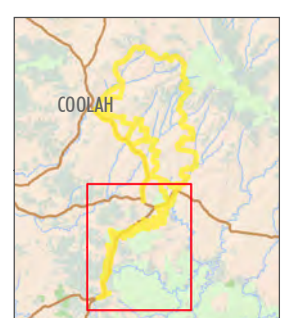


FIGURE 3.9B
Threatened Ecological Communities

3.4 MNES

The referral identified MNES recorded in the locality, and/or predicted to occur within the locality based on field surveys, NSW BioNet wildlife atlas searches, outputs of the NSW BAM – Credit Calculator and PMST report as of October 2022. An update PMST report is provided in **Appendix E** to inform an updated assessment of likelihood of occurrence of MNES in the Proposed Action Area (refer to **Appendix F**).

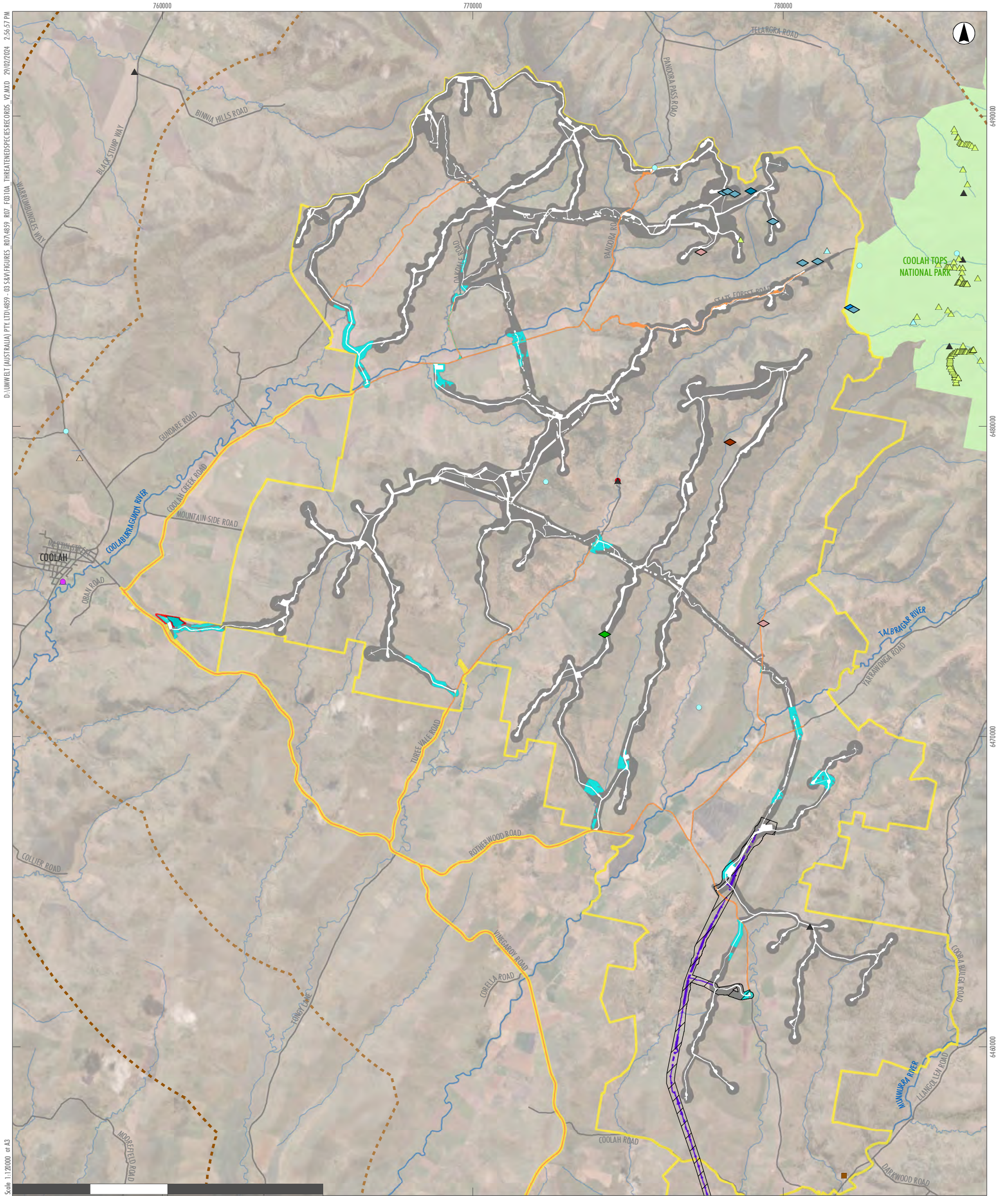
In keeping with section 158A of the EPBC Act and the PER Guidelines, this assessment has not considered any new species/communities' listings that have occurred after the controlled action determination (that is after the 30 March 2023). Species listed in the PMST (refer to **Appendix E**) that were listed after this date and are not required to be assessed are presented below:

- *Bertya mollissima*
- southern whiteface (*Aphelocephala leucopsis*)
- brown treecreeper (south-eastern) (*Climacteris picumnus victoriae*)
- hooded robin (south-eastern) (*Melanodryas cucullata cucullata*)
- blue-winged parrot (*Neophema chrysostoma*)
- diamond firetail (*Stagonopleura guttata*).

In keeping with the PER Guidelines, species identified in the updated searches, due to changes in distributional knowledge since the EPBC Referral in early 2023, have been included in the likelihood of occurrence assessment (refer to **Appendix F**) and in **Table 3.8**.

MNES known to occur or assessed as having a moderate or higher likelihood of occurring in the Proposed Action Area are provided in the following sections and listed in **Table 3.8**. This includes a number of species raised by DCCEEW as requiring consideration.

The location of the Commonwealth Box Gum Woodland CEEC and all threatened species, as listed under the EPBC Act, recorded by Umwelt and NGH together with BioNet records are shown in **Figure 3.9** and **Figure 3.10**.



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GDA2020 MGA Zone 55

Legend

Proposed Action Area	Proposed Action Area - 5km Buffer	NSW Bionet Records	Road
Development Corridor	Proposed Action Area - 10km Buffer	<i>Thesium australe</i>	Drainage Line
Development Corridor - Wind Farm	Umwelt and NGH TS Records	Fork-tailed Swift	National Parks (NPWS Estate)
Development Corridor - TWA Facility	Corben's long-eared bat	Koala	Land Category 1 - Exempt Land
Development Corridor - External Transmission Line	Greater glider	Latham's Snipe	
Indicative Development Footprints	Grey-headed flying-fox	Sharp-tailed Sandpiper	
Indicative Development Footprint - Wind Farm	Large-eared pied bat	South-eastern Glossy Black-Cockatoo	
Indicative Development Footprint - TWA Facility	Spotted-tailed quoll	Southern Greater Glider	
Indicative Development Footprint - External Transmission Line	Yellow-bellied glider	Superb Parrot	
Indicative Development Footprint - Public Road Upgrades		White-throated Needletail	

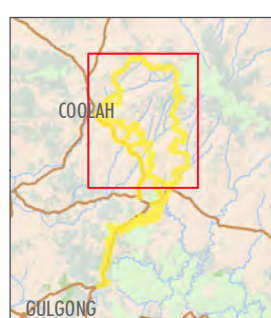
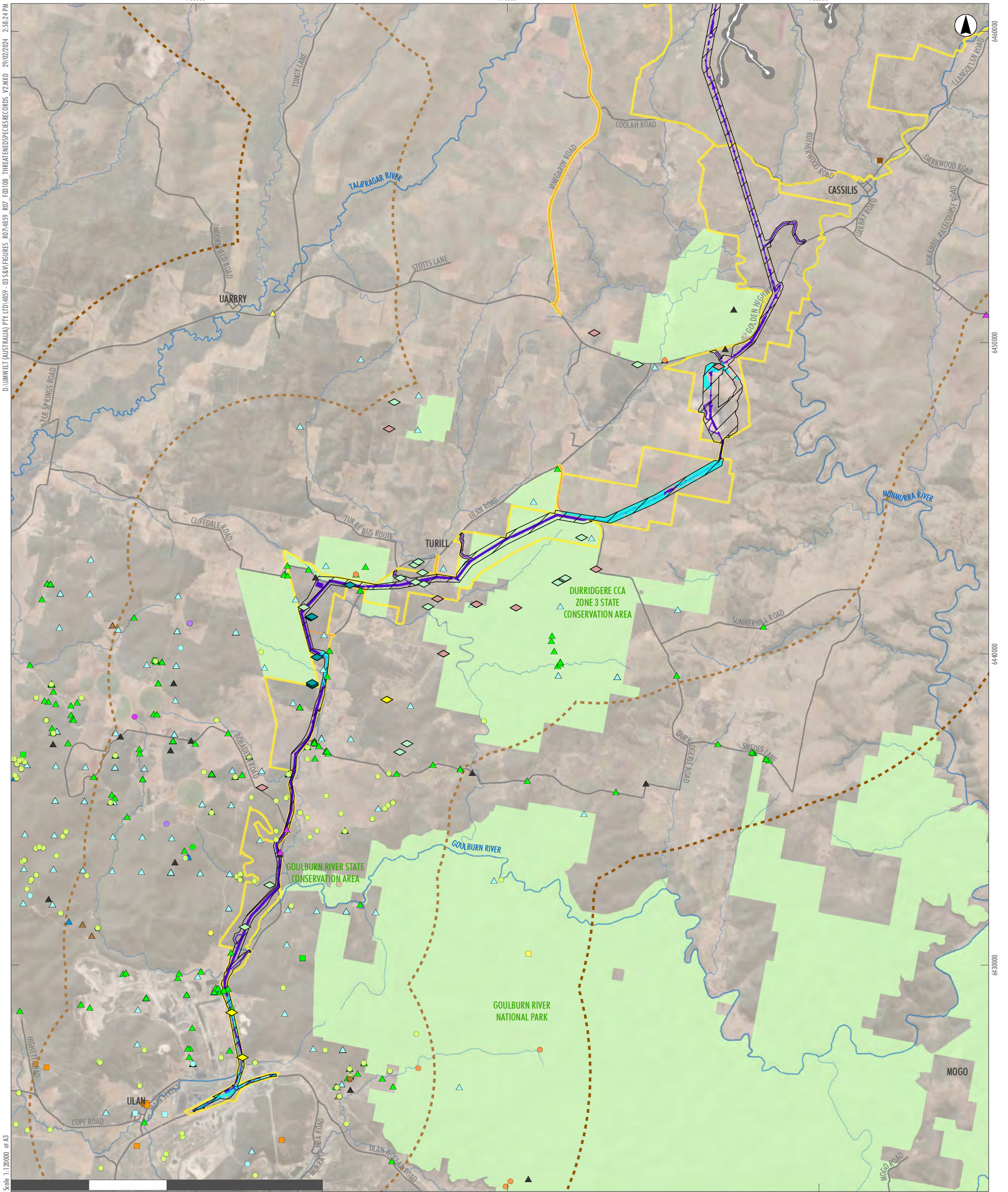


FIGURE 3.10A
MNES Records

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022), NSW Bionet Atlas records (2023), (NGH Environmental 2013a, 2013b and 2017)



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 6460000 6450000 6440000 6430000 6420000 6410000 6400000

Legend

- | | | | | |
|---|------------------------------------|-------------------------------------|--|-------------------------------|
| Proposed Action Area | Proposed Action Area - 5km Buffer | Latham's Snipe | <i>Homoranthus darwinioides</i> | Road |
| Development Corridor | Proposed Action Area - 10km Buffer | Malleefowl | <i>Leucochrysum albicans subsp. tricolor</i> | Drainage Line |
| Development Corridor - Wind Farm | NSW Bionet Records | New Holland Mouse | <i>Prasophyllum petilum</i> | National Parks (NPWS Estate) |
| Development Corridor - TWA Facility | Brush-tailed Rock-wallaby | Painted Honeyeater | <i>Thesium australe</i> | Land Category 1 - Exempt Land |
| Development Corridor - External Transmission Line | Caspian Tern | Pilotbird | Umwelt and NGH TS Records | |
| Indicative Development Footprints | Common Sandpiper | Plains-wanderer | Corben's long-eared bat | |
| Indicative Development Footprint - Wind Farm | Corben's Long-eared Bat | Sharp-tailed Sandpiper | Glossy black-cockatoo | |
| Indicative Development Footprint - TWA Facility | Fork-tailed Swift | South-eastern Glossy Black-Cockatoo | Glossy black-cockatoo (chewed sheoak cones) | |
| Indicative Development Footprint - External Transmission Line | Gang-gang Cockatoo | Spotted-tailed Quoll | Large-eared pied bat | |
| Indicative Development Footprint - Public Road Upgrades | Koala | Swift Parrot | Painted honeyeater | |
| | Large-eared Pied Bat | White-throated Needletail | | |
| | | <i>Commersonia procumbens</i> | | |

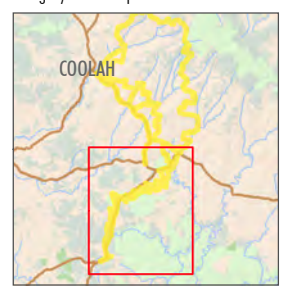


FIGURE 3.10B
MNES Records

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022), NSW Bionet Atlas records (2023), (NGH Environmental 2013a, 2013b and 2017)

Table 3.8 Description of the environment for species/communities to be assessed in PER

Species/ Community Name	Scientific Name	EPBC Act Status	Likelihood of Occurrence	Description of Environment provide in
Threatened ecological communities				
White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grassland		CEEC	Known	Section 3.5.1
Listed threatened flora				
-	<i>Homoranthus darwinioides</i>	V	Low. Requested by DCCEEW	Section 3.6.1
-	<i>Ozothamnus tessellatus</i>	V	Low. Requested by DCCEEW.	Section 3.6.2
Listed threatened birds				
Regent honeyeater	<i>Anthochaera phrygia</i>	CE	Moderate.	Section 3.7.1
Gang-gang cockatoo	<i>Callocephalon fimbriatum</i>	E	Low. Requested by DCCEEW.	Section 3.7.2
South-eastern Glossy Black-Cockatoo	<i>Calyptorhynchus lathami lathami</i>	V	Known	Section 3.7.3
Grey falcon	<i>Falco hypoleucos</i>	V	Low. Requested by DCCEEW.	Section 3.7.4
Painted honeyeater	<i>Grantiella picta</i>	V	Known	Section 3.7.5
White-throated needletail	<i>Hirundapus caudacutus</i>	V, CAMBA, JAMBA, ROKAMBA	Known	Section 3.7.6
Swift parrot	<i>Lathamus discolor</i>	CE	Moderate	Section 3.7.7
Superb parrot	<i>Polytelis swainsonii</i>	V	Low. Requested by DCCEEW.	Section 3.7.8
Pilotbird	<i>Pycnoptilus floccosus</i>	V	Low. Requested by DCCEEW.	Section 3.7.9
Listed threatened mammals				
Large-eared pied bat	<i>Chalinolobus dwyeri</i>	V	Known	Section 3.8.1
Spotted-tail quoll (SE mainland population)	<i>Dasyurus maculatus maculatus</i>	E	High (call heard)	Section 3.8.2
Corben's long-eared Bat	<i>Nyctophilus corbeni</i>	V	Known	Section 3.8.3
Greater glider (southern and central)	<i>Petauroides volans</i>	E	Known	Section 3.8.4
Yellow-bellied glider (south-eastern)	<i>Petaurus australis australis</i>	V	Known	Section 3.8.5
Koala (<i>Phascolarctos cinereus</i>) (combined populations of Qld, NSW and the ACT)	<i>Phascolarctos cinereus</i>	E	High	Section 3.8.6

Species/ Community Name	Scientific Name	EPBC Act Status	Likelihood of Occurrence	Description of Environment provide in
Grey-headed flying-fox	<i>Pteropus poliocephalus</i>	V	Known (recorded overhead) Requested by DCCEEW.	Section 3.8.7
Listed Migratory Species (Sections 20 and 20A)				
White-throated needletail	<i>Hirundapus caudacutus</i>	V, migratory (CAMBA, JAMBA, ROKAMBA)	Known	Section 3.7.6
Black-faced monarch	<i>Monarcha melanopsis</i>	marine; migratory (Bonn)	Low. Requested by DCCEEW.	Section 3.9.3
Satin flycatcher	<i>Myiagra cyanoleuca</i>	marine; migratory (Bonn)	Low. Requested by DCCEEW.	Section 3.9.2
Rufous fantail	<i>Rhipidura rufifrons</i>	marine; migratory (Bonn)	Medium. Requested by DCCEEW.	Section 3.9.1

3.5 Threatened Ecological Communities

3.5.1 White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grassland – Critically Endangered

3.5.1.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is listed as a CEEC under the EPBC Act. This community occurs in and along the western slopes and tablelands of the Great Dividing Range from Southern Queensland (QLD) through New South Wales (NSW) to central Victoria (VIC) in areas where rainfall is between 400 and 900 mm per annum, on moderate to highly fertile soils, hilly to undulating landscapes and altitudes of 170 m to 1200 m (DCCEEW 2023a).

The distribution of woodland that may be representative of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC in NSW is shown in Figure 5.2 of the BDAR (Umwelt 2023a) in **Appendix D**. It should be noted that this figure shows the current extent of the NSW Box Gum Woodland CEEC, based on the SVTM. The distribution and extent of Commonwealth Box Gum Woodland CEEC in NSW is likely to represent only a portion of that shown in Figure 5.2 of the BDAR (Umwelt 2023a) given differences in the key diagnostic and condition thresholds.

The ecological community is characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of white box (*Eucalyptus albens*), yellow box (*Eucalyptus melliodora*) and/or Blakely's red gum (*Eucalyptus blakelyi*) trees (TSSC 2006, DCCEEW 2023a). In the Nandewar bioregion only, western grey box (*Eucalyptus microcarpa*) or grey box (*Eucalyptus moluccana*) may also be dominant or co-dominant. These tree species may all co-occur but also exist in various combinations, including only one of these species being present at a site (DCCEEW 2023a). Dominance of tussock grasses is a key feature of the ground layer of this ecological community with a range of broad-leaved forbs and lilies amongst the grass tussocks (DCCEEW 2023a).

Derived native grassland expression of the ecological community occurs where the tree canopy cover of the grassy woodland is removed, and the understorey remains relatively intact (DCCEEW 2023a). Modification of most areas of the ecological community since European settlement has increased the range of structural forms now present, with tree cover and stem density now varying substantially. Current levels of canopy cover range from absent in the derived grasslands form, to a continuous canopy cover in some circumstances (DCCEEW 2023a).

Commonwealth Box Gum Woodland CEEC has been cleared or degraded across most of its range (TSSC 2006, DCCEEW 2023a). At the time of listing, 92 per cent of the original extent was estimated to have been cleared (TSSC 2006, DCCEEW 2023a). Less than 10 per cent of the Commonwealth Box Gum Woodland CEEC is protected within the national reserve system (DCCEEW 2023a).

At the time of listing, it was estimated that less than five per cent of Commonwealth Box Gum Woodland CEEC remained in good condition with most of this remaining in small, isolated patches (TSSC 2006, TSSC 2020a). The Commonwealth Box Gum Woodland CEEC has been most severely reduced on the western slopes of NSW and Central Victoria (TSSC 2006, TSSC 2020a). The level of clearance has been least in the ACT, Northern NSW and Southern NSW, particularly in the rugged gorge country (TSSC 2006, TSSC 2020a). It is estimated that 93 per cent of the Commonwealth Box Gum CEEC has been removed in NSW and that about 92 per cent of the total former extent is estimated to have been cleared (TSSC 2006, DCCEEW 2023a).

There is circumstantial evidence which suggests that clearing of the Commonwealth Box Gum Woodland CEEC is ongoing and has increased in recent years, particularly in NSW which accounts for three quarters of the distribution of the Commonwealth Box Gum Woodland CEEC. The Conservation Advice of the Commonwealth Box Gum Woodland CEEC states that in NSW clearing of woody native vegetation has increased in recent years (DCCEEW 2023a). In the period of 2009-2016, the average area of grassy woodlands (not specific to Commonwealth Box Gum Woodland CEEC) cleared in NSW by agriculture and infrastructure was estimated to be 550 ha per year. In the years 2016-2017, clearing of grassy woodland (not specific to Commonwealth Box Gum Woodland CEEC) rose to an estimated average of 654 ha for agriculture and 216 ha for infrastructure in NSW, increasing further in 2017-2018 to 1,344 ha and 589 ha, respectively (TSSC 2020a). In NSW between 2017-2019 the annual mean loss of grassy woodland (not specific to Commonwealth Box Gum Woodland CEEC) increased further to 2,290 ha the majority associated with agricultural clearing (DCCEEW 2023a).

Over the period of 2009 to 2018 in Brigalow Belt South IBRA Bioregion about 2,630 ha of grassy woodland (not specific to Commonwealth Box Gum Woodland CEEC) was cleared while 1,320 ha was cleared in the Sydney Basin IBRA Bioregion (TSSC 2020a). The rates for clearing or modification of derived native grassland components are unknown (TSSC 2020a).

The species composition varies significantly across the Commonwealth Box Gum Woodland CEEC, depending on the structural condition in which it occurs (i.e. woodland, thinned woodland or derived native grassland) and substantial variation also occurs within different conditions of this structure. Variation in species composition is caused by a range of biotic and abiotic factors, including but not limited to weather, land use history, current land use and fire regimes (TSSC 2020a, DCCEEW 2023a). There are very few examples of the fully intact ecological community. Given the currently highly fragmented and degraded state of the Commonwealth Box Gum Woodland CEEC, all areas that meet the minimum condition criteria in the Conservation Advice should be considered critical to the survival of the community (DCCEEW 2023a).

3.5.1.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Approved Conservation Advice for the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (DCCEEW 2023a).
- Commonwealth Listing Advice on White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (TSSC 2006). The 2023 Conservation Advice does not present a revision, update or copy of the original listing advice from 2006 (DCCEEW 2023).
- Conservation Assessment of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland by the NSW TSSC (2020a).
- National Recovery Plan for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (DECCW 2010a).
- Adopted/made threat abatement plans:
 - Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads (DSEWPaC 2011).
 - Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*) (2017) (DoEE 2017b).
 - Threat abatement plan for disease in natural ecosystems caused by *Phytophthora cinnamomi* (DoEE 2018).

3.5.1.3 Survey Effort and Results

A total of 126 BAM Vegetation Integrity Plots have been conducted in accordance with the BAM (DPIE 2020a) over the following survey periods:

- 4 to 8 May 2020
- 15 to 19 June 2020
- 14 August 2020
- 18 to 22 January 2021
- 10 to 14 May 2021
- 20 to 24 September 2021
- 16 to 19 May 2023
- 23 to 25 May 2023.

Adequacy of survey coverage for BAM Vegetation Integrity Plots is summarised in **Table 3.5**. The number of BAM Vegetation Integrity plots completed for the vegetation zones that have been assessed as representative of the Commonwealth Box Gum Woodland CEEC comply with or exceed the survey effort requirements of the BAM (DPIE 2020a).

Vegetation communities identified in the Development Corridor were compared to TECs listed under the EPBC Act and an assessment of similarity was undertaken against the Commonwealth Threatened Species Scientific Committee Listing and Conservation Advice. The following approach was used:

- Full-floristic quadrat assessment, rapid assessments and meandering survey to determine floristic composition and structure of each ecological community.
- Comparison with published species lists, including lists of “important species” as identified on the listing/conservation advice provided by the Commonwealth Threatened Species Scientific Committee.
- Comparison with habitat descriptions and distributions for listed TECs.
- Assessment using guidelines and recovery plans published by the Commonwealth DCCEEW and the NSW BCS and the NSW and Commonwealth threatened species scientific committees, where available.
- Comparison with other assessments of TECs in the region.

Vegetation communities identified and mapped during the biodiversity assessment by Umwelt were reviewed to identify if they conformed to the CEEC listing advice and condition thresholds as provided in DCCEEW (2023a). This analysis used floristic data from the ecological surveys completed by Umwelt and provided in detail in the BDAR (Umwelt 2023a) in **Appendix D**.

The Commonwealth Box Gum Woodland CEEC occurs within the Proposed Action Area and Indicative Development Footprints of the Approved and Proposed Action.

Following submission of the Referred Action and the NSW Mod-1 Application, additional surveys and revision of vegetation mapping was completed in response to a request from NSW BCS. This review while focused on the NSW listed community, has informed review of the extent of Commonwealth Box Gum Woodland CEEC in the Development Corridor. NSW BCS, at the most recent agency review of the NSW Mod-1 Application Amendment 1 BDAR (Umwelt 2023a) in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys.

3.5.1.4 Proposed Action Habitat Assessment

The detailed assessment of the listing advice for the Commonwealth Box Gum Woodland CEEC in the BDAR (Umwelt 2023a) in **Appendix D** as summarised in **Table 3.9**, identified three Vegetation Zones in the Development Corridor – Wind Farm and Development Corridor – External Transmission Line as conforming with the Commonwealth Box Gum Woodland CEEC as listed under the EPBC Act.

Table 3.9 EPBC Act listed CEEC Condition Classes and Thresholds in the Development Corridor

Listing Advice Criterion	Patch Size	Condition Thresholds	PCT 281 Vegetation Zone 2	PCT 483 Vegetation Zone 6	PCT 488 Vegetation Zone 9
Class A Good quality understorey and mature overstorey both present.	0.1 ha or larger	The ground layer is predominantly native*, AND	✓	✓	✓
		The understorey contains at least 12 native, non-grass species (such as forbs, shrubs, ferns and sedges), AND	✓	✓	✓
		At least one of the understorey species should be a species recognised as 'important', AND	✓	✓	✓
		The patch contains 10 or more mature trees* per hectare consistent with the key diagnostics for the ecological community	✓	✓	✓
		Outcome	✓	✓	✓
Class B Good quality understorey present. Characteristic trees may be absent.	0.1 ha or larger	The ground layer is predominantly native*, AND	n/a	n/a	n/a
		The understorey contains at least 12 native, non-grass species (such as forbs, shrubs, ferns and sedges), AND	n/a	n/a	n/a
		At least one of the understorey species should be a species recognised as 'important', AND	n/a	n/a	n/a
		Outcome	n/a	n/a	n/a
Class C Allows for a lower diversity in the understorey in areas where there is regeneration and/or tree density may be relatively dense.	2 ha or larger	The ground layer is predominantly native*, AND	n/a	n/a	n/a
		The patch contains 20 or more mature trees* per hectare, AND/OR	n/a	n/a	n/a
		The patch contains natural regeneration of dominant overstorey eucalypts*	n/a	n/a	n/a
		Outcome	n/a	n/a	n/a

* Definitions as per Page 20 of the Commonwealth Box Gum Woodland CEEC Conservation Advice (DCCEEW 2023).

As shown in **Table 3.9**, two Vegetation Zones wholly conformed with the Commonwealth Box Gum Woodland CEEC, while one partially conformed with the community:

- Vegetation Zone 2: PCT 281 Rough-Barked Apple— Red Gum— Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion— Moderate/good condition (refer to **Photo 3.14**).
 - This vegetation zone wholly conforms with the Commonwealth Box Gum Woodland CEEC, totalling 45.7 ha of the Development Corridor.
 - Occurs on low alluvial plains close to several watercourses. In the Development Corridor it occurs mainly along Ulan Road in the south (refer to **Figure 3.9**).



Photo 3.14 Moderate/good patch of Commonwealth Box Gum Woodland CEEC within Vegetation Zone 2

- Vegetation Zone 6: PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, Upper Hunter— Moderate/good condition (refer to **Photo 3.15**).
 - This vegetation zone wholly conforms with the Commonwealth Box Gum Woodland CEEC, totalling 117 ha of the Development Corridor.
 - Despite this moderate area of coverage, this vegetation zone is uncommon. Occurring only in restricted pockets in agricultural land where the canopy and midstorey have not been substantially removed but the ground layer is somewhat disturbed.



Photo 3.15 Moderate/good patch of Commonwealth Box Gum Woodland CEEC within Vegetation Zone 6

- Vegetation Zone 9: Silvertop Stringybark – Yellow Box +/- Nortons Box grassy woodland on basalt hills mainly on northern aspects of the Liverpool Range, Brigalow Belt South Bioregion – Moderate/good condition (refer to **Photo 3.16**).
 - This vegetation zone partially conforms with the Commonwealth Box Gum Woodland CEEC, totalling 11.5 ha of the Development Corridor, specifically only within the Development Corridor – Wind Farm.
 - While this vegetation zone is common throughout the Development Corridor, totalling 330.8 hectares, it generally does not conform with the Commonwealth Box Gum Woodland CEEC due to it being characterised by a canopy inconsistent with the community. However, several patches of this vegetation zone in the north-east of the Proposed Action supports a canopy dominated by yellow box (*Eucalyptus melliodora*) and therefore was assessed as conforming with the Commonwealth Box Gum Woodland CEEC.
 - The 11.5 ha of this vegetation zone that conforms with the Commonwealth Box Gum Woodland CEEC represents approximately three (3) per cent of the total area of the vegetation zone within the Development Corridor.



Photo 3.16 Moderate/good patch of Commonwealth Box Gum Woodland CEEC within Vegetation Zone 9

In total about 174.1 ha of the Commonwealth Box Gum Woodland CEEC has been identified in the Development Corridor for the Wind Farm and External Transmission Line. The Proposed Action will impact 31.6 ha of the Commonwealth Box Gum Woodland CEEC. The distribution of the Commonwealth Box Gum Woodland CEEC in the Development Corridor is shown in **Figure 3.9**.

Importantly, the area of the Commonwealth Box Gum Woodland CEEC in the Development Corridor of the Proposed Action has decreased from 362.5 ha in the Referred Action to 174.1 ha in the Proposed Action. The decrease between Referred Action and Proposed Action is due to changes in the design layout of the Proposed Action (refer to **Section 2.2**).

Notwithstanding this reduction, it is acknowledged that the area of the Commonwealth Box Gum Woodland CEEC in the Development Corridor of the Proposed Action has increased from that mapped for the Approved Action, this increase is not considered to be a result of the Proposed Action impacting new areas or better patches of the Commonwealth Box Gum Woodland CEEC. Instead, Umwelt consider the primary reason for this change to be an outcome of the detailed analysis of extensive BAM Vegetation Integrity Plots undertaken for the Proposed Action against the Listing Advice for the Commonwealth Box Gum Woodland CEEC (DCCEEW 2023a).

3.5.1.5 Impact Assessment Required?

An impact assessment is required for Commonwealth Box Gum Woodland CEEC, refer to **Section 5.3.1**.

3.6 Listed Threatened Flora Species

3.6.1 *Homoranthus darwinioides*

3.6.1.1 Information on the Abundance, Distribution, Ecology and HABITAT preferences

Homoranthus darwinioides is a small shrub that often forms tangled masses in various woodland habitats with shrubby understoreys, usually in gravely sandy soils. It has been recorded on a variety of landforms including flat sunny ridge tops with scrubby woodland, sloping ridges, gentle south-facing slopes, and a slight depression on a roadside with loamy sand (DEWHA 2008a).

It has localised distribution in the central tablelands and western slopes of NSW occurring from just north of Dubbo through to just west of Denman. It may be the dominant undershrub at some sites. Vegetation associations include *Eucalyptus-Callitris* woodland, consisting of *Eucalyptus crebra*, *E. fibrosa*, *E. trachyphloia*, *E. beyeri subsp. illaquens*, *E. dwyeri*, *E. rossii*, *Leptospermum divaricatum*, *Melaleuca uncinata*, *Calytrix tetragona*, *Allocasuaria* spp., *Micromyrtus* spp., and *Acacia* spp. (DEWHA 2008a).

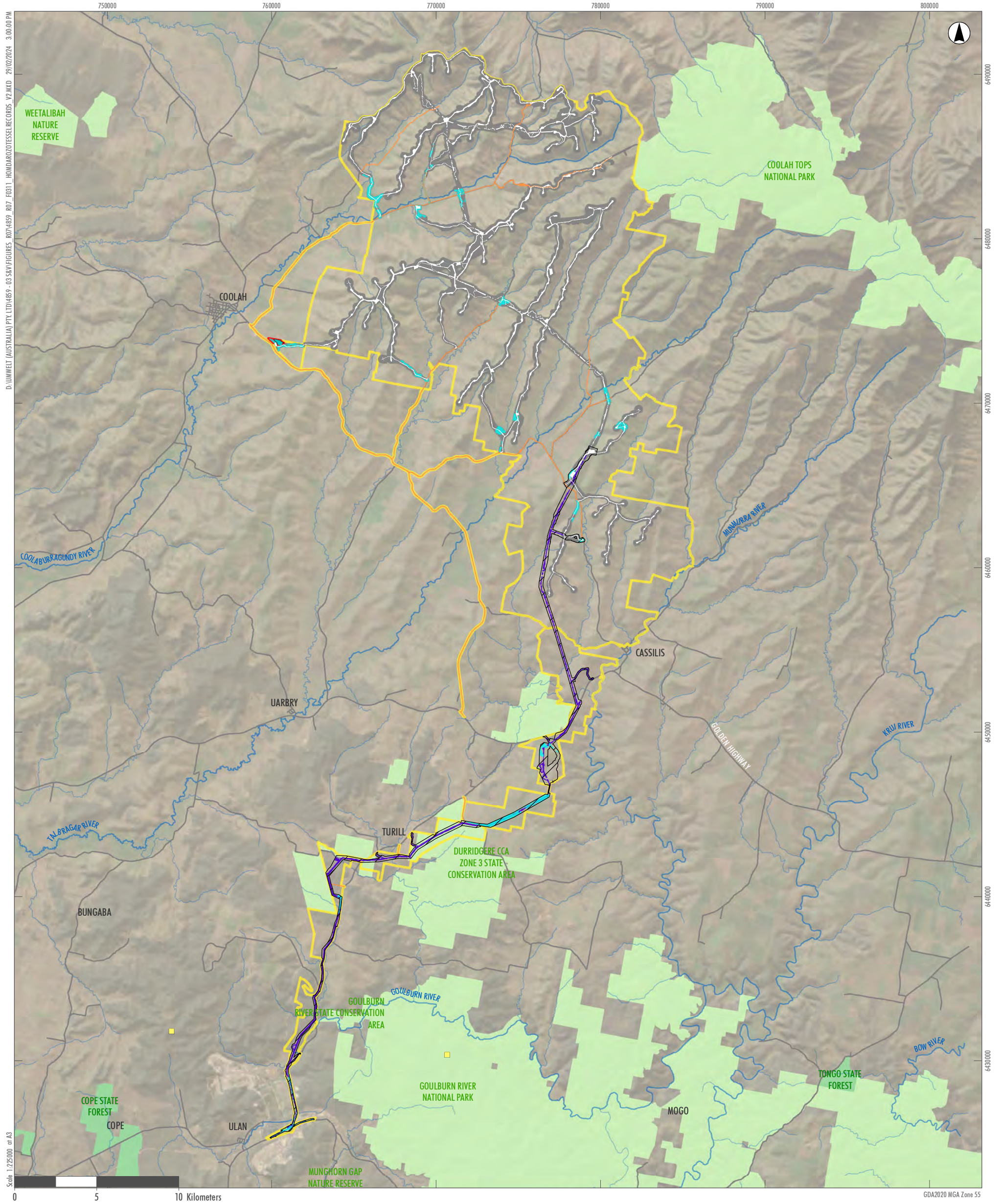
Homoranthus darwinioides is listed as vulnerable under the EPBC Act and the BC Act. Under the NSW BAM it is assessed as a species credit species.

There are no records of this species within 5 km of the Development Corridor. There are two number of records of this species within a 10 km radius of the Development Corridor from no later than 1998 (refer to **Figure 3.11**). There are numerous BioNet records of this species more than 10 km from the Development Corridor in the eastern end of Goulburn River National Park on sandstone outcrops or ridges. These records are part of the populations recorded in the conservation advice from Goulburn River National Park and two populations in Goonoo State Forest north-east of Dubbo in NSW (DEWHA 2008a).

3.6.1.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Approved Conservation Advice for *Homoranthus darwinioides* (DEWHA 2008a).
- There is no listing advice for this species, listing assessment information may be available in the Approved Conservation Advice.
- There is no adopted or made Recovery Plan for this species.
- Adopted/made threat abatement plans: Threat abatement plan for competition and land degradation by rabbits (DOEE 2016).



D:\UMWELT (AUSTRALIA) PTY LTD\4857-03 SRV\FIGURES_8074857_007_FIG11_HOMORANTHUS DARWINOIDES RECORDS_V2.MXD_29/02/2024_3:00:00 PM
 Scale: 1:25000 at A3

Legend

- Proposed Action Area
- Development Corridor**
- Development Corridor - Wind Farm
- Development Corridor - TWA Facility
- Development Corridor - External Transmission Line
- Indicative Development Footprints**
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - TWA Facility
- Indicative Development Footprint - External Transmission Line
- Indicative Development Footprint - Public Road Upgrades
- Road
- Drainage Line
- National Parks (NPWS Estate)
- State Forest
- Land Category 1 - Exempt Land
- NSW Bionet Records**
- Homoranthus darwinioides*

FIGURE 3.11

**Homoranthus darwinioides
BioNet Records**

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022), NSW Bionet Atlas records (2023), (NGH Environmental 2013a, 2013b and 2017)

3.6.1.3 Survey Effort and Results

In addition to the field surveys conducted by NGH (2013a, 2013b and 2017) (refer to **Table 3.3** and **Table 3.4**), Umwelt conducted targeted surveys for this species in April, May, June, August and October 2020, May and September 2021 and May 2023 (refer to **Table 3.6**). These surveys coincide with recommended survey periods for this species as defined in the NSW TBDC.

A summary of the targeted surveys for this species are listed below:

- 8–19 October 2012
- 1–9 October 2013
- 20–23 March 2015
- 4–6 October 2016
- 8, 9 and 17 April 2020
- 4–8 May 2020
- 15–19 June 2020
- 17–21 August 2020
- 7–9 October 2020
- 10–14 May 2021
- 20–24 September 2021
- 16–25 May 2023.

Approximately 138 person days of targeted survey have been completed for this species as part of the Proposed Action. Survey transects (parallel walked transects and general meandering transects) locations were selected by Umwelt generally in accordance with the survey design, technique and sampling effort in *Surveying threatened plants and their habitats: NSW guide for the Biodiversity Assessment Method* (DPIE 2020b) and its predecessor, and the NSW BAM (DPIE 2020a). That is surveys were completed in potential habitat, avoiding ecotones and disturbed areas, coinciding with optimum survey periods to detect the species as defined in the literature and/or the NSW TBDC.

Where a species could not be positively identified in the field and was suspected of being a threatened species, a voucher specimen was collected. These samples were sent to the Royal Botanical Gardens in Sydney for confirmation of identifications.

No individuals were observed within the Development Corridor.

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a) in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys.

3.6.1.4 Proposed Action Habitat Assessment

The NSW TBDC predicts that *Homoranthus darwinioides* is associated with a number of woodland PCTs however none of the PCTs described within the Development Corridor are predicted to provide habitat for this species. The BAM – Credit Calculator for the BDAR does not identify this species as predicted to occur.

No potential habitat has been mapped for the species in the Development Corridor.

Notwithstanding this, surveys were completed for this species by Umwelt due to presence of woodland habitat and associated species. This species has not been recorded within the Development Corridor (Umwelt 2023a).

3.6.1.5 Impact Assessment Required?

As there is a low likelihood that this species could occur within the Development Corridor, an impact assessment for this species is not required.

3.6.2 *Ozothamnus tessellatus*

3.6.2.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

Ozothamnus tessellatus is a dense low shrub from the Asteraceae family, that grows in dry sclerophyll forests (shrubby and shrub/grass sub-formation) and grassy woodlands. It is restricted to a few locations north of Rylstone in the Sydney Basin Bioregion (south of Bunnan and between west Bylong and east Ravensworth (TBDC)) and is conserved within the Goulburn River National Park and Munghorn Gap Nature Reserve (DEWHA 2008). It is known from Wollemi National Park restricted to scattered populations in open woodland or forest on Permian sediments on the drier, northern footslopes around Coxs Gap and major valleys draining into the Goulburn River (Bell 2008).

Ozothamnus tessellatus is listed as vulnerable under the EPBC Act and the BC Act. Under the NSW BAM it is assessed as a species credit species.

3.6.2.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Approved Conservation Advice for *Ozothamnus tessellatus* (DEWHA 2008b).
- There is no listing advice for this species, listing assessment information may be available in the Approved Conservation Advice.
- There is no adopted or made Recovery Plan for this species.
- There is no adopted/made threat abatement plans, identified as being relevant for this species.

3.6.2.3 Survey Effort and Results

This species has not been previously considered within the referral for this Proposed Action and was not identified in the NSW BAM – Credit Calculator as a candidate species for the BDAR. No targeted surveys were completed for this species. Other targeted surveys for flora species were conducted by NGH and Umwelt as summarised in **Table 3.3**, **Table 3.4** and **Table 3.6**.

A summary of ecological survey programs that were completed during suitable months for this species (as per the TBDC) are presented below:

- 8–19 October 2012
- 1–9 October 2013
- 4–6 October 2016
- 7–9 October 2020
- 20–24 September 2021.

Approximately 64 person days of targeted survey have been completed for this species as part of the Proposed Action. Survey transects (parallel walked transects and general meandering transects) locations were selected by Umwelt generally in accordance with the survey design, technique and sampling effort in *Surveying threatened plants and their habitats: NSW guide for the Biodiversity Assessment Method* (DPIE 2020b) and its predecessor, and the NSW BAM (DPIE 2020a). That is surveys were completed in potential habitat, avoiding ecotones and disturbed areas, coinciding with optimum survey periods to detect the species as defined in the literature and/or the NSW TBDC.

There are no BioNet records of this species within 10 km of the Development Corridor, the closest records are south of Goulburn River National Park near Wollar.

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a) in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys.

3.6.2.4 Proposed Action Habitat Assessment

Based on the NSW TBDC, there are no PCTs within the Development Corridor which are predicted to provide habitat for this species. There is a low likelihood of the species occurring in the Proposed Action Area.

3.6.2.5 Impact Assessment Required?

This species has not been recorded in and there is no predicted habitat for this species within the Development Corridor. It has a very restricted distribution in areas to the 24 km east of the Development Corridor.

An impact assessment is not required for this species.

3.7 Listed Threatened Bird Species

3.7.1 Regent Honeyeater (*Anthochaera phrygia*)

3.7.1.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

The regent honeyeater is a critically endangered, partially nomadic species occurring in temperate woodlands and forests within a patchy distribution between central VIC and south-east QLD which has undergone a severe decline in recent decades (Garnett *et al.* 2011). The listing advice in 2015 estimated that the extent of occurrence was 600,000 km² and the area of occupancy 300 km² (DoE 2016) and decreasing.

The regent honeyeater mostly inhabits inland slopes of the Great Dividing Range, in areas of low to moderate relief with moist, fertile soils; most commonly associated with box-ironbark eucalypt woodland and dry sclerophyll forest, but may also occur in riparian vegetation, spotted gum-ironbark associations and coastal forest dominated by swamp mahogany (*Eucalyptus robusta*). The regent honeyeater forages on nectar (eucalypts and mistletoes) and invertebrates and their exudates (DoE 2015a). Movement is thought to be governed by flowering of select eucalypt species. The regent honeyeater roosts communally in small groups, in trees with dense foliage (DoE 2015a).

In 2010 the number of mature individuals was estimated at 350–400 (Garnett *et al.* 2011), and there is an inferred continuing decline although there is no estimate as to the ongoing rate of decline (DoE 2016). More than 95 per cent of mature individuals occur in a single subpopulation (Garnett *et al.* 2011). The estimated total number of mature individuals of this species is low, and the geographic distribution is precarious for the survival of the species because more than 95 per cent of mature individuals occur in a single subpopulation. More recently, total population estimated at 100 breeding pairs (Crates *et al.* 2018).

Habitat critical to the survival of the regent honeyeater include key breeding and foraging areas at:

- Bundarra-Barraba and subsidiary area of Pilliga Woodlands, Warrumbungles, Inverell-Ashford-Emmaville.
- Capertee Valley and subsidiary area of Mudgee-Munghorn Gap-Wollar and Burratorang River Valleys.
- Hunter Valley/Central Coast areas in NSW extending from central coast, the lower Hunter Valley to Upper Hunter Valley and Goulburn River (DoE 2016).

The Mudgee-Munghorn Gap-Wollar area is more than 10 kilometres to the south of the southern end of the Development Corridor – External Transmission Line. Extensive areas of known and potential habitat remain in the surrounding landscape in Munghorn Gap, Wollemi and Goulburn River national park estate in the Mudgee-Wollar IBA. Within the Mudgee-Wollar IBA a resident population of 50 individuals of the regent honeyeater occurred between 1996 and 2006 (Birdlife Australia 2023a). However, it is noted that parts of this habitat were burnt in the 2019/ 2020 wildfires which could lead in changes to utilisation of the species throughout its NSW range.

Capertee Valley is recognised as an IBA supporting a large number of bird species (Birdlife Australia 2023c). It occurs south of Kandos, about 67 km south of Ulan. Between 1990 and 2007 Capertee Valley IBA supported a resident population estimated at 800 individuals of regent honeyeater (Birdlife Australia 2023c). Habitat in Capertee Valley has experienced wildfires in 2019/ 2020 reducing area of habitat critical to the survival of the regent honeyeater (BirdLife Australia 2021).

3.7.1.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Approved Conservation Advice *Anthochaera phyrigia* regent honeyeater (DoE 2015a).
- There is no listing advice for this species, listing assessment information may be available in the Approved Conservation Advice.
- Adopted or made Recovery Plan: National Recovery Plan for the Regent Honeyeater (*Anthochaera phyrigia*) (DoE 2016).
- Adopted/made threat abatement plans: Threat abatement plan for competition and land degradation by rabbits (DOEE 2016).
- Other policy statements and guidelines: Survey guidelines for Australia's threatened birds. Guidelines for detecting birds listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010).

3.7.1.3 Survey Effort and Results

This species is listed under the NSW BC Act and the Commonwealth EPBC Act and has specific assessment requirements under the NSW BAM (DPIE 2020a):

- Foraging habitat for the regent honeyeater is assessed in the NSW BAM (DPIE 2020a) as an ecosystem credit species, that is targeted surveys are not required to identify or confirm presence as occurrence is predicted based on association with a PCT in the Development Corridor.
- Important habitat (breeding and foraging habitat) for the species is assessed in the BAM – Credit Calculator as a dual credit species. The important habitat mapping is prepared by NSW DPE.

Commonwealth survey guidelines for threatened birds (DEWHA 2010) recommends area searches in suitable habitat preferably in the morning. Targeted searches of woodland patches with heavily flowering trees is useful, especially around waterpoints such as dams and creeklines. Broadcasting surveys immediately before and during the breeding season may be useful.

The following survey effort guide:

- Area searches, for areas less than 50 ha, 20 hours 10 days.
- Targeted searches of heavily flowering trees and flocks of other blossom feeders, 20 hours 5 days.

Avifauna surveys have been completed by NGH and Umwelt across the Development Corridor including:

- Bird surveys over 10 days in October 2012, over 9 days in October 2013 (NGH 2013a and 2013b) (refer to **Table 3.3** and **Table 3.4**).
- Winter bird surveys including call playback over five days in 17 to 21 August 2020 specifically targeting the regent honeyeater and the swift parrot (refer to **Table 3.6**).

Approximately 48 person days of targeted survey have been completed for this species as part of the Proposed Action.

Field survey techniques used to undertake surveys were in general accordance with the NSW guide for the BAM (DPIE 2020a).

Targeted searches were completed in 2020 for the regent honeyeater in keeping with the Commonwealth guidelines during winter flowering. This survey included call broadcasting the call of regent honeyeater with a speaker, followed by a period of listening, another period of broadcasting the call with a speaker, followed by a 20 minute / 2 hectare targeted diurnal bird survey.

This species has not been recorded by surveys within the Development Corridor. There are only two records of the species (one from 1999 and one recent record 2021) within 10 km of the Development Corridor and none within five kilometres. The closest record is about seven kilometres to the south of Development Corridor – External Transmission Line (refer to **Figure 3.12**). There are numerous records, further south of the Development Corridor from the Munghorn Gap area from before 2000s.

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a), as part of the NSW Mod-1 Application response to submissions phase, in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys.

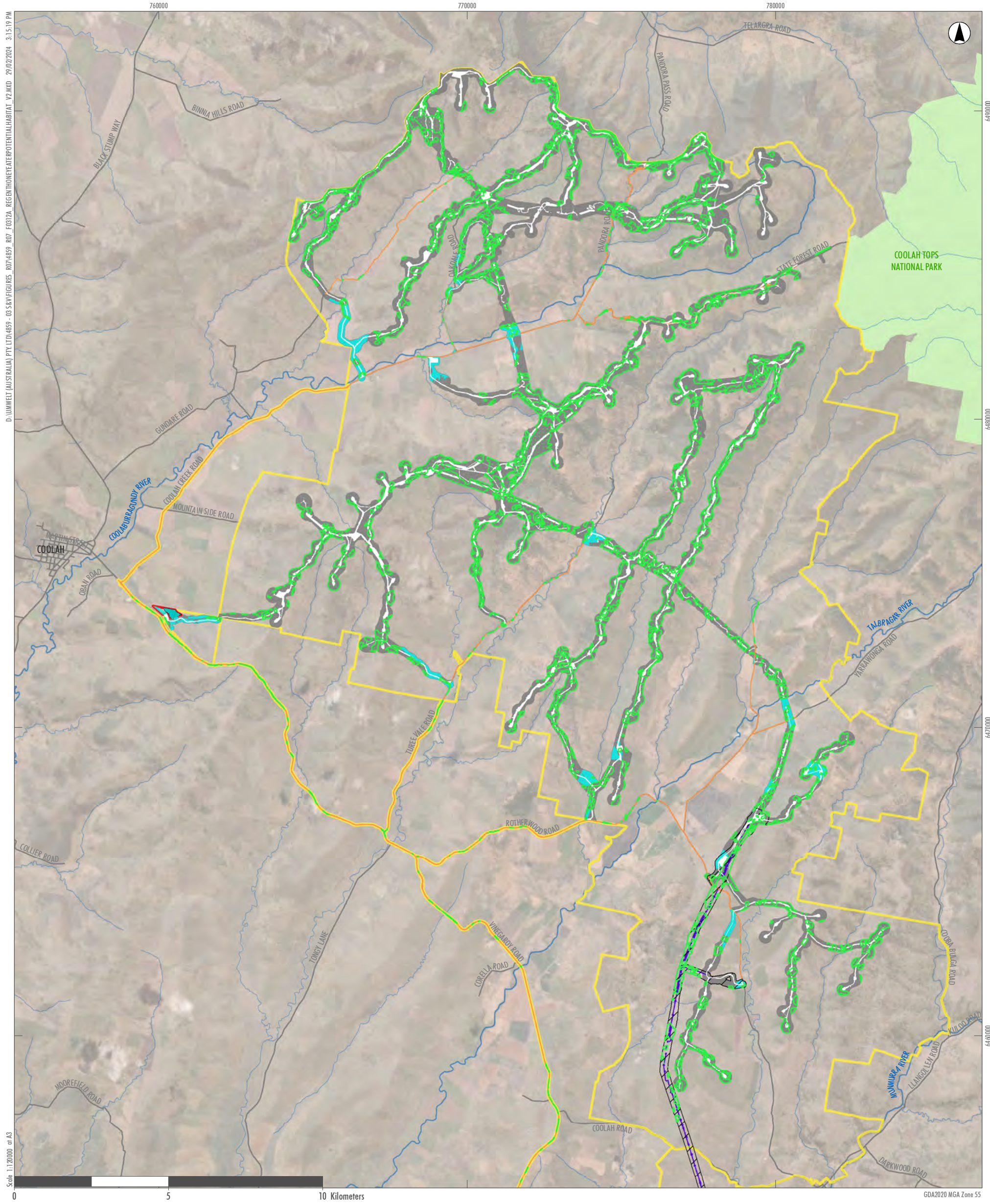
3.7.1.4 Proposed Action Habitat Assessment

The NSW DPE have not mapped any Important Habitat Areas for this species in the Development Corridor (Umwelt 2023a). Based upon a review of potential habitat and BioNet records in the locality, Umwelt has assumed that the regent honeyeater has the potential to utilise woodland habitat within the Development Corridor and broader Proposed Action Area, for foraging and potentially breeding, as the species is highly mobile and irregularly detected over a wide range. The likelihood of the species utilising habitat in the Proposed Action Area is consistent with that of extensive areas of degraded woodland and dry forest throughout the species range. Foraging resources in the Development Corridor include white box (*Eucalyptus albens*), yellow box (*E. melliodora*), mugga ironbark (*E. sideroxylon*) and mistletoe species *Amyema miquelii*.

The BDAR (Umwelt 2023a) has defined a species polygon for potential habitat for the regent honeyeater based on PCTs listed as suitable PCTs in the NSW TBDC for the species, being PCT 84, PCT 281, PCT 479, PCT 481, PCT 483 and PCT 488 (refer to **Figure 3.12**). Umwelt has identified 3,233.4 ha potentially suitable habitat for the species within the Development Corridor, of which 603.9 ha would be impacted by the Proposed Action. The potential habitat polygon excludes Vegetation Zone 12 PCT 488, Vegetation Zone 8 PCT 483 and Vegetation Zone 17 PCT 483 as these vegetation zones are either derived native grassland or heavily degraded with exotic understorey and almost absent of scattered trees. It is considered highly unlikely that regent honeyeater will utilise vegetation zones 8, 12 and 17 but they may seek temporary shelter in the scattered canopy trees when travelling through the landscape in rare occurrences that the species occurred in the Proposed Action Area. It is more likely the species would utilise the more intact woodlands and forested habitats within the Proposed Action Area during those occurrences.

3.7.1.5 Impact Assessment Required?

The impact of the Proposed Action on the regent honeyeater is considered in **Section 5.4.1**.



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Scale: 1:120000 at A3

GDA2020 MGA Zone 55

Legend

- Proposed Action Area
- Development Corridor**
- Development Corridor - Wind Farm
- Development Corridor - TWA Facility
- Development Corridor - External Transmission Line
- Indicative Development Footprints**
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - TWA Facility
- Indicative Development Footprint - External Transmission Line
- Indicative Development Footprint - Public Road Upgrades
- Land Category 1 - Exempt Land
- Regent Honeyeater Potentially Suitable Habitat
- Road
- Drainage Line
- National Parks (NPWS Estate)

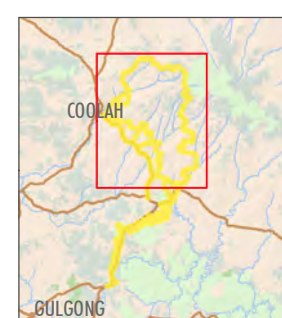
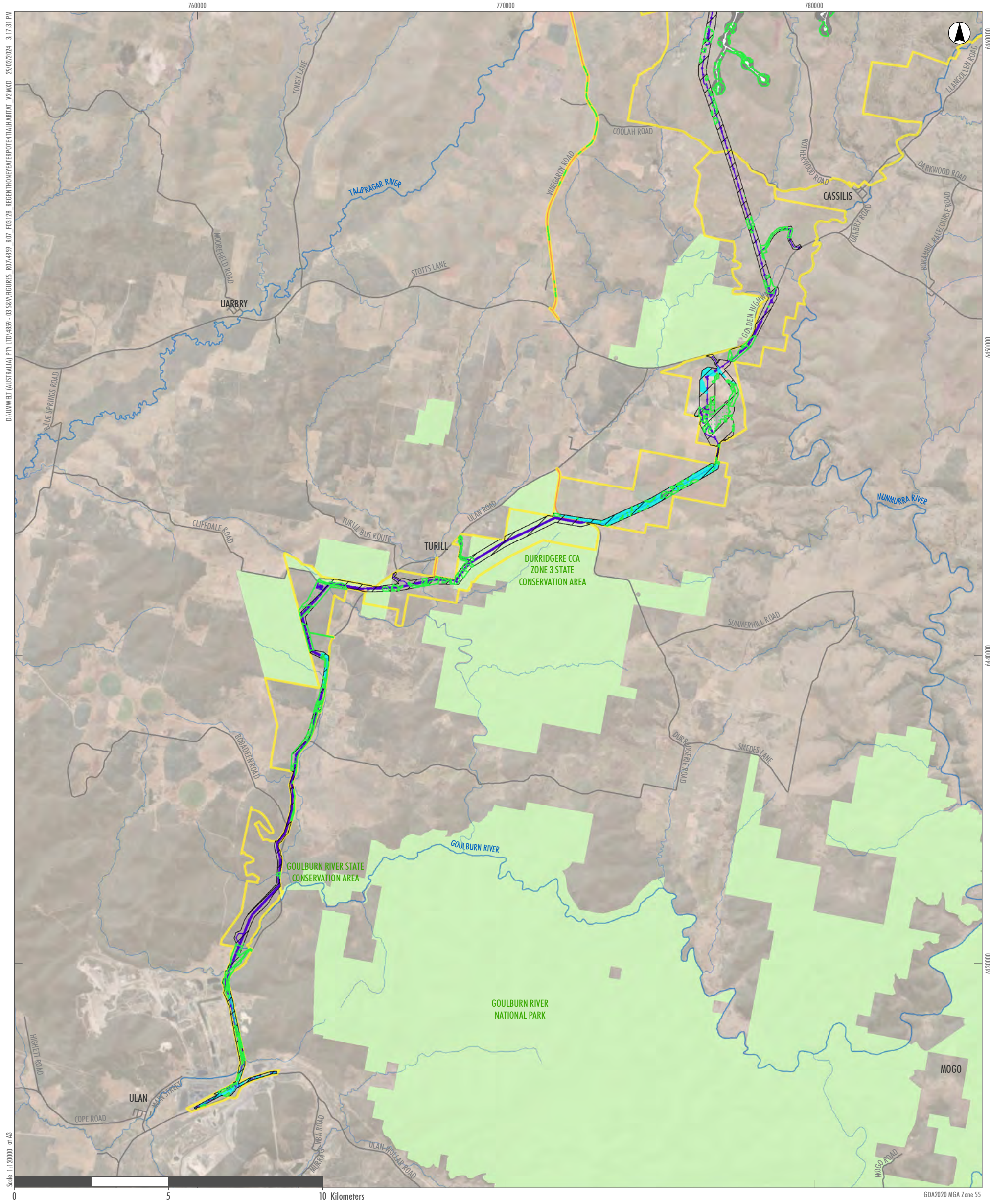


FIGURE 3.12A

Regent Honeyeater potential habitat and BioNet records

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2021), NSW Bionet Atlas records (2023), (NGH Environmental 2013a, 2013b and 2017)



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Scale: 1:120000 at A3

Legend

- Proposed Action Area
- Development Corridor**
- Development Corridor - Wind Farm
- Development Corridor - TWA Facility
- Development Corridor - External Transmission Line
- Indicative Development Footprints**
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - TWA Facility
- Indicative Development Footprint - External Transmission Line
- Indicative Development Footprint - Public Road Upgrades

- Land Category 1 - Exempt Land
- Regent Honeyeater Potentially Suitable Habitat
- Road
- Drainage Line
- National Parks (NPWS Estate)

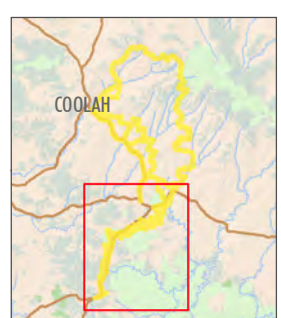


FIGURE 3.12B

Regent Honeyeater potential habitat and BioNet records

Image Source: ESRI Basemap (2022) Data source: NSW DSEI (2021), NSW Bionet Atlas records (2023), (NGH Environmental 2013a, 2013b and 2017)

3.7.2 Gang-gang Cockatoo (*Callocephalon fimbriatum*)

3.7.2.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

Gang-gang cockatoos are listed as endangered under the EPBC Act, endemic to south-eastern Australia. The species is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee. It is adapted to cooler conditions and has always been more common at higher elevations and more southern latitudes (DAWE 2022a).

Gang-gang cockatoos primarily occur within the temperate eucalypt forests and woodlands of mainland south-east Australia. The gang-gang cockatoo is an altitudinal migrant occupying mature, tall mountain wet sclerophyll forests and woodlands in summer months. During winter months, the gang-gang cockatoos tend to inhabit woodland assemblages at lower, drier altitudes supporting box-ironbark assemblages and river red gum (DAWE 2022a).

Gang-gang cockatoos and favour old growth forest and woodland assemblages for nesting, loafing, and roosting. The species nests in the hollows of tree trunks and limbs, or within the dead sprout of large, living eucalypts. Nesting and roosting sites are often near water, where larger hollow-bearing trees can be more common (DAWE 2022a). The gang-gang cockatoo is monogamous, breeding between October and January. Preferred hollows generally have an entrance height of 21.3 cm (minimum entrance height 12 cm) and an average entrance width of 13.1 cm (range 9–24 cm). The hollow chambers are generally around 20 cm in floor diameter, around 50.5 cm deep (range 22–90 cm) and occur around 7.5 m (range 5–9.4 m) above the ground (DAWE 2022a).

The 2019/2020 bushfires may have reduced the carrying capacity of 40 per cent of occupied grid cells by half and resulted in a 10 per cent reduction in the overall population size. An analysis based on expert elicitation estimated an overall population decline at one year post-fire of 21 per cent, and that three generations post-fire the population would still be 29 per cent lower than the pre-fire population size, and possibly as much as 52 per cent lower, indicating a poor recovery rate. These predictions assume no further extreme drought or extensive fire events; however, such events are likely to reoccur over the assessment period, which would worsen the extent of population decline (DAWE 2022a).

There are an estimated 25,300 (range 17,600–35,200) mature individuals in the wild with a declining trend (high reliability) (Cameron et al. 2021). The species' extent of occurrence (EOO) and area of occupancy (AOO) are estimated to be stable at 400,000 km² and 30,000 km², respectively (DAWE 2022a).

3.7.2.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Approved Conservation Advice for *Callocephalon fimbriatum* (gang-gang cockatoo) (DAWE 2022a).
- There is no listing advice for this species, listing assessment information may be available in the Approved Conservation Advice.
- There is no adopted or made Recovery Plan for this species.
- There are no adopted/made threat abatement plans, identified as being relevant for this species.

3.7.2.3 Survey Effort and Results

This species is listed under the NSW BC Act and the Commonwealth EPBC Act and has specific assessment requirements under the NSW BAM (DPIE 2020a) depending upon whether the habitat impacted is breeding or foraging habitat:

- Foraging habitat for the gang-gang cockatoo is assessed in the NSW BAM (DPIE 2020a) as an ecosystem credit species, that is targeted surveys are not required to identify or confirm presence as occurrence is predicted based on association with a PCT. Accordingly targeted surveys have not been completed for this species.
- Breeding habitat for the species is assessed in the BAM – Credit Calculator as a species credit-species based on based on identification of suitable hollow bearing trees (eucalypt tree species with hollows greater than 9 cm diameter).

Habitat assessment, avifauna and opportunistic surveys have been completed by NGH (NGH 2013a and 2013b) and Umwelt across the Development Corridor (refer to **Table 3.3**, **Table 3.4** and **Table 3.6**):

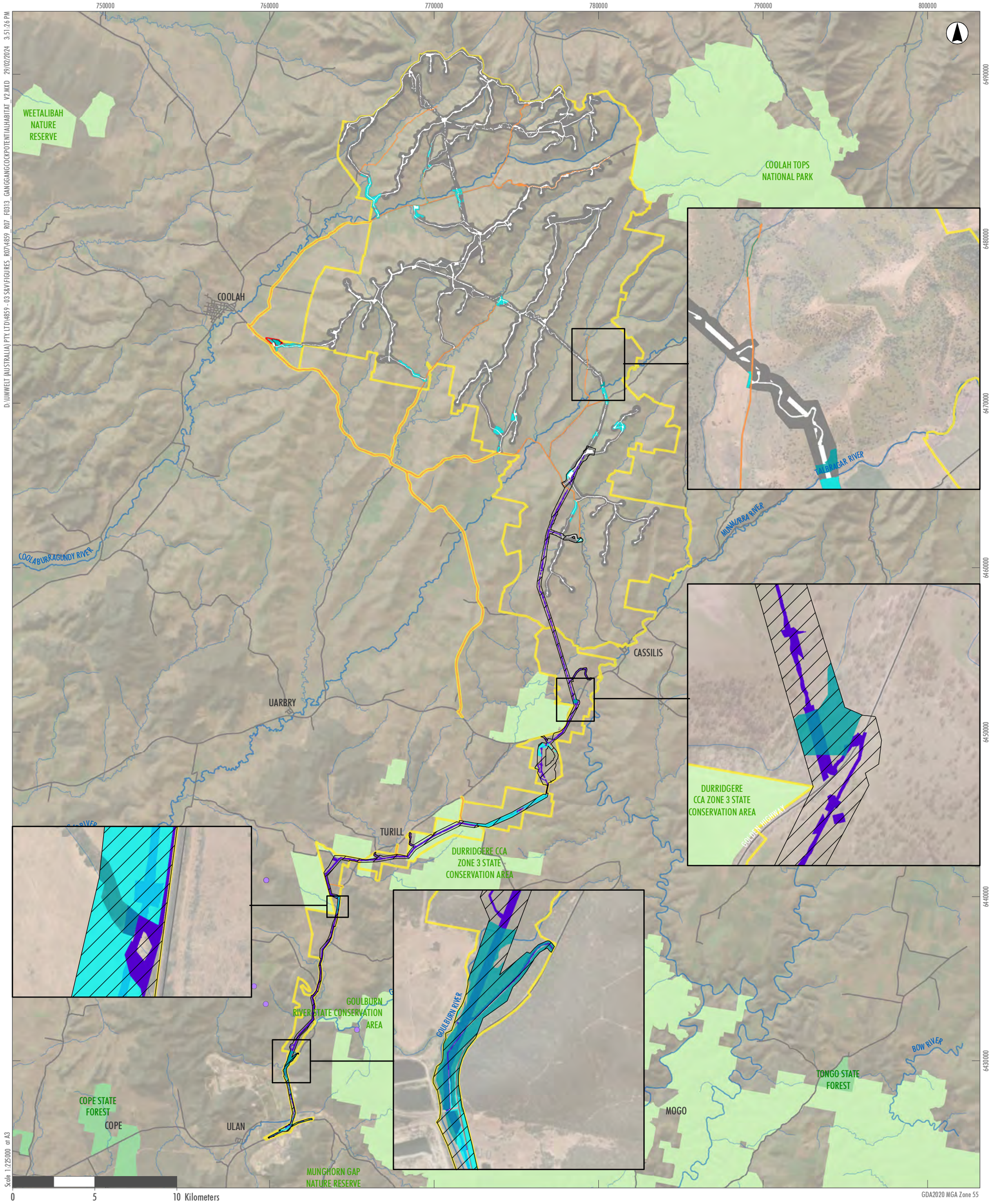
- 8–19 October 2012
- 1–9 October 2013
- 4–6 October 2016
- 7–9 October 2020
- 18–22 January 2021
- 16–20 January 2023.

Approximately 74 person days of targeted survey have been completed for this species as part of the Proposed Action.

This species has not been recorded by surveys within the Development Corridor.

There are 11 records of gang-gang cockatoos within a 10 km radius of the Development Corridor including five within five kilometres of the Development Corridor. Most of these records are in the Ulan area (refer to **Figure 3.13**) with other records from Coolah Tops, Durridgere State Conservation Area and recent records from Cassilis.

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a), as part of the NSW Mod-1 Application response to submissions phase, in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys.



Scale: 1:25000 at A3

0 5 10 Kilometers

GDA2020 MGA Zone 55

Legend

- Proposed Action Area
- Development Corridor**
- Development Corridor - Wind Farm
- Development Corridor - TWA Facility
- Development Corridor - External Transmission Line
- Indicative Development Footprints**
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - TWA Facility
- Indicative Development Footprint - External Transmission Line
- Indicative Development Footprint - Public Road Upgrades
- Land Category 1 - Exempt Land
- Gang-gang Cockatoo Potential Habitat
- Road
- Drainage Line
- National Parks (NPWS Estate)
- State Forest
- NSW Bionet Records**
- Gang-gang Cockatoo

FIGURE 3.13

Gang-gang Cockatoo potential habitat and BioNet records

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022), NSW Bionet Atlas records (2023), (NGH Environmental 2013a, 2013b and 2017)

3.7.2.4 Proposed Action Habitat Assessment

Breeding habitat was not identified in the Development Corridor as none of the vegetation present is the tall mountain forests favoured by the species.

Based on the NSW TBDC and the BAM – Credit Calculator, the only PCT predicted to provide habitat for the gang-gang cockatoo within the Development Corridor is PCT 281. Potential habitat covers about 45.7 ha within the Development Corridor, mainly within the Kerrabee IBRA sub-region in the south of the External Transmission Line (refer to **Figure 3.13**). This section of the Proposed Action Area is contiguous to remnant native vegetation in the Ulan area through to Goulburn River National Park to the east where BioNet records in the locality are concentrated. It is likely that the gang-gang cockatoo is mainly inhabiting these habitats in winter with the majority of BioNet records from winter months.

The Proposed Action proposes to impact 13.4 ha of potential habitat for the gang-gang cockatoo.

3.7.2.5 Impact Assessment Required?

The impact of the Proposed Action on the gang-gang cockatoo is considered in **Section 5.4.2**.

3.7.3 South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*)

3.7.3.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

The south-eastern glossy black-cockatoo/glossy black-cockatoo (*Calyptorhynchus lathami lathami*) is listed as vulnerable under the EPBC Act, it is uncommon across its widespread distribution which spans from Mitchell in southern central Queensland to East Gippsland in Victoria (DCCEEW 2022b). Distribution is continuous through the forested regions of the Great Diving Range and coastal New South Wales, becoming more scattered inland, to as far west as the Riverina in New South Wales (DCCEEW 2022b).

The Conservation Advice for this species ((DCCEEW 2022b) divides the critical habitat for the species into breeding and foraging habitat. The south-eastern glossy black cockatoo utilises hollows in both living and dead eucalypt trees. Breeding habitat along the Murrumbidgee River and other inland waterways in NSW is in river red gums (*Eucalyptus camaldulensis*) while in central New South Wales breeding habitat has been documented to largely consist of narrow-leaved ironbark (*Eucalyptus crebra*), with blue-leaved ironbark (*Eucalyptus ubile*) and to a less extent Blakely's red gum (*Eucalyptus blakelyi*) (DCCEEW 2022b).

The south-eastern glossy black-cockatoo heavily relies upon on the seeds of sheoaks (*Allocasuarina* spp. And *Casuarina* spp.) as an almost exclusive food source, typically preferring to forage from a single individual feed tree. The sheoak species utilised varies between regions (DCCEEW 2022b).

An analysis by the National Environmental Science Program (NESP) Threatened Species Recovery Hub shows that a large proportion of the range of south-eastern glossy black cockatoo was affected by the 2019/2020 bushfires: 10 per cent was burnt in high to very high severity fire, and a further 15 per cent was burnt in low to moderate severity fire (Legge et al. 2021). For comparison, experts also estimated the population change over time in the absence of fire; by three generations after the 2019/2020 bushfires, the overall population of the south-eastern glossy black cockatoo was estimated to be 16 per cent lower than it would have been, had the fires not occurred (Legge et al. 2021).

3.7.3.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Approved Conservation Advice for *Calyptorhynchus lathami lathami* (south-eastern glossy-black cockatoo) (DCCEEW 2022b).
- There is no listing advice for this species, listing assessment information may be available in the Approved Conservation Advice.
- There is no adopted or made Recovery Plan for this species.
- There is no adopted/made threat abatement plans, identified as being relevant for this species.

3.7.3.3 Survey Effort and Results

This species is listed under the NSW BC Act and the Commonwealth EPBC Act and has specific assessment requirements under the NSW BAM (DPIE 2020a) depending upon whether the habitat impacted is breeding or foraging habitat:

- Foraging habitat for the glossy black-cockatoo is assessed in the NSW BAM (DPIE 2020a) as an ecosystem credit species, that is targeted surveys are not required to identify or confirm presence as occurrence is predicted based on association with a PCT. Accordingly targeted surveys have not been completed for this species.
- Breeding habitat for the species is assessed in the BAM – Credit Calculator as a species credit-species based on identification of suitable hollow bearing trees (living or dead tree with hollows greater than 15 cm diameter and greater than 8 m above ground) for breeding.

Habitat assessments, avifauna and opportunistic surveys have been completed by NGH (NGH 2013a and 2013b) and Umwelt across the Development Corridor (refer to **Table 3.3**, **Table 3.4** and **Table 3.6**) including:

- 8–19 October 2012 (habitat assessments only)
- 1–9 October 2013 (habitat assessments only)
- 20–23 March 2015
- 4–6 October 2016 (habitat assessments only)
- 8–9 April 2020
- 17 April 2020
- 4–8 May 2020
- 15–19 June 2020
- 17–21 August 2020
- 7–9 October 2020 (habitat assessments only)

- 18–22 January 2021
- 10–14 May 2021
- 20–24 September 2021
- 16–20 January 2023
- 16–25 May 2023.

Approximately 158 person days of targeted survey (including habitat assessments) have been completed for this species as part of the Proposed Action.

There are numerous BioNet records of the glossy black-cockatoo in remnant native vegetation either side of the Development Corridor – External Transmission Line south of Golden Highway and five records within 5 km of the Development Corridor – Wind Farm in Coolah Tops National Park (refer to **Figure 3.14**).

This species was recorded by NGH at 28 locations along the Development Corridor-External Transmission Line (refer to **Figure 3.14**) including 11 indirect/passive records (i.e. chewed sheoak cones) during surveys of the external transmission line. Umwelt did not record the species.

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a), as part of the NSW Mod-1 Application response to submissions phase, in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys.

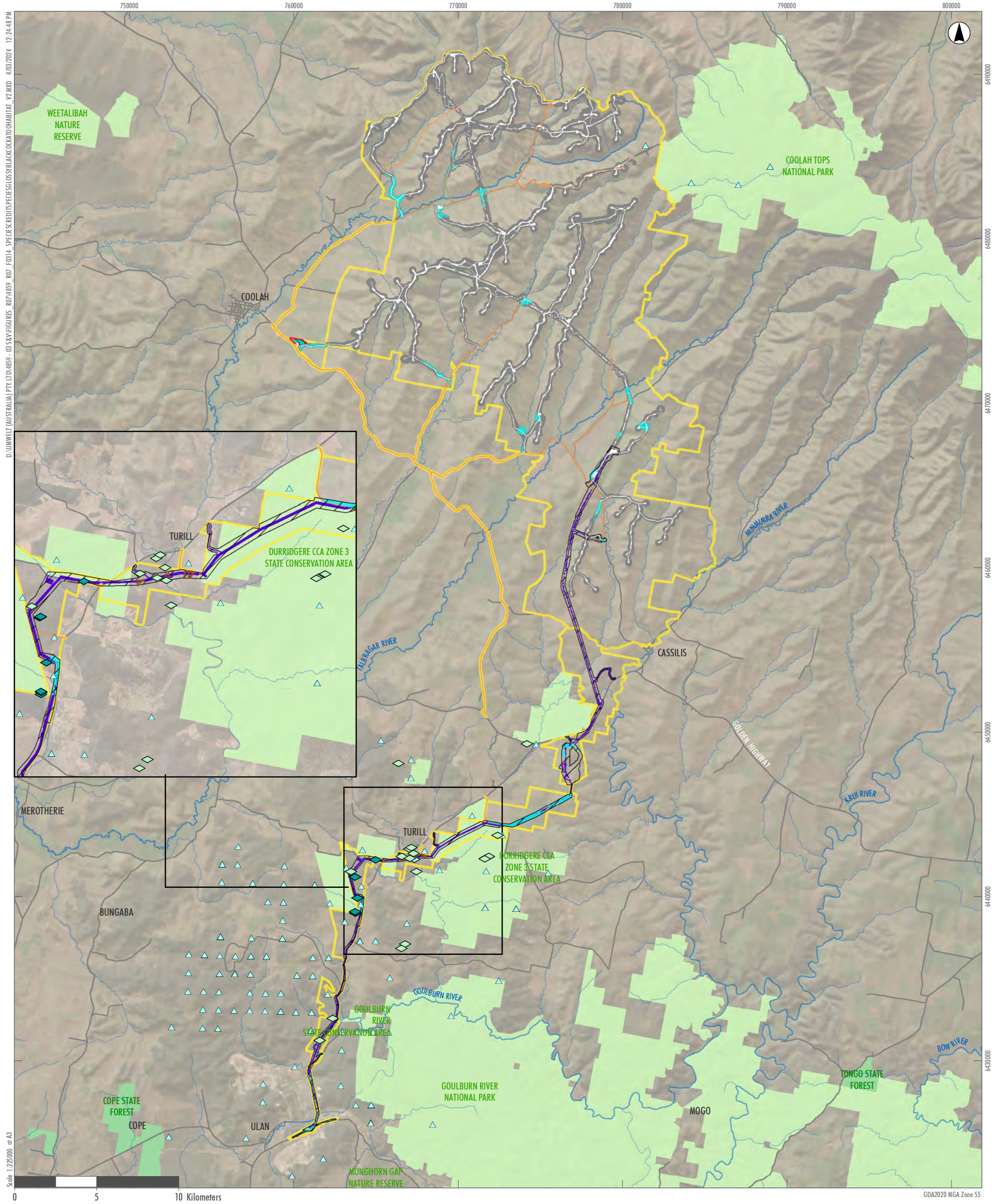
3.7.3.4 Proposed Action Habitat Assessment

While no breeding habitat was confirmed during surveys in the Development Corridor, for the purposes of the NSW BAM (DPIE 2020a), the BDAR has assessed the glossy black-cockatoo as a species credit species for breeding habitat (Umwelt 2023a). Breeding habitat was mapped as those areas of PCT 488 within 200 m buffers of hollow bearing trees recorded in habitat continuous with the 28 records of the glossy black-cockatoo along the Development Corridor – External Transmission Line. Mapped breeding habitat was estimated at 5.4 ha within the Development Corridor and an estimated 2.0 ha of habitat was identified as being impacted by the Indicative Development Footprint (see Table 3.19 Umwelt 2023a in **Appendix D**).

The glossy black-cockatoo was also assessed as an ecosystem credit species foraging habitat associated with PCT 488 and 495. Potential foraging habitat may be associated with Vegetation Zones 9 and 10 and PCT 495 where canopy and midstorey layers are present that may provide foraging habitat. In total there is approximately 508.0 ha of potential foraging habitat in the Development Corridor and 83.7 ha would be impacted by the Proposed Action (refer to **Figure 3.14**).

3.7.3.5 Impact Assessment Required?

The impact of the Proposed Action on the south-eastern glossy black cockatoo is considered in **Section 5.4.3**.



Legend

- Proposed Action Area
- Development Corridor**
- Development Corridor - Wind Farm
- Development Corridor - TWA Facility
- Development Corridor - External Transmission Line
- Indicative Development Footprints**
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - TWA Facility
- Indicative Development Footprint - External Transmission Line
- Indicative Development Footprint - Public Road Upgrades
- Land Category 1 - Exempt Land
- Glossy Black-cockatoo Species Polygon
- Road
- Drainage Line
- National Parks (NPWS Estate)
- State Forest
- Umwelt and NGH TS Records**
- Glossy Black-cockatoo
- Glossy Black-cockatoo (chewed sheoak cones)
- NSW Bionet Records**
- ▲ South-eastern Glossy Black-cockatoo

FIGURE 3.14

South-eastern Glossy Black-cockatoo records and species polygon

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022), (NGH Environmental 2013a, 2013b and 2017)

3.7.4 Grey Falcon (*Falco hypoleucos*)

3.7.4.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

The grey falcon is listed as vulnerable under the EPBC Act, it 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 2020a).

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 2020a). The nests chosen are usually in the tallest trees along watercourses, particularly River Red Gum (*Eucalyptus camaldulensis*) and Coolibah (*E. coolabah*), but falcons also nest in telecommunication towers.

There are no records for this species on the NSW BioNet within a 10 km radius of the Development Corridor and the species has not been predicted to occur within the BAM – Credit Calculator. The PMST has however, predicted that species or species habitat are known to occur within a 10 km vicinity of the Development Corridor.

3.7.4.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Conservation Advice *Falco hypoleucos* grey falcon (TSSC 2020a).
- There is no listing advice for this species, listing assessment information may be available in the Approved Conservation Advice.
- There is no adopted or made Recovery Plan for this species. The Conservation Advice provides sufficient guidance on the recovery of the grey falcon.
- There is no adopted/made threat abatement plans, identified as being relevant for this species.

3.7.4.3 Survey Effort and Results

This species is listed under the NSW BC Act and the Commonwealth EPBC Act and has specific assessment requirements under the NSW BAM (DPIE 2020a). The species is assessed in the BDAR as an ecosystem credit species (Umwelt 2023a).

In addition to the field surveys conducted by NGH (2013a, 2013b and 2017), Umwelt conducted targeted surveys for this species during Bird and Bat Utilisation Surveys (BBUS) on 4 to 8 May 2020 and bird utilisation surveys 17 to 21 August 2020. This species was also targeted during meandering transects on the following dates:

- 8–9 April 2020
- 17 April 2020
- 4–8 May 2020

- 15–19 June 2020
- 17–21 August 2020
- 7–9 October 2020
- 18–22 January 2021
- 10–14 May 2021
- 20–24 September 2021
- 16–20 January 2023.

Approximately 158 person days of survey have been completed for this species as part of the Proposed Action.

This species was not observed during surveys and has not been recorded within the Development Corridor.

This species is noted as recorded in Coolah Tops National Park in the Plan of Management (NPWS 2002). Although the Atlas of Living Australia includes a record north-east of Coolah within the Proposed Action Area. This record has an attributed accuracy of 10,000 m. Umwelt have consulted with Birdlife Australia (recorded attributed to Birdlife Australia) and been advised that the record is well outside of normal range and doubtful.

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a), as part of the NSW Mod-1 Application response to submissions phase, in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys.

3.7.4.4 Proposed Action Habitat Assessment

Based on the NSW TBDC, the only PCT which is predicted to provide habitat for the grey falcon within the Development Corridor is PCT 84. Potential habitat has not been mapped in the Proposed Action Area as there are no records of the species on the NSW BioNet within a 10 km radius of the Development Corridor.

3.7.4.5 Impact Assessment Required?

An impact assessment is not required for this species given there are no records of this species within the Development Corridor or BioNet records in the locality, and those in Coolah Tops National Park have been assessed by Birdlife Australia as doubtful.

3.7.5 Painted Honeyeater (*Grantiella picta*)

3.7.5.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

The painted honeyeater is listed as vulnerable under the EPBC Act. It is a nomad honeyeater that occurs in low densities throughout its range from eastern Northern Territory to south-eastern Australia predominantly on the inland slopes and plains of the Murray-Darling Basin. It exhibits seasonal north to south movements following fruiting of mistletoe which forms most of its diet.

It inhabits a range of woodlands and shrublands, particularly weeping myall, brigalow woodlands, box-gum woodlands and box-ironbark forests that support a high density of mistletoe of the genus *Amyema* spp. (CoA 2021a). The species prefers woodlands which contain a higher number of mature trees, at these trees host more mistletoes. The painted honeyeater is more common in wider blocks of remnant woodland than narrower strips (TSSC 2015a).

The recovery plan for the painted honeyeater identifies key biodiversity areas (KBA) for the painted honeyeater being sites of critical importance to the long-term persistence of the painted honeyeater (CoA 2021a). There are seven KBA for the painted honeyeater in Australia including five in NSW:

- Binya and Cocoparra KBA is the Cocoparra National Park in the Riverina region, covering about 8,357 ha.
- Capertee Valley KBA which occurs partly in the Gardens of Stone National Park and Wollemi National Park.
- Goonoo KBA covers about 1034 km² of woodland, between the towns of Dubbo, Gilgandra and Dunedoo, which is partly within national park estate.
- Pilliga Forests/Scrub KBA covering over 5,000 km² of semi-arid woodland in temperate north-central NSW.
- South-west slopes of NSW and ACT KBA covers an area of 25,653 km² supporting significant wintering populations of a number of threatened species (CoA 2021a).

Habitat critical to the survival of the painted honeyeater include:

- Breeding habitat in boree/weeping myall, brigalow woodlands, box-gum woodlands and box-ironbark forest on the inland slopes of the Great Dividing Range.
- Foraging habitat within known and likely foraging species particularly mistletoes of the genus *Amyema*.
- Habitat for long term maintenance of the species including all KBAs for the painted honeyeater and suitable habitat in future climate change niches (CoA 2021a).

3.7.5.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Conservation Advice *Grantiella picta* painted honeyeater (TSSC 2015a).
- There is no listing advice for this species, listing assessment information may be available in the Approved Conservation Advice.
- National Recovery Plan for the Painted Honeyeater (*Grantiella picta*) (CoA 2021a).
- There are no adopted/made threat abatement plans, identified as being relevant for this species.

3.7.5.3 Survey Effort and Results

This species is listed under the NSW BC Act and the Commonwealth EPBC Act and has specific assessment requirements under the NSW BAM (DPIE 2020a) as an ecosystem credit species, that is targeted surveys are not required to identify or confirm presence as occurrence is predicted based on association with a PCT where the habitat requirement of mistletoes being present at a density of greater than five per hectare is met. Accordingly targeted surveys are not required for this species.

A summary of ecological survey programs (including bird surveys but also general surveys) that were completed for the Proposed Action (**Table 3.3**, **Table 3.4** and **Table 3.6**) are presented below:

- 8–19 October 2012
- 1–9 October 2013
- 20–23 March 2015
- 4–6 October 2016
- 8–9 April 2020
- 17 April 2020
- 4–8 May 2020
- 15–19 June 2020
- 17–21 August 2020
- 7–9 October 2020
- 18–22 January 2021
- 10–14 May 2021
- 20–24 September 2021
- 16–20 January 2023
- 16–25 May 2023.

Approximately 158 person days of survey have been completed for this species as part of the Proposed Action.

There are four BioNet records of the painted honeyeater in Durrigere State Conservation Area, seven records near Turill in 2018 and 2019 near the Development Corridor – External Transmission Line and numerous records in the Ulan area (refer to **Figure 3.15**). The species prefers woodlands which contain a higher number of mature trees, at these trees host more mistletoes. The painted honeyeater is more common in wider blocks of remnant woodland than narrower strips (TSSC 2015b). This observation is supported by the numerous BioNet records of the painted honeyeater to the west of the Development Corridor – External Transmission Line between Durrigere and Ulan and to the east in Goulburn River National Park in wider blocks of remnant woodland. Other records in the locality are also largely associated with blocks of woodland.

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a), as part of the NSW Mod-1 Application response to submissions phase, in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys.

3.7.5.4 Proposed Action Habitat Assessment

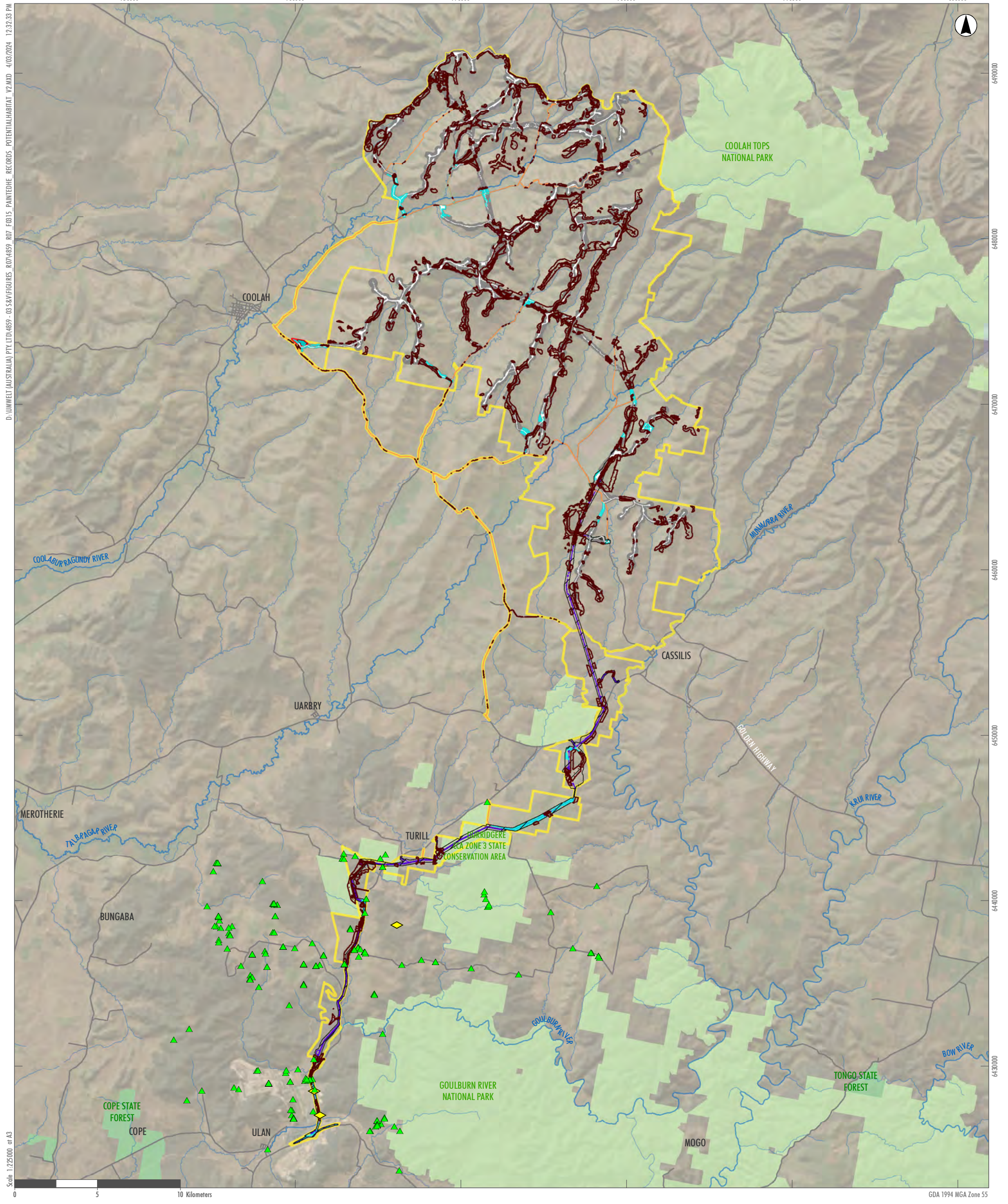
The painted honeyeater is predicted to occur in the Development Corridor associated with PCT 84, PCT 281, PCT 479, PCT 481, PCT 483, PCT 488 and PCT 495, where mistletoe is present at density of greater than five per hectare. Vegetation zones that are identified as derived grasslands with very low densities of trees (vegetation zone 8 and 12) have been excluded as marginal habitat. The Development Corridor provides about 3,407.5 ha of potential habitat (refer to **Figure 3.15**), of which the Proposed Action would impact 627.6 ha.

The painted honeyeater is an uncommon/rare visitor most likely to occur during spring and summer when mistletoe is flowering in the Proposed Action Area. BioNet records in the locality are concentrated near the Development Corridor— External Transmission Line around Ulan and Durrigere in the spring and summer months.

As noted in **Section 3.7.5.1**, the Proposed Action Area is not included in any of the KBA however it does occur in between three of the five sites in NSW which are the Capertee Valley (about 80 km to the south of the Proposed Action Area), Goonoo State Conservation Area and National Park (about 70 km to the west of the Proposed Action Area) and the Pilliga (about 90 km to the north of the Proposed Action Area).

3.7.5.5 Impact Assessment Required?

The impact of the Proposed Action on the painted honeyeater is considered in **Section 5.4.4**.



Scale: 1:25,000 at A3

GDA 1994 MGA Zone 55

Legend

- Proposed Action Area
- Development Corridor**
- Development Corridor - Wind Farm
- Development Corridor - TWA Facility
- Development Corridor - External Transmission Line
- Indicative Development Footprints**
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - TWA Facility
- Indicative Development Footprint - External Transmission Line
- Indicative Development Footprint - Public Road Upgrades
- Land Category 1 - Exempt Land
- Painted Honeyeater Potential Habitat
- Road
- Drainage Line
- National Parks (NPWS Estate)
- State Forest
- NSW Bionet Records**
- ▲ Painted Honeyeater
- Umwelt and NGH TS Records**
- ◆ Painted Honeyeater

FIGURE 3.15

Painted Honeyeater potential habitat and records

Image Source: ESRI Basemap (2021) Data source: NSW LPI (2021), NSW DSFI (2021); NPWS Estate (2019), NSW Bionet Atlas records (2021), (NGH Environmental 2013a, 2013b and 2017)

3.7.6 White-throated Needletail (*Hirundapus caudacutus*)

3.7.6.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

The white-throated needletail (*Hirundapus caudacutus* subsp *caudacutus* or *H. caudacutus*) is listed as vulnerable and migratory under the EPBC Act. As a migratory species it is listed under the international agreements being the China-Australia Migratory Bird Agreement (CAMBA), Japan-Australia Migratory Bird Agreement (JAMBA) or Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

The white-throated needletail is a migratory swift which breeds in north-east Asia and spends the non-breeding season in eastern and south-eastern Australia. It occurs in coastal regions of Queensland and NSW extending inland to the western slopes of the Great Dividing Range arriving in Australia for summer as early as September but usually from late October/early November to mid-March/April with numbers typically peaking during February and March (TSSC 2019). They travel south through Queensland and NSW, either side of the Great Dividing Range, in October and November arriving in Victoria and Tasmania in November to December. The northward migration begins in mid-March and April. A few birds occasionally remain in Australia during the breeding season (TSSC 2019).

While the population size in Australia has not been quantified, the number of white-throated needletail observed in Australia has declined in Australia by an estimated 74 per cent since the 1950s primarily due to large-scale deforestation of its breeding habitat (Tarburton 2014). The species is listed as vulnerable as the TSSC identified that the species has undergone a substantial reduction in population size (at least 30 to 50 per cent) over three generation lengths (25.5 years) and the reduction has not ceased (TSSC 2019).

In Australia, the white-throated needletail is mostly aerial from heights of less than one metre up to more than 1,000 m above the ground, mostly above wooded areas (TSSC 2019) including open forest and rainforest though less likely over woodland. The white-throated needletail roosts in trees amongst dense foliage in the canopy or in hollows but does not breed in Australia (TSSC 2019).

3.7.6.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Conservation Advice *Hirundapus caudacutus* white-throated needletail (TSSC 2019).
- There is no listing advice for this species, listing assessment information may be available in the Approved Conservation Advice.
- There is no adopted or made Recovery Plan for this species. The Conservation Advice provides sufficient guidance on recovery of the species.
- There is no adopted/made threat abatement plans, identified as being relevant for this species.
- Policy statements and guidelines: Draft referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE 2015), administration guideline.

3.7.6.3 Survey Effort and Results

This species is not listed under the NSW BC Act, but it is assessed under the NSW BAM (DPIE 2020a) as an ecosystem credit species, that is targeted surveys are not required to identify or confirm presence as occurrence is predicted based on association with a PCT. Accordingly targeted surveys are not required for this species.

Surveys for birds, particularly bird utilisation surveys focused on aerial species were completed by NGH (NGH 2013a) and Umwelt (refer to refer to **Table 3.3** and **Table 3.6**) and are presented below:

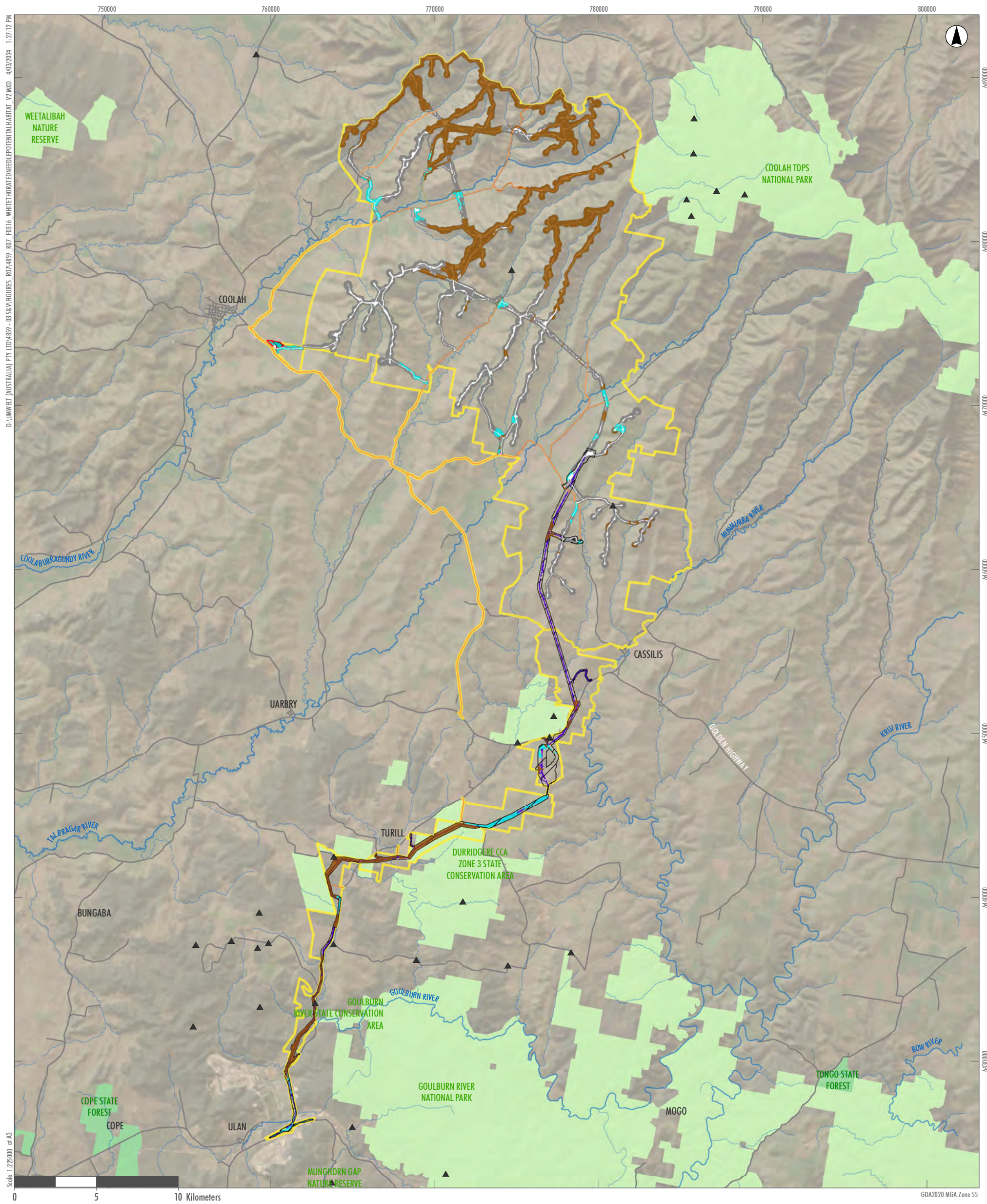
- 8–19 October 2012
- 4–8 May 2020
- 17–21 August 2020
- 16–20 January 2023.

Approximately 54 person days of survey have been completed for this species as part of the Proposed Action.

Of the surveys completed for the Proposed Action, the surveys in May and August occurred when the species is typically not in Australia in great numbers.

The white-throated needletail has not been recorded in surveys undertaken in the Development Corridor by NGH (2013a) or Umwelt (Umwelt 2022a) however there are numerous recent BioNet records of the species in and around the Development Corridor including in Coolah Tops National Park, Coolah, Ulan and Goulburn River National Park (refer to **Figure 3.16**) primarily over spring and summer months.

There were no observations of white-throated needletail roosting or behaving as if preparing to roost in the Development Corridor.



D:\UMWELT (AUSTRALIA) PTY LTD\4859 - 03 SERVICES\URES_807\4859_807_40316_WHITE THROATED NEEDLETAIL POTENTIAL HABITAT_V2.MXD 4/03/2024 1:27:12 PM
Scale: 1:25000 at A3

GDA2020 MGA Zone 55

- Legend**
- Proposed Action Area
 - Development Corridor**
 - Development Corridor - Wind Farm
 - Development Corridor - TWA Facility
 - Development Corridor - External Transmission Line
 - Indicative Development Footprints**
 - Indicative Development Footprint - Wind Farm
 - Indicative Development Footprint - TWA Facility
 - Indicative Development Footprint - External Transmission Line
 - Indicative Development Footprint - Public Road Upgrades
 - Land Category 1 - Exempt Land
 - White-throated Needletail Potential Terrestrial Habitat
 - Road
 - Drainage Line
 - National Parks (NPWS Estate)
 - State Forest
 - NSW Bionet Records**
 - ▲ White-throated Needletail

FIGURE 3.16
White-throated Needletail potential terrestrial habitat and records

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022), NSW Bionet Atlas records (2023), (NGH Environmental 2013a, 2013b and 2017)

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a), as part of the NSW Mod-1 Application response to submissions phase, in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys.

3.7.6.4 Proposed Action Habitat Assessment

Given the location of the Proposed Action Area along the Great Dividing Range and the number of BioNet records in Coolah Tops National Park and at the southern end of the Proposed Action Area (from 1998 to 2021) (refer to **Figure 3.16**), it is assumed that the species occurs in low numbers in the Development Corridor.

Under the NSW BAM (DPIE 2020a), the white-throated needletail is assessed as an ecosystem credit species. The TBDC identifies that the white-throated needletails is associated with PCTs 84, 281, 479, 481, 483, 488, 490, 1661 and 1675. In the Development Corridor potential terrestrial habitat is associated with all of these PCTs but not with very low densities of trees and grassland understorey, that is Vegetation Zones 7, 8, 12, 17 and 18. Noting that the white-throated needletail is largely an aerial species, in total there is about 2,348.6 ha of potential habitat within the Development Corridor that they may forage above and/or potentially roost in, of which 463.2 ha would be impacted by the Proposed Action. Therefore 1,885.4 ha (80 per cent) will not be impacted by the Proposed Action.

Based on the referral guidelines for migratory species, a total of 10 individuals corresponds to an ecologically significant proportion of their population at the national scale while a total of 100 individuals corresponds to an internationally significant proportion of their population (i.e., one per cent of their total population) (DoE 2015). The Proposed Action Area is located within a region that is likely to occasionally support an ecologically significant proportion of the white-throated needletail's population.

3.7.6.5 Impact Assessment Required?

The impact of the Proposed Action on the white-throated needletail as a threatened species is considered in **Section 5.4.5**. Accordingly, an assessment of the impact of the Proposed Action on the white-throated needletail as a migratory species is not required.

3.7.7 Swift Parrot (*Lathamus discolor*)

3.7.7.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

The swift parrot is a critically endangered migrant of south-eastern Australia which occurs in temperate woodlands and forests. The swift parrot breeds in Tasmania and moves to mainland Australia for the non-breeding season (usually arriving between February and March) (Saunders and Tzaros 2011). Most of the population winters in Victoria and NSW where it disperses across broad landscapes foraging on nectar and lerps in eucalypts. The occurrence of swift parrots at foraging sites is primarily associated with abundance of winter flowering nectar and lerps and non-aggressive competitors. In the western slopes region of NSW this is largely box-ironbark forest and grassy woodlands.

In NSW, swift parrots forage mostly throughout the coastal region and western slopes region along the inland slopes of the Great Dividing Range (Saunders and Tzaros 2011). Forests on the coastal plains from southern to northern NSW are also important and tend to support large numbers of birds particularly when inland habitats area subject to drought (CoA 2019). They feed preferentially on foliage and lerps in large mature trees (CoA 2019). In inland NSW the key foraging species include mugga ironbark (*Eucalyptus sideroxylon*), grey box (*Eucalyptus microcarpa*), white box (*Eucalyptus albens*) and yellow box (*Eucalyptus melliodora*) (Saunders and Tzaros 2011). In coastal NSW the key foraging resources are swamp mahogany (*Eucalyptus robusta*), forest red gum (*Eucalyptus tereticornis*), blackbutt (*Eucalyptus pilularis*) and spotted gum (*Corymbia maculata*) (Saunders and Tzaros 2011).

During the non-breeding season, the home-range varies tremendously between individuals and between years. The movements of this species on the mainland are poorly understood, but it is considered to be nomadic and irruptive, moving in response to food supply. Upon reaching their core non-breeding range there is no known geographical pattern of movement. The swift parrots return to Tasmania in spring (September–October).

The swift parrot has undergone a severe decline in recent decades due to broadscale breeding and foraging habitat loss and predation by introduced sugar gliders in their Tasmanian breeding range (Stojanovic et al. 2014, Heinsohn et al. 2015 cited in National Environmental Science Program Threatened Species Research Hub (2019b)). Total population is estimated to be below 2,000 individuals (Garnett, et al 2011) and as low as 500 (Olah et al. 2020).

3.7.7.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Conservation advice *Lathamus discolor* swift parrot (TSSC 2016a).
- There is no listing advice for this species, listing assessment information may be available in the Approved Conservation Advice.
- National Recovery Plan for the Swift Parrot *Lathamus discolor* (Saunders and Tzaros 2011).
- Draft National Recovery Plan for the Swift Parrot (*Lathamus discolor*) (CoA 2019).
- Adopted/made threat abatement plans: Threat abatement plan for predation by feral cats (CoA 2015a).
- Other policy statements and guidelines: Survey guidelines for Australia’s threatened birds. Guidelines for detecting birds listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010).

3.7.7.3 Survey Effort and Results

The swift parrot is listed under the NSW BC Act and the Commonwealth EPBC Act and has specific assessment requirements under the NSW BAM (DPIE 2020a) as a dual credit species. Important habitat is mapped by NSW DPE to identify important foraging habitat for the swift parrot.

The NSW DPE have not mapped any Important Habitat Areas for this species in the Development Corridor. Foraging habitat (beyond the important habitat areas) for the swift parrot is identified by the BAM – Credit Calculator and TBDC, that is targeted surveys are not required as the species habitat is predicted to occur based on association with PCTs in the Development Corridor.

Avifauna surveys have been completed by NGH and Umwelt across the Development Corridor including:

- Bird surveys over 10 days in October 2012, over 9 days in October 2013 (NGH 2013a and 2013b) (refer to **Table 3.3** and **Table 3.4**).
- Winter bird surveys including call playback 17 to 21 August 2020 targeting this species and the swift parrot (refer to **Table 3.6**).

Approximately 48 person days of targeted survey have been completed for this species as part of the Proposed Action.

Targeted searches were completed in 2020 for the swift parrot during winter flowering. This survey included call broadcasting the call of swift parrot with a speaker, followed by a period of listening, another period of broadcasting the call with a speaker, followed by a 20 minute / 2 hectare targeted diurnal bird survey.

This species has not been recorded despite targeted surveys being undertaken in 2020, or during other surveys undertaken as part of the Biodiversity Assessments (NGH 2013a and 2013b) and the Biodiversity Assessment Addendum (NGH 2017).

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a), as part of the NSW Mod-1 Application response to submissions phase, in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys.

3.7.7.4 Proposed Action Habitat Assessment

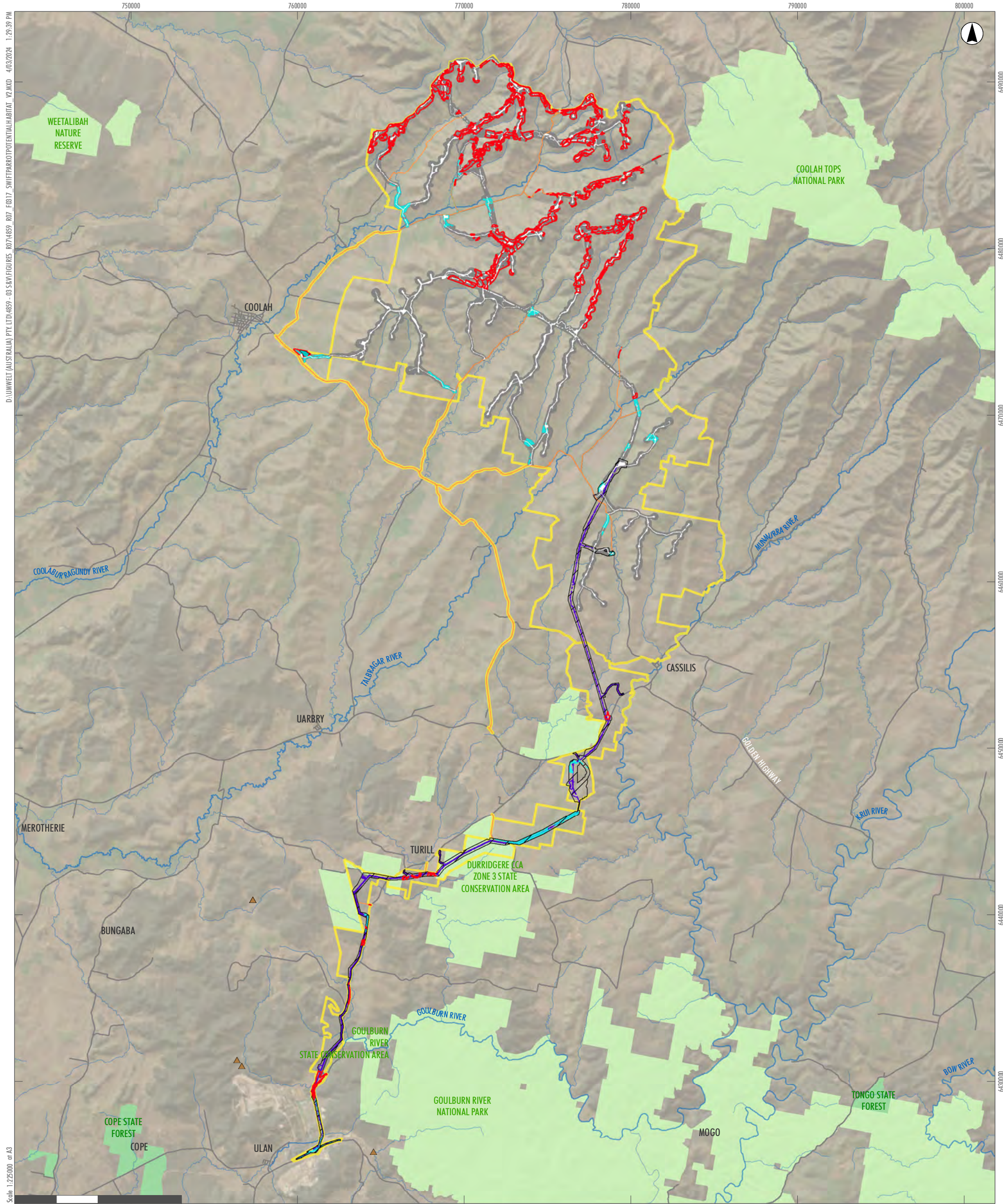
Based upon a review of potential habitat and BioNet records in the locality, Umwelt has assumed that the swift parrot has the potential to utilise woodland habitat within the Development Corridor and broader Proposed Action Area, for foraging, as the species is highly mobile and irregularly detected over a wide range.

The Proposed Action has identified potentially suitable habitat based on PCTs listed as suitable PCTs in the TBDC for the species in accordance with BAM (DPIE 2020a). Potentially suitable habitat in the Development Corridor is associated with PCTs 281, 488 and 495. The potential suitable habitat polygon excludes just one vegetation zone from PCT 488, being Vegetation Zone 12 as this vegetation zone is derived native grassland or heavily degraded with exotic understorey and almost absent of scattered trees. It is considered highly unlikely that the swift parrot will utilise Vegetation Zone 12 but they may seek temporary shelter in the scattered canopy trees when travelling through the landscape in rare occurrences that the species occurred in the Proposed Action Area. It is more likely the species would utilise the more intact woodlands and forested habitats within the Proposed Action Area during those occurrences.

A total of 1,653.0 ha of potentially suitable swift parrot foraging habitat has been assessed within the Development Corridor (refer to **Figure 3.17**) and considerable amounts of the potentially suitable habitat occur beyond the Development Corridor in the local region. Of this total habitat, the Proposed Action would impact 302.5 ha of potential habitat. There are however only eight BioNet records within 10 km of the Development Corridor including three within five kilometres, the most recent being from 2014.

3.7.7.5 Impact Assessment Required?

The impact of the Proposed Action on the swift parrot is considered in **Section 5.4.6**.



Legend

- | | | | | | |
|--|---|--|---|---------------------------|--------------|
| | Proposed Action Area | | Land Category 1 - Exempt Land | NSW Bionet Records | |
| Development Corridor | | | Swift Parrot Potentially Suitable Habitat | | Swift Parrot |
| | Development Corridor - Wind Farm | | Road | | |
| | Development Corridor - TWA Facility | | Drainage Line | | |
| | Development Corridor - External Transmission Line | | National Parks (NPWS Estate) | | |
| Indicative Development Footprints | | | State Forest | | |
| | Indicative Development Footprint - Wind Farm | | | | |
| | Indicative Development Footprint - TWA Facility | | | | |
| | Indicative Development Footprint - External Transmission Line | | | | |
| | Indicative Development Footprint - Public Road Upgrades | | | | |

FIGURE 3.17

Swift Parrot potentially suitable habitat

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022), NSW Bionet Atlas records (2023), (NGH Environmental 2013a, 2013b and 2017)

3.7.8 Superb Parrot (*Polytelis swainsonii*)

3.7.8.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

The superb parrot is a medium-sized parrot listed as vulnerable under the EPBC Act. The core range of the superb parrot is west of the Great Dividing Range in NSW from Canberra and Goulburn to as far west as Nyngan and Swan Hill, that is mostly in the Riverina and south-west slopes regions. In Victoria it is largely confined to the Barmah forest area (TSSC 2016b, CoA 2021b). The superb parrot also occurs in central west plains and north-west plains regions of NSW up to Coonabarabran and Narrabri.

The birds breed between September and January, with nesting typically from October to late December, mostly in the south-west slopes and Riverina regions. The superb parrot breeds singly or in loose colonies of up to 15 pairs with nests in hollow branches (rarely trunks) of large, living or dead trees near water. On the inland slopes, they use at least six species of eucalypts but have a particular reliance on Blakely's red gum (*Eucalyptus blakelyi*). Most nest sites are within 10 km of feeding areas, that is box-gum woodland and are sometimes within it (TSSC 2016b). The same nest sites are used in successive years (CoA 2021b).

There are three main breeding areas for the superb parrot (TSSC 2016b). These are included within the three global KBAs that are identified as important for the superb parrot, that is:

- South-west slopes of NSW KBA supports the painted honeyeater, a significant wintering population of the swift parrot and the core distribution of the superb parrot (CoA 2021b). The KBA approximates an 80 km stretch of the Great Dividing Range from Wagga Wagga to Orange, south-east through Boorowa and Yass to Queanbeyan south to Tarcutta, Gundagai, Tumut and Adelong (CoA 2021b). The south-west slopes of NSW KBA covers an area of 25,653 km².
- Murrumbidgee Red Gums KBA covers an area of 2,451 km² consisting of two stretches of the Murrumbidgee River, one west of Wagga Wagga and the other centred on Darlington Point south of Griffith (CoA 2021b). Breeding occurs along the Murrumbidgee River, between Wagga Wagga and Toganmain Station, and farther north at Goolgowi (TSSC 2016b).
- Barmah-Millewa KBA covers an area of 2,635 km² and is defined by the river red gum forest of the Barmah-Millewa (CoA 2021b). The superb parrot breeds along the Murray and Edward Rivers, from east of Barmah and Millewa State Forest to south of Taylors Bridge (NSW and Victoria) (TSSC 2016b).

In the Riverina, the majority of Superb Parrot nests are in large, living trees with many hollow branches, typically located close to a watercourse. Birds also occasionally nest in large standing dead trees. Nest sites are usually located within 10 km of box-gum woodland, primarily black box (*Eucalyptus largiflorens*), yellow box (*Eucalyptus melliodora*) and grey box (*Eucalyptus microcarpa*) or box-pine Callitris woodland. Box-gum woodlands on the inland slopes and tablelands of Victoria, NSW and ACT comprising at least six species of eucalypts including River Red Gum (*Eucalyptus camaldulensis*), Blakely's red gum (*Eucalyptus blakelyi*), apple box (*Eucalyptus bridgesiana*), grey box, white box (*Eucalyptus albens*) and red box (*Eucalyptus polyanthemus*).

Local abundance outside the breeding season is reliant upon plant productivity. The birds may migrate to *Acacia pendula* woodlands between the Murrumbidgee and Murray rivers and are rarely seen on the inland slopes during winter with most of that breeding population moving to eucalypt-pine-woodlands in west central and north central NSW (CoA 2021b) in response to availability of food.

The superb parrot feed in trees and understorey shrubs and on the ground, including artificial habitats such as crops, and their diet consists mainly of grass seed and herbaceous plants (CoA 2021b).

The most recent population estimates in 2020 is 20,000 mature individuals with ongoing decline of the wild population across a substantial portion of their range but increasing numbers in the ACT region (CoA 2021b).

3.7.8.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Conservation Advice *Polytelis swainsonii* superb parrot (TSSC 2016b).
- There is no listing advice for this species, listing assessment information may be available in the Approved Conservation Advice.
- National Recovery Plan for the superb parrot (*Polytelis swainsonii*) (CoA 2021b).
- There is no adopted/made threat abatement plans, identified as being relevant for this species.
- Other policy statements and guidelines: Survey guidelines for Australia's threatened birds. Guidelines for detecting birds listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010).

3.7.8.3 Survey Effort and Results

This species is listed under the NSW BC Act and the Commonwealth EPBC Act and has specific assessment requirements under the NSW BAM (DPIE 2020a) depending upon whether the habitat impacted is breeding or foraging habitat:

- Foraging habitat for the superb parrot is assessed in the NSW BAM (DPIE 2020a) as an ecosystem credit species, that is targeted surveys are not required to identify or confirm presence as occurrence is predicted based on association with a PCT. Accordingly targeted surveys have not been completed for this species.
- Breeding habitat for the species is assessed in the BAM – Credit Calculator as a species credit-species based on based on identification of suitable hollow bearing trees (living or dead *Eucalyptus blakelyi*, *Eucalyptus melliodora*, *Eucalyptus camaldulensis*, *Eucalyptus microcarpa*, *Eucalyptus polyanthemos*, *Eucalyptus mannifera*, *Eucalyptus intertexta* with hollows greater than 5 cm diameter, greater than 4 m above the ground or trees with a diameter at breast height of greater than 30 cm).

Avifauna and opportunistic surveys for this species have been completed by NGH (NGH 2013a and 2013b) and Umwelt across the Development Corridor (refer to **Table 3.3**, **Table 3.4** and **Table 3.6**).

- 8–19 October 2012
- 1–9 October 2013
- 20–23 March 2015
- 4–6 October 2016

- 8–9 April 2020
- 17 April 2020
- 4–8 May 2020
- 15–19 June 2020
- 17–21 August 2020
- 7–9 October 2020
- 18–22 January 2021
- 10–14 May 2021
- 20–24 September 2021
- 16–20 January 2023
- 16–25 May 2023.

Approximately 158 person days of survey have been completed for this species as part of the Proposed Action.

There is only one BioNet record of the species within 10 km of the Development Corridor to the north of Coolah in 2015 (refer to **Figure 3.18**). Umwelt ecologists observed a bird opportunistically in the township of Coolah.

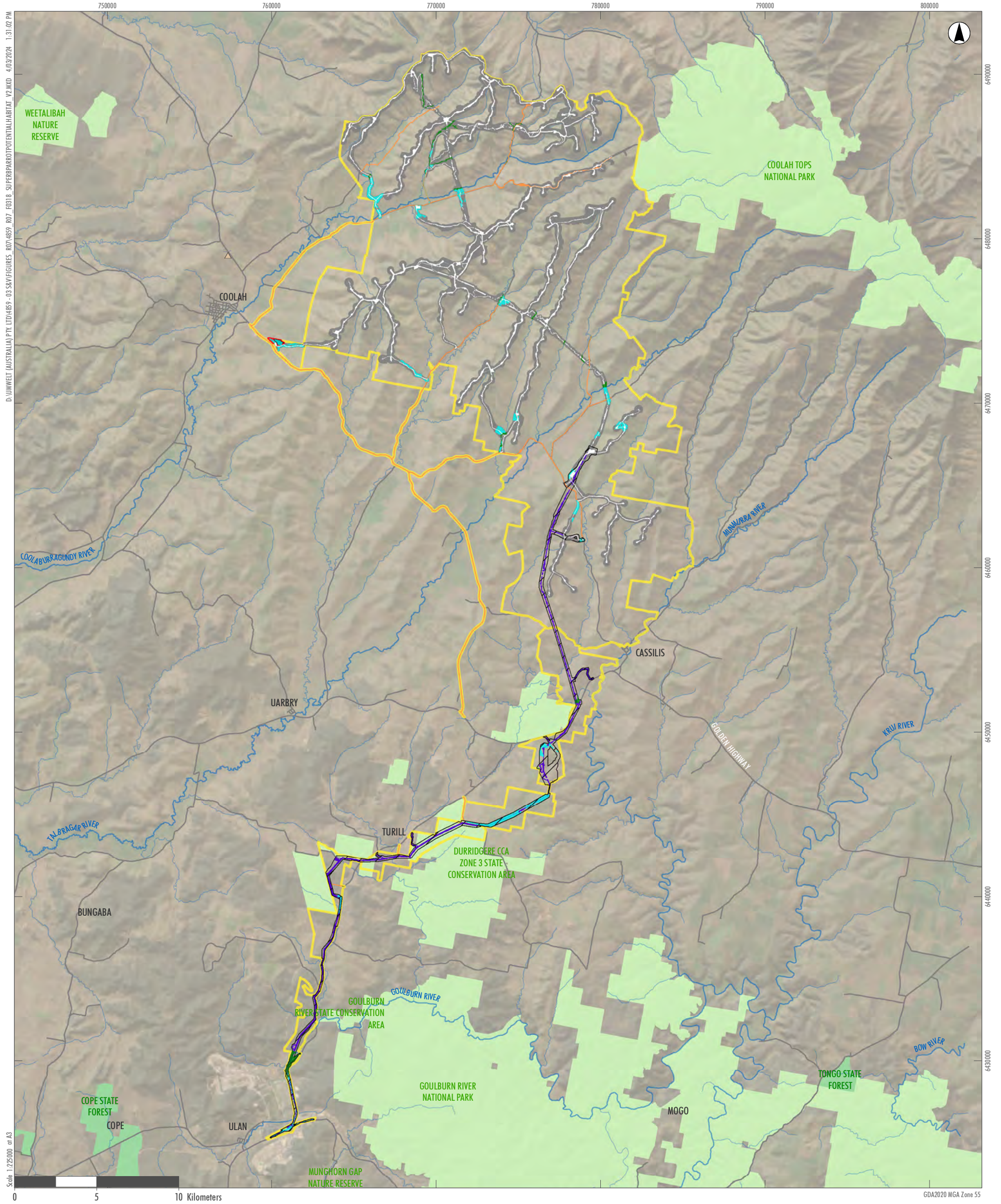
The species was not recorded in the Development Corridor.

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a), as part of the NSW Mod-1 Application response to submissions phase, in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys.

3.7.8.4 Proposed Action Habitat Assessment

Based on the NSW TBDC, the only PCT which is predicted to provide foraging habitat for the superb parrot within the Development Corridor is PCT 84 and PCT 281 (refer to **Figure 3.18**). There is approximately 124.2 ha of potential habitat for the superb parrot in the Development Corridor, of which the Proposed Action would impact 22.9 ha.

Breeding habitat for the superb parrot is identified in the BAM – Credit Calculator as occurring in Brigalow Belt South Piliga sub-region only in the Development Corridor associated with hollow-bearing trees living or dead *Eucalyptus blakelyi*, *Eucalyptus melliodora*, *Eucalyptus camaldulensis*, *Eucalyptus microcarpa*, *Eucalyptus polyanthemos*, *Eucalyptus mannifera*, *Eucalyptus intertexta* with hollows greater than 5 cm diameter, greater than 4 m above the ground or trees with a diameter at breast height of greater than 30 cm.



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 Scale: 1:25000 at A3

GDA2020 MGA Zone 55

Legend

- | | | |
|---|---------------------------------|---------------------------|
| Proposed Action Area | Land Category 1 - Exempt Land | NSW Bionet Records |
| Development Corridor | Superb Parrot Potential Habitat | Superb Parrot |
| Development Corridor - Wind Farm | Road | |
| Development Corridor - TWA Facility | Drainage Line | |
| Development Corridor - External Transmission Line | National Parks (NPWS Estate) | |
| Indicative Development Footprints | State Forest | |
| Indicative Development Footprint - Wind Farm | | |
| Indicative Development Footprint - TWA Facility | | |
| Indicative Development Footprint - External Transmission Line | | |
| Indicative Development Footprint - Public Road Upgrades | | |

FIGURE 3.18

Superb Parrot potential habitat and records

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022), NSW Bionet Atlas records (2023), (NGH Environmental 2013a, 2013b and 2017)

The conservation advice (TSSC 2016b) and superseded National Recovery Plan for superb parrot recognises three main breeding areas (Baker-Gabb 2011), being:

- the bounds of Molong, Rye Park, Yass, Coolac, Cootamundra and Young (NSW)
- along the Murrumbidgee River, between Wagga Wagga and Toganmain Station (near Bringagee), and farther north at Goolgowi (NSW)
- along the Murray and Edward Rivers, from east of Barmah and Millewa State Forest to south of Taylors Bridge (NSW and Victorian border).

In recognition of the information summarised above from the National Recovery Plan for the superb parrot, the Proposed Action only supports foraging habitat for the species as the Development Corridor is not considered likely to support a breeding population.

The Development Corridor is not within any of the three KBAs for the superb parrot (CoA 2021b) and is not within an area important for the long-term maintenance of the species.

3.7.8.5 Impact Assessment Required?

The impact of the Proposed Action on the superb parrot is considered in **Section 5.4.7**.

3.7.9 Pilotbird (*Pycnoptilus floccosus*)

3.7.9.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

Pilotbirds are endemic to south-east Australia, listed as vulnerable under the EPBC Act. There are two recognised subspecies with the upland pilotbirds occur above 600 m in the Brindabella Ranges in the Australian Capital Territory, and in the Snowy Mountains in New South Wales and north-east Victoria. Lowland pilotbirds occur in forests from the Blue Mountains west of Newcastle, around the wetter forests of eastern Australia, to Dandenong (DAWE 2022b). The subspecies that may occur in the Proposed Action Area is the lowland pilotbird (*Pycnoptilus floccosus sandlandi*).

There are estimated to be 77,000 (range 9,000–125,000) lowland pilotbirds (*Pycnoptilus floccosus sandlandi*) in the wild. The lowland population is estimated to have declined by 30 per cent in the 2019/2020 fires which are estimated to have burnt about 51 per cent of nesting and feeding habitat (DAWE 2022b). The extent of occurrence for the species is 212,200 km² of which 196,000 km² is the lowland pilotbird, however the area of occupancy for the species has contracted to 26,600 km² (23,800 km² for the lowland pilotbird) (DAWE 2022b).

Pilotbirds are small strictly terrestrial birds, largely sedentary, living on the ground in dense forests with heavy undergrowth. They have been associated with superb lyrebirds, foraging in their wake. They forage on insects and occasionally seeds and fruits. Habitat critical to the survival of the Pilotbird includes wet sclerophyll forests in temperate zones in moist gullies with dense undergrowth, and dry sclerophyll forests and woodlands occupying dry slopes and ridges (DAWE 2022b). Any breeding or foraging habitat in areas where the species is known or likely to occur and any newly discovered breeding or foraging locations should be considered habitat critical to the survival (DAWE 2022b).

3.7.9.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Conservation Advice for *Pycnoptilus floccosus* (Pilotbird) (DAWE 2022b).
- There is no listing advice for this species, listing assessment information may be available in the Approved Conservation Advice.
- There is no adopted or made Recovery Plan for this species. The Conservation Advice provides sufficient guidance on the recovery of the species.
- There is no adopted/made threat abatement plans, identified as being relevant for this species.

3.7.9.3 Survey Effort and Results

This species has not been previously considered within the referral for this Proposed Action or the NSW BDAR (Umwelt 2023a).

Bird surveys completed in accordance with guidelines listed in **Section 3.2.2.2** were undertaken by NGH (2013a, 2013b and 2017) (refer to **Table 3.3** and **Table 3.4**) and Umwelt (refer to **Table 3.6**), and are summarised below:

- 8–19 October 2012
- 1–9 October 2013
- 20–23 March 2015
- 4–6 October 2016
- 8–9 April 2020
- 17 April 2020
- 4–8 May 2020
- 15–19 June 2020
- 17–21 August 2020
- 7–9 October 2020
- 18–22 January 2021
- 10–14 May 2021
- 20–24 September 2021
- 16–20 January 2023
- 16–25 May 2023.

Approximately 158 person days of survey have been completed for this species as part of the Proposed Action.

There are five BioNet records of the pilotbird within 10 km vicinity of the Development Corridor in the Ulan Area and south-west of Goulburn River National Park. There are no records beyond 2006. The pilotbird is known to occur in the Greater Blue Mountains IBA, which was assessed as regularly supporting significant population of the species (Birdlife International 2023b).

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a), as part of the NSW Mod-1 Application response to submissions phase, in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys.

3.7.9.4 Proposed Action Habitat Assessment

Based on the NSW TBDC, there are no PCTs within the Development Corridor that provide potentially suitable habitat for this species.

Preferred habitat for lowland pilotbirds, dense forests with heavy undergrowth around wetter forests, does not occur in the Development Corridor.

3.7.9.5 Impact Assessment Required?

As there are no recent records for this species within the locality and no potentially suitable habitat within the Development Corridor, an impact assessment is not required.

3.8 Listed Threatened Mammal Species

3.8.1 Large-eared Pied Bat (*Chalinolobus dwyeri*)

3.8.1.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

The large-eared pied bat is patchily distributed in central-eastern New South Wales (NSW) and south-eastern and central Queensland, from the area bounded by Shoalwater Bay, north of Rockhampton (QLD), south to Bungonia in the NSW Southern Highlands and Ulladulla on the coast, NSW (DCCEEW 2023b).

The large-eared pied bat is listed as vulnerable under the EPBC Act. The conservation advice for the large-eared pied bat identifies that the species' total population size likely ranges between 10,000 individuals and 20,000 individuals, although the number of mature individuals is lower (DCCEEW 2023b). It is estimated that 27 per cent of the species' habitat occurs within areas affected by the 2019 / 2020 wildfires, with 10 per cent of the range intersecting with severe fire (DCCEEW 2023b). Much of the known distribution of the large-eared pied bat occurs in NSW (DCCEEW 2023b). In NSW, the species occurs in the Sydney sandstone region, Pilliga region and in the north-east at Coolah Tops and Mt Kaputar.

The population structure and number of locations are poorly known however main strongholds are present in the Sydney sandstone region, Pilliga region and Central Queensland Sandstone Belt (DCCEEW 2023b). In NSW, north-east of Coolah Tops, Mt Kaputar National Park and Warrumbungle National Park, the species is present in areas of volcanic strata (DCCEEW 2023b). In NSW, maternity roosts occur in Ukerbarley State Conservation Area near Coonabarabran, Woodsreef asbestos mine near Barraba, Pilliga National Park and Nature Reserve, Ophir reserve near Orange, and potentially near Ulan (DCCEEW 2023b). Based on this advice it is likely that the majority of the population occurs in NSW.

The national population extent of occurrence is estimated to be 570 000 km² based on the distribution range in Hoye and Dwyer (1995) (DCCEEW 2023b). The area of occupancy is defined by the area supporting maternity roost sites. The area of occupancy is approximately 9120 km² (DCCEEW 2023b).

The majority of records of the species occur within several kilometres of cliff lines or caves, in which it is known to roost. The large-eared pied bat is dependent on the presence of diurnal roosts for shelter. The species is known to roost in sandstone caves, overhangs, disused mine shafts, and abandoned *Petrochelidon ariel* (Fairy Martin) nests (DCCEEW 2023b). The structure of maternity roosts appears to be very specific with caves high and deep enough to allow juveniles to learn to fly inside with indentations to allow for clustering (DCCEEW 2023b).

The large-eared pied bat has been recorded foraging in fertile (relative to surrounding landscape) valleys and plains, as well as areas with moderately tall to taller trees in woodland along water courses and upper slopes and crests of ranges (DCCEEW 2023). The majority of records are from canopied habitat, suggesting a sensitivity to clearing, although narrow connecting riparian strips in otherwise cleared habitat are sometimes quite heavily used. This may be because such riparian zones are highly productive (DCCEEW 2023b).

3.8.1.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Conservation Advice for *Chalinolobus dwyeri* (large-eared pied bat) (DCCEEW 2023b).
- There is no listing advice for this species, listing assessment information may be available in the Approved Conservation Advice.
- National recovery plan for the large-eared pied bat *Chalinolobus dwyeri* (DERM 2011).
- There is no adopted/made threat abatement plans, identified as being relevant for this species.
- Other policy statements and guidelines: Survey guidelines for Australia's threatened bats. Guidelines for detecting bats listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010b).

3.8.1.3 Survey Effort and Results

NGH survey effort included 15 survey sites, totalling 21 nights of survey data. The species was recorded at five locations as part of the original assessment, primarily within and adjacent to the Durridgere State Conservation Area as well as one location in the wind farm component of the Project (NGH 2013a, 2013b and 2017).

Umwelt survey effort including six anabat units were deployed within the Development Corridor in May 2020, four of which were at/near ground level, while two were deployed on a meteorological mast approximately 20–30 m high. There was a total of 13 nights worth of data. Umwelt completed four nights of bat utilisation data in the north-east of the Proposed Action Area near the Coolah Tops National Park in January 2023. As part of this survey three microbat echolocation call detectors were deployed for four nights. Umwelt survey effort did not record this species despite extensive surveys.

Scattered BioNet records occur in the locality in the south of the Development Corridor – External Transmission Line, around Ulan Mine to the west and to the east into Goulburn River National Park (refer to **Figure 3.19**). The sandstone escarpments of the Sydney Basin are likely to support an important population of the large-eared pied bat. There are more than 20 known records of the species within 10 km of the External Transmission Line, but not in proximity to the Wind Farm component of the Proposed Action (refer to **Figure 3.19**).

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a), as part of the NSW Mod-1 Application response to submissions phase, in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys.

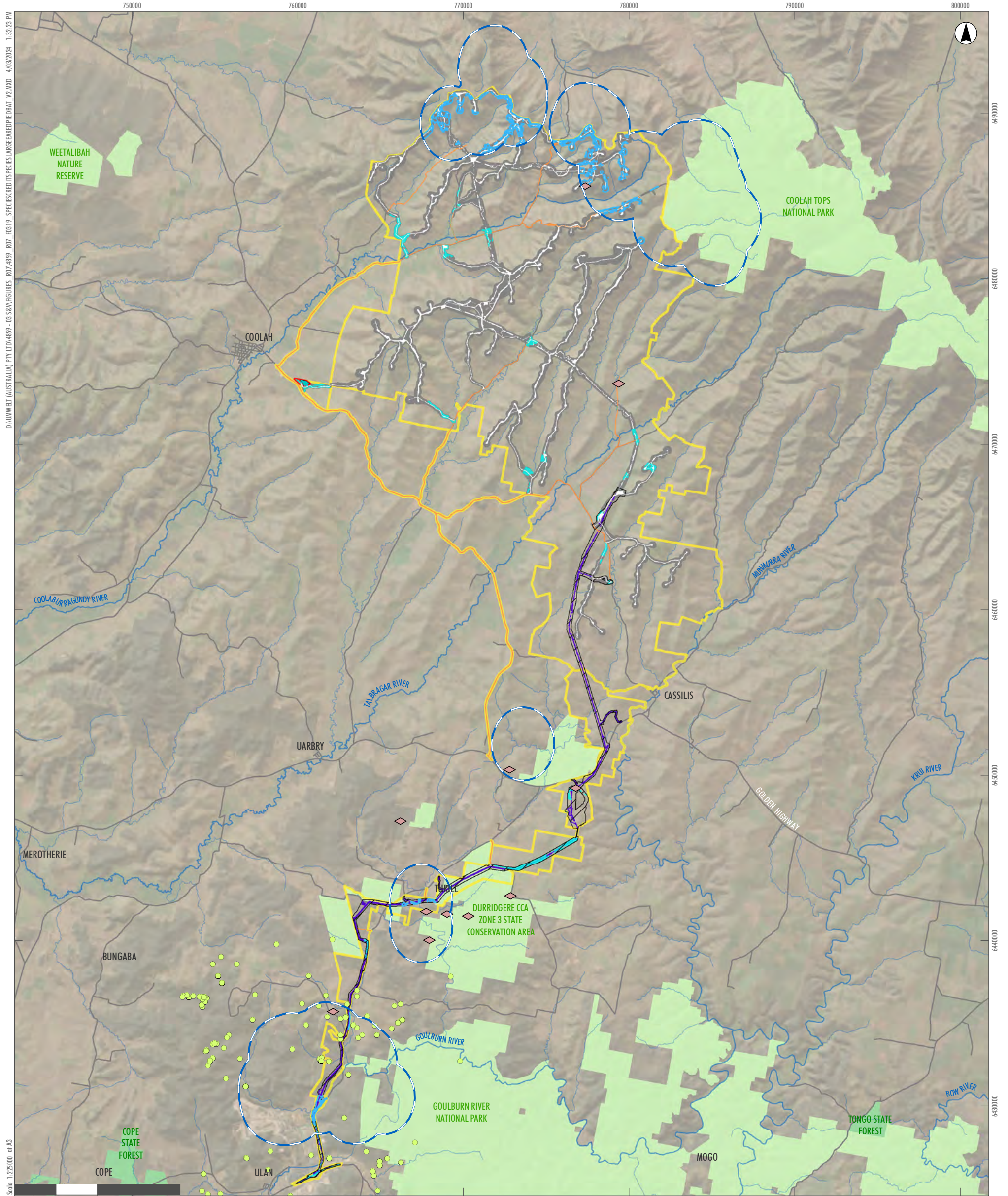
3.8.1.4 Proposed Action Habitat Assessment

In keeping with the NSW BAM (DPIE 2020a), a species polygon has been mapped for the species based on the intersection of suitable PCTs (281, 495 and 488) as identified in the TBDC within two kilometres of mapped rocky areas in order to quantify the offset liability for this species. A total of 572.0 ha of habitat for the large-eared pied-bat occurs within the Development Corridor, of which 106.7 ha would be impacted by the Proposed Action. This represents habitat for the species in proximity to potential roost sites and breeding habitat.

Within the immediate locality of the Proposed Action, the large-eared pied-bat is known from Coolah Tops National Park, Goulburn River National Park, Munghorn Gap Nature Reserve, Wollemi National Park and crown land near Ulan (DERM 2011). It is likely that these reserves will support roosting and foraging habitat for the species.

3.8.1.5 Impact Assessment Required?

The impact of the Proposed Action on the large-eared pied bat is considered in **Section 5.5.1**.



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GDA2020 MGA Zone 55

Legend

- | | | |
|---|--------------------------------------|----------------------------------|
| Proposed Action Area | Land Category 1 - Exempt Land | Umwelt and NGH TS Records |
| Development Corridor | Large-eared Pied Bat Species Polygon | Large-eared Pied Bat |
| Development Corridor - Wind Farm | 2km buffer of rocky habitat | NSW Bionet Records |
| Development Corridor - TWA Facility | Road | Large-eared Pied Bat |
| Development Corridor - External Transmission Line | Drainage Line | |
| Indicative Development Footprints | National Parks (NPWS Estate) | |
| Indicative Development Footprint - Wind Farm | State Forest | |
| Indicative Development Footprint - TWA Facility | | |
| Indicative Development Footprint - External Transmission Line | | |
| Indicative Development Footprint - Public Road Upgrades | | |

FIGURE 3.19

Large-eared Pied Bat records and species polygon

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022), NSW Bionet Atlas records (2023), (NGH Environmental 2013a, 2013b and 2017)

3.8.2 Spotted-tail Quoll (SE mainland population) (*Dasyurus maculatus maculatus*)

3.8.2.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

The spotted-tailed quoll (southeastern mainland population) occurs in eastern Australia from south-eastern Queensland to western Victoria. In NSW the spotted-tailed quoll occurs along both sides of the Great Dividing Range. Populations are now fragmented and isolated and estimates of the decline in range is from 50–90 percent for the mainland and 25–50 percent in New South Wales since European settlement (TSSC 2020).

The spotted-tail quoll (SE mainland population) is listed as endangered under the EPBC Act. There is no precise estimate of population size or number of mature individuals. The population in NSW has remained abundant in some areas at least up until the 2019/2020 bushfires (TSSC 2020). It is predicted that the population may have declined since these fires as 29 per cent of the distribution range was fire affected (TSSC 2020). At the time of the recovery plan in 2016, stronghold populations in NSW important for the long-term survival and recovery of the species, with high abundance included:

- Northern tablelands area – particularly the Guy Fawkes River National Park, New England National Park and Oxley Wild Rivers National Park and the Barrington area.
- The Greater Blue Mountains area – Wolgan, Goulburn River and the Jenolan-Kanangra area.
- South coast/tablelands – Barren Grounds Nature Reserve and Budderoo National Park and the Tallaganda/Badja area (east of Braidwood).
- Kosciuszko National Park/Snowy Mountains (DELWP 2016, TSSC 2020).

The spotted-tailed quoll is a mainly forest dependent species but occurs in a variety of habitats including closed forests (including temperate and sub-tropical rainforest), tall eucalypt forests, open woodlands, open forests, drier rainshadow woodlands and coastal heathlands. The highest densities of the species have been recorded from both wet and dry forest habitats (TSSC 2020).

The spotted-tailed quolls are solitary highly cryptic animals and occur at low densities with males having large overlapping home ranges (from 359 to 5512 hectares) while females have smaller ranges of several hundred hectares (88 to 1515 hectares) (DELWP 2016). They will have multiple dens across their range using rock crevices, hollow logs, tree hollows, burrows of other animals and under buildings (DELWP 2016). While habitat critical to the survival of the spotted-tailed quoll has not been defined or mapped it would include large patches of forest with adequate denning resources and relatively high densities of medium-sized mammalian prey (DELWP 2016).

3.8.2.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Conservation Advice *Dasyurus maculatus maculatus* (southeastern mainland population) Spotted-tailed Quoll, southeastern mainland (TSSC 2020c).
- There is no listing advice for this species, listing assessment information may be available in the Approved Conservation Advice.

- National Recovery Plan for the Spotted-tailed Quoll *Dasyurus maculatus*.
- Adopted/made threat abatement plans: Threat abatement plan for predation by feral cats (CoA 2015), Threat abatement plan for predation by European red fox (DEWHA 2008c).
- Other policy statements and guidelines:
 - Survey guidelines for Australia’s threatened mammal. Guidelines for detecting mammals listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (DSEWPaC 2011).
 - Administrative Guidelines on Significance: Supplement for the tiger quoll (southeastern mainland population) and the use of 1080 (DEH 2004).
 - Draft EPBC Act Policy Statement 3.4 – Significant Impact Guidelines for the endangered spot-tailed quoll *Dasyurus maculatus maculatus* (southeastern mainland population) and the use of 1080 (DEWHA 2009).

3.8.2.3 Survey Effort and Results

The spotted-tailed quoll is assessed in the NSW BAM (DPIE 2020a) as an ecosystem credit species, that is targeted surveys are not required to identify or confirm presence as occurrence is predicted based on association with a PCT. Accordingly targeted surveys have not been completed for this species. Notwithstanding a summary of nocturnal spotlighting surveys undertaken for the Proposed Action is provided below (refer to **Table 3.3**, **Table 3.4** and **Table 3.6** for further detail):

- 8–19 October 2012
- 1–9 October 2013
- 20–23 March 2015
- 25–29 May 2020
- 10–14 May 2021
- 16–20 January 2023
- 27 February to 3 March 2023.

Approximately 90 person days of targeted survey have been completed for this species as part of the Proposed Action.

During nocturnal surveys completed by Umwelt in the north-east of the Development Corridor – Wind Farm, near Coolah Tops National Park, calls were heard that were attributed to a spotted-tailed quoll. The individual was not observed and no indirect evidence of the presence of the species were recorded.

This species has been recorded seven times within a 10 km vicinity of the Development Corridor, including five within five kilometres, mainly in the south of the Development Corridor, in the Ulan area (refer to **Figure 3.20**). The most recent record is from May 2021 alongside the Mudgee-Ulan Road.

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a), as part of the NSW Mod-1 Application response to submissions phase, in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys.

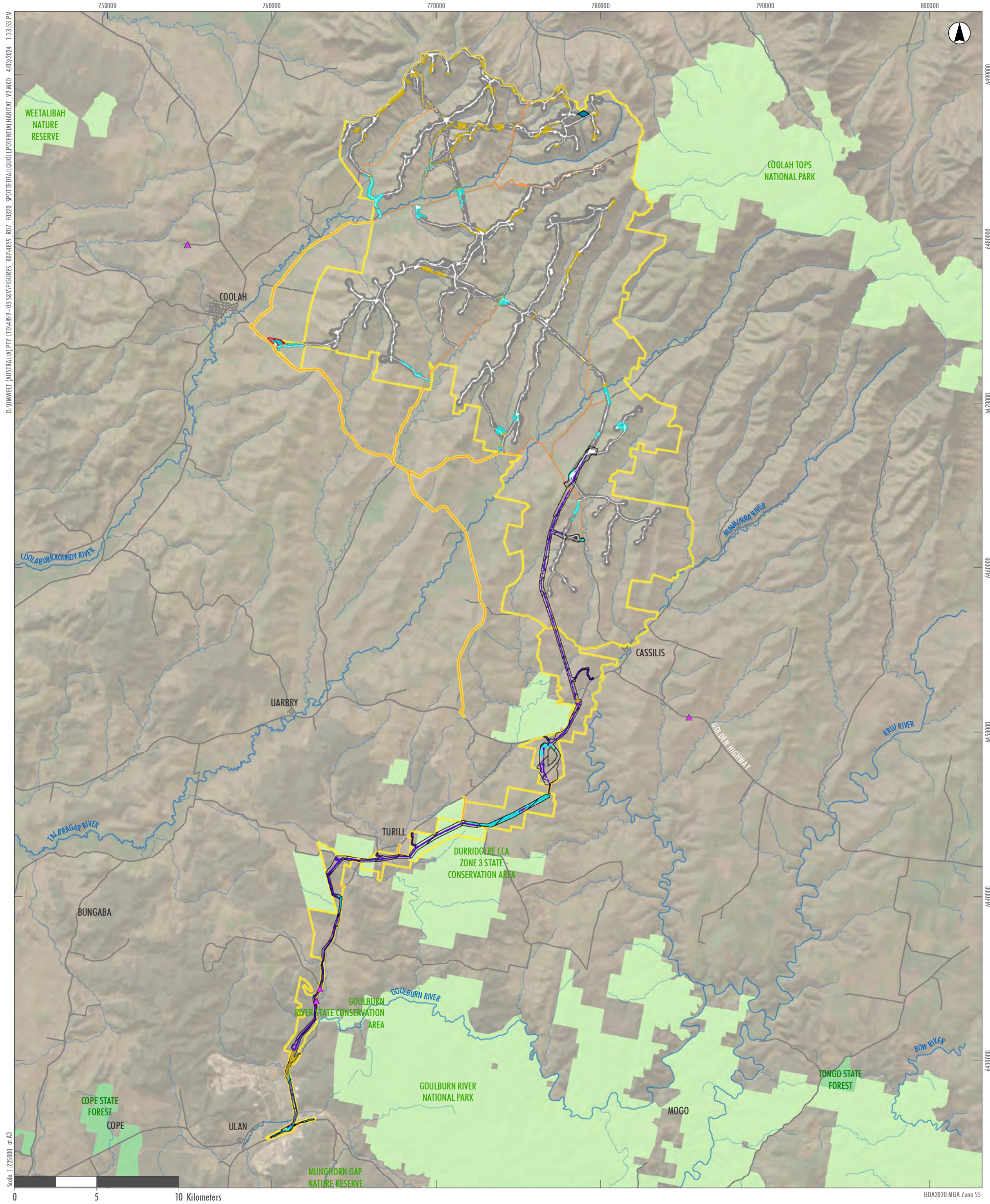
3.8.2.4 Proposed Action Habitat Assessment

Based on the NSW TBDC, PCTs which are predicted to provide habitat for the spotted-tailed quoll within the Development Corridor are PCT 84, 281, 488, 495, 1661 and 1675. Vegetation zones of these PCTs that have little to no canopy cover or shrub strata, that is PCT 488 Vegetation Zones 11 and 12 and PCT 1661 Vegetation Zone 18 are unlikely to provide habitat. There is approximately 941.4 ha of suitable spotted-tail quoll habitat in the Development Corridor (refer to **Figure 3.20**), of which 193.9 ha would be impacted by the Proposed Action.

Forested habitat contiguous with the Development Corridor – External Transmission Line, south of Turrill, would provide potential habitat for the spotted-tailed quoll. Particularly those areas associated with Durrigere State Conservation Area and habitat to the west and east of the Mudgee-Ulan Road that is contiguous with the Goulburn River National Park.

3.8.2.5 Impact Assessment Required?

The impact of the Proposed Action on the spotted-tailed quoll is considered in **Section 5.5.2**.



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GDA2020 MGA Zone 55

Legend

- Proposed Action Area
- Development Corridor**
- Development Corridor - Wind Farm
- Development Corridor - TWA Facility
- Development Corridor - External Transmission Line
- Indicative Development Footprints**
- Indicative Development Footprint - Wind Farm
- Indicative Development Footprint - TWA Facility
- Indicative Development Footprint - External Transmission Line
- Indicative Development Footprint - Public Road Upgrades
- Land Category 1 - Exempt Land
- Spotted-tail Quoll Potential Habitat
- Road
- Drainage Line
- National Parks (NPWS Estate)
- State Forest
- Umwelt and NGH TS Records**
- ◆ Spotted-tailed Quoll
- NSW Bionet Records**
- ▲ Spotted-tailed Quoll

FIGURE 3.20

Spotted-tail Quoll potential habitat and records

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022), NSW Bionet Atlas records (2023), (NGH Environmental 2013a, 2013b and 2017)

3.8.3 Corben's Long-eared Bat (*Nyctophilus corbeni*)

3.8.3.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

The south-eastern form of Corben's long-eared bat (*Nyctophilus corbeni*), also known as the south-eastern long-eared bat, is patchily distributed from southern central Queensland, central western NSW, through to north-west Victoria (TSSC 2015). It is listed as vulnerable under the EPBC Act. NSW accounts for about 50 per cent of the species known distribution (TSSC 2015c). Most records are inland from the Great Dividing Range with the Pillaga Scrub region a known stronghold for the species in NSW (TSSC 2015c).

The species utilises a range of habitats including box, ironbark, and cypress pine woodlands, bull oak woodland, Brigalow woodland, and black box woodland. In NSW it is distinctly more common in extensive stands of vegetation with a distinct tree canopy of box/ironbark/cypress pine vegetation along the western slopes and plains and a dense understorey (TSSC 2015).

Corben's long-eared bat roosts solitarily, in stag trees and dead limbs of living trees. Maternity colonies of 10 to 20 individuals are in dead trees (TSSC 2015).

3.8.3.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Conservation advice *Nyctophilus corbeni* south-eastern long-eared bat (TSSC 2015).
- Commonwealth listing advice on ten species of bats (TSSC 2001).
- There is no adopted or made Recovery Plan for this species.
- There is no adopted/made threat abatement plans, identified as being relevant for this species.
- Other policy statements and guidelines: Survey guidelines for Australia's threatened bats. Guidelines for detecting bats listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010b).

3.8.3.3 Survey Effort and Results

Corben's long-eared bat is assessed in the NSW BAM (DPIE 2020a) as an ecosystem credit species, that is targeted surveys are not required to identify or confirm presence as occurrence is predicted based on association with a PCT. Accordingly targeted surveys have not been completed for this species.

Corben's long-eared bat was recorded from multiple locations during the 2012 field surveys conducted by NGH (2013a, b and 2017) associated with she-oaks along creeklines, open forest without understorey and dense woodland (NGH 2013a, b) (refer to **Figure 3.21**).

Umwelt survey effort included six Anabat units deployed within the Development Corridor in May 2020, four of which were at/near ground level, while two were deployed on a meteorological mast approximately 20–30 m high. There was a total of 13 nights worth of data. Umwelt have completed four nights of bat utilisation data in the north-east of the Proposed Action Area near the Coolah Tops National Park in January 2023. As part of this survey three microbat echolocation call detectors were deployed for four nights. Microbat call analysis from the 2020 and 2023 bat utilisation survey conducted by Umwelt detected calls that could be from Corben’s long-eared bat, however, call analysis was unable to confirm the species’ presence from the data collected (Umwelt 2023a). In addition, there are nine BioNet records of the species within the locality including Durrigere SCA, Turill State Forest and Goulburn River National Park.

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a), as part of the NSW Mod-1 Application response to submissions phase, in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys.

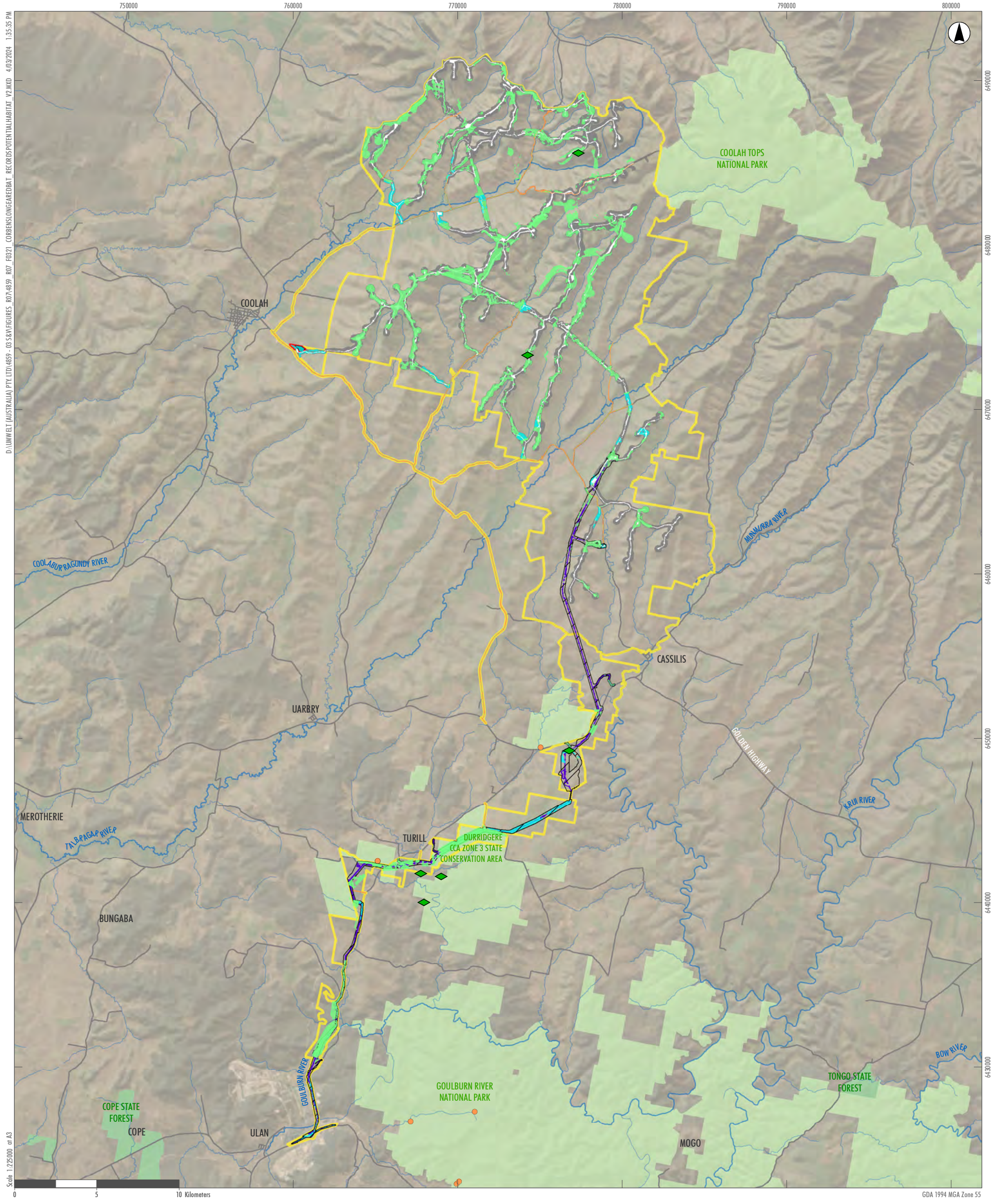
3.8.3.4 Proposed Action Habitat Assessment

Based on the NSW TBDC and BAM – Credit Calculator, PCTs which are predicted to provide habitat for Corben’s long-eared bat within the Development Corridor include PCT 84, PCT 488, PCT 1661 and PCT 1675, excluding vegetation zone 11, 12 and 18 which are described as highly degraded grassland likely derived from open woodland with canopy trees at very low densities (refer to **Figure 3.21**).

The Development Corridor supports up to 721.5 ha of potential roosting and foraging habitat for Corben’s long-eared bat, of which 156.8 ha would be impacted by the Proposed Action.

3.8.3.5 Impact Assessment Required?

The impact of the Proposed Action on Corben’s long-eared bat is considered in **Section 5.5.3**.



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Legend

- | | | |
|---|---|----------------------------------|
| Proposed Action Area | Land Category 1 - Exempt Land | Umwelt and NGH TS Records |
| Development Corridor | Corben's Long-eared Bat Potential Habitat | Corben's Long-eared Bat |
| Development Corridor - Wind Farm | Road | NSW Bionet Records |
| Development Corridor - TWA Facility | Drainage Line | Corben's Long-eared Bat |
| Development Corridor - External Transmission Line | National Parks (NPWS Estate) | |
| Indicative Development Footprints | State Forest | |
| Indicative Development Footprint - Wind Farm | | |
| Indicative Development Footprint - TWA Facility | | |
| Indicative Development Footprint - External Transmission Line | | |
| Indicative Development Footprint - Public Road Upgrades | | |

FIGURE 3.21

Corben's Long-eared Bat potential habitat and records

Image Source: ESRI Basemap (2021) Data source: NSW LPI (2021), NSW DSFI (2021), NPWS Estate (2019), NSW Bionet Atlas records (2021), (NGH Environmental 2013a, 2013b and 2017)

3.8.4 Greater Glider (southern and central) (*Petauroides volans*)

3.8.4.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

The greater glider (southern and central) is the largest glider in eastern Australia. It is restricted to eastern Australia, occurring from Proserpine in Queensland through to central Victoria, with an elevational range from sea level to 1,200 m above sea level (DCCEEW 2022c).

The greater glider is listed as endangered under the EPBC Act. There is no robust estimate of the population size of the greater glider with estimates in 2014 of over 100,000 mature individuals and it is highly unlikely that the number of mature individuals is less than 1,000 (DCCEEW 2022b). There is a declining trend in population, particularly following the 2019-2020 bushfires with estimates of overall population decline of greater than 20 per cent (DCCEEW 2022c). The greater glider has been recently assessed to have undergone a severe reduction in numbers of at least 50 per cent over the past three generations (21 years) (DCCEEW 2022c).

This species is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows as the greater glider typically roosts in large hollows in large, old trees but will also occur in drier habitats (DCCEEW 2022c). The species is largely dependent on large tracts of undisturbed, tall forest with suitably large hollows (diameter greater than 10 centimetres) preferably in living trees with suitable sized branch hollows; each animal requires a home range of between one to four ha up to 19 ha in less fertile sites and will use multiple den trees (DCCEEW 2022c). It is particularly sensitive to forest clearance and to fragmentation, dispersing poorly across vegetation that is not native forest (DCCEEW 2022c).

3.8.4.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Conservation Advice for *Petauroides volans* (greater glider) (southern and central) (DCCEEW 2022c).
- There is no listing advice for this species, listing assessment information may be available in the Approved Conservation Advice.
- There is no adopted or made Recovery Plan for this species.
- There is no adopted/made threat abatement plans, identified as being relevant for this species.

3.8.4.3 Survey Effort and Results

At the time of the submission of the referral of the Approved Action, the greater glider was not listed as a threatened species under the EPBC Act. While the species was not listed during the time of these surveys, targeted surveys specific to the species were not required or undertaken. Irrespective, NGH and Umwelt have undertaken nocturnal spotlighting surveys as part of the Proposed Action which can readily be considered as targeted survey effort given the species is very characteristic and readily identifiable. A summary of nocturnal spotlighting surveys undertaken for the Proposed Action is provided below (refer to **Table 3.3**, **Table 3.4** and **Table 3.6** for further detail):

- 8–19 October 2012
- 1–9 October 2013
- 20–23 March 2015
- 25–29 May 2020
- 10–14 May 2021
- 16–20 January 2023
- 27 February to 3 March 2023.

Approximately 90 person days of targeted survey have been completed for this species as part of the Proposed Action.

In addition to nocturnal spotlighting surveys, remote infrared survey cameras in October 2013, October 2020 and May 2021.

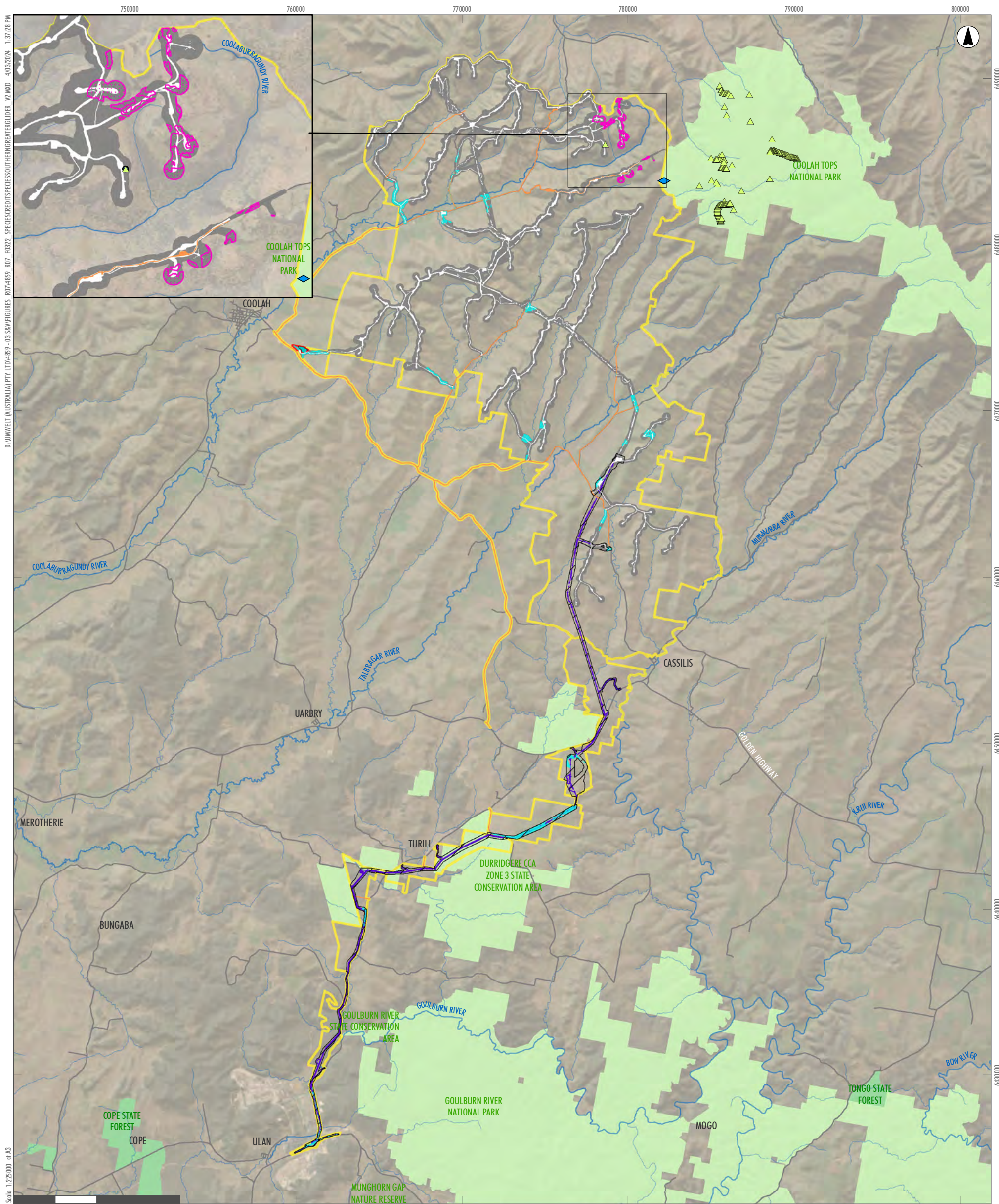
The greater glider was recorded by NGH in the north-east of the Approved Project (SSD 6696) (precise location is not known) (NGH 2013a). As the species was not listed under the BC Act or EPBC Act at the time of the original assessment, the precise location of these records is unknown. The original assessment states that a “...high density of greater gliders, were detected within the turbine development area directly adjacent the National Park and within Brittle Gum Stringybark Woodland or Silvertop Stringybark Forest” (NGH 2013a).

There are BioNet records of the greater glider in the Ulan and Moolarben area to the south of the Development Corridor and Turill locality however the majority of records occur in the Coolah Tops National Park, adjoining the north-east of the Proposed Action (refer to **Figure 3.22**). In the 1990s it was estimated that the greater glider was recorded at densities of 1.9 animals per hectare at elevations about 700 to 800 m (NGH 2013a). A review of the BioNet records for Coolah Tops National Parks and contiguous habitats identifies that only two of the records, within five kilometres of the Development Corridor, are dated later than 1998.

In addition to BioNet records, a population of at least 1,358 greater gliders have been recently detected in Coolah Tops National Park as part of thermal drone surveys completed by NPWS through approximately 10–15 per cent of Coolah Tops National Park (pers. Comm. Tilt Renewables 2023).

NGH (2013a) identified a high density of greater glider in the north-east of the original Proposed Action Area directly adjacent to Coolah Tops National Park within PCT 495 brittle gum – silvertop stringybark grassy open forest or PCT 490 silvertop stringybark – forest ribbon gum very tall moist open forest on basalt plateau. The precise location of the recorded greater glider was not documented.

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a), as part of the NSW Mod-1 Application response to submissions phase, in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys. This acknowledges the additional surveys that were completed in the north-east section of the Proposed Action, including targeted surveys for the greater glider, as requested in the NSW BCS submission on the NSW Mod-1 Application in September 2022.



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GDA2020 MGA Zone 55

Legend

- | | | |
|---|--------------------------------|----------------------------------|
| Proposed Action Area | Land Category 1 - Exempt Land | Umwelt and NGH TS Records |
| Development Corridor | Greater Glider Species Polygon | Greater Glider |
| Development Corridor - Wind Farm | Road | NSW Bionet Records |
| Development Corridor - TWA Facility | Drainage Line | Greater Glider |
| Development Corridor - External Transmission Line | National Parks (NPWS Estate) | |
| Indicative Development Footprints | State Forest | |
| Indicative Development Footprint - Wind Farm | | |
| Indicative Development Footprint - TWA Facility | | |
| Indicative Development Footprint - External Transmission Line | | |
| Indicative Development Footprint - Public Road Upgrades | | |

Image Source: ESRI Basemap (2022) Data source: NSW DSEI (2022), NSW Bionet Atlas records (2023)

FIGURE 3.22

Greater Glider records and species polygon

3.8.4.4 Proposed Action Habitat Assessment

Based on the NSW TBDC and BAM – Credit Calculator, none of the PCTs in the Development Corridor are predicted to provide habitat for the southern greater glider. However, given the high number of records for this species in Coolah Tops National Park and the findings of NGH (2013a), it is assumed that there is likely a high level of utilisation of potentially suitable habitat for this species within those areas of the Indicative Development Footprint— Wind Farm in forested habitats above 700 m altitude and contiguous with Coolah Tops National Park. While the Coolah Tops National Park has experienced recent small wildfires and prescribed burns (refer to Figure 3.7) it has not been affected by widespread fires, increasing the value of the national park as a refuge for the species. This statement is supported by the recent numbers of greater glider individuals recorded in the national park by NPWS monitoring surveys. The Proposed Action has assessed potential habitat for southern greater glider as Moderate/Good Condition PCT 490 and PCT 495 where they occur in proximity to Coolah Tops National Park (refer to **Figure 3.22**).

The development corridor provides about 111.3 ha of potential habitat for southern greater glider, of which 19.3 ha would be impacted by the Proposed Action.

No potential habitat for the southern greater glider is predicted to occur in the Development Corridor – External Transmission Line or Development Corridor – Public Road Upgrades.

3.8.4.5 Impact Assessment Required?

The impact of the Proposed Action on the greater glider is considered in **Section 5.5.4**.

3.8.5 Yellow-bellied Glider (south-eastern) (*Petaurus australis australis*)

3.8.5.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

The yellow-bellied glider is a medium-sized arboreal marsupial found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. There are two subpopulations of the yellow-bellied glider with *Petaurus australis australis* (south-eastern population) separated from the northern isolated *Petaurus australis* (wet tropics subspecies) (DAWE 2022b). In March 2022, the yellow-bellied glider, south-eastern population was listed as vulnerable under the EPBC Act.

The south-eastern population extends along the NSW coast from Queensland to Victoria. In NSW, it predominantly occurs in forests along the coast extending inland to the western slopes of the Great Dividing Range in parts (DAWE 2022b). Across its' range, distribution is highly disjunct to due specific habitat requirements and land clearing.

The forest type preferences of this species vary with latitude and elevation: mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south with a preference for winter-flowering and smooth-barked eucalypts. The species primarily feed on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. The yellow-bellied glider den in hollows of large trees and lives in family groups of two to six individuals in exclusive home range of about 50 to 65 ha (DAWE 2022b).

Known populations identified as important to the survival of the glider in NSW include Bago Plateau; Richmond Range National Park; Blacktown range; Shoalhaven populations; populations between Coffs Harbour / Dorrigo / Glen Innes and Grafton; and populations between Nimmitabel and Cathcart. The Proposed Action Area does not occur in any of these areas.

3.8.5.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Conservation advice for *Petaurus australis* (yellow-bellied glider (south-eastern)) (DAWE 2022c).
- There is no listing advice for this species, listing assessment information may be available in the Approved Conservation Advice.
- There is no adopted or made Recovery Plan for this species.
- There are no adopted/made threat abatement plans, identified as being relevant for this species.

3.8.5.3 Survey Effort and Results

At the time of the submission of the referral of the Approved Action, the yellow-bellied glider was not listed as a threatened species under the EPBC Act. While the species was not listed during the time of these surveys, targeted surveys specific to the species were not required or undertaken. Irrespective, NGH and Umwelt have undertaken nocturnal spotlighting surveys as part of the Proposed Action which can readily be considered as targeted survey effort given the species is very characteristic and readily identifiable. A summary of nocturnal spotlighting surveys undertaken for the Proposed Action is provided below (refer to **Table 3.3**, **Table 3.4** and **Table 3.6** for further detail):

- 8–19 October 2012
- 1–9 October 2013
- 20–23 March 2015
- 25–29 May 2020
- 10–14 May 2021
- 16–20 January 2023
- 27 February to 3 March 2023.

Approximately 90 person days of targeted survey have been completed for this species as part of the Proposed Action.

In addition to nocturnal spotlighting surveys, remote infrared survey cameras in October 2013, October 2020 and May 2021.

NGH (2013a, 2013b) had not identified the species in the Approved Development Corridor and habitat for the species was assessed as marginal.

Surveys by Umwelt in May 2020 identified the yellow-bellied glider in PCT 490, silvertop stringybark – forest ribbon gum very tall moist open forest on basalt plateau, in the north-east of the Development Corridor – Wind Farm near Coolah Tops National Park (refer to **Figure 3.23**). PCT 490 is dominated by mountain gum (*Eucalyptus dalrympleana*) and silvertop stringybark (*E. laevopinea*) and both species are known sap trees for the yellow-bellied glider (DAWE 2022b).

The NSW BioNet does not identify any records of the species in the Proposed Action Area or locality. There are no records of the yellow-bellied glider in the literature or in publicly available databases in Coolah Tops National Park. The nearest records in publicly available databases include Munghorn Gap Nature Reserve and a large number of records in valleys to the east of the Bylong Valley and into Wollemi National Park. The majority of these publicly available records pre-date the 2019 to 2020 bushfires.

In May 2020 Umwelt ecologists identified numerous yellow-bellied gliders along State Forest Road within Coolah Tops National Park (refer to **Figure 3.23**), Umwelt ecologists further recorded the species in multiple locations within Coolah Tops National Park during transit to survey areas in the north-east of the Proposed Action Development Corridor. The records in the Proposed Action Area and Coolah Tops National Park are a previously unknown population in NSW.

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a), as part of the NSW Mod-1 Application response to submissions phase, in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys. This acknowledges the additional surveys that were completed in the north-east section of the Proposed Action since the NSW Mod-1 Application, including targeted surveys for the yellow-bellied glider, as requested in the NSW BCS submission in September 2022.

3.8.5.4 Proposed Action Habitat Assessment

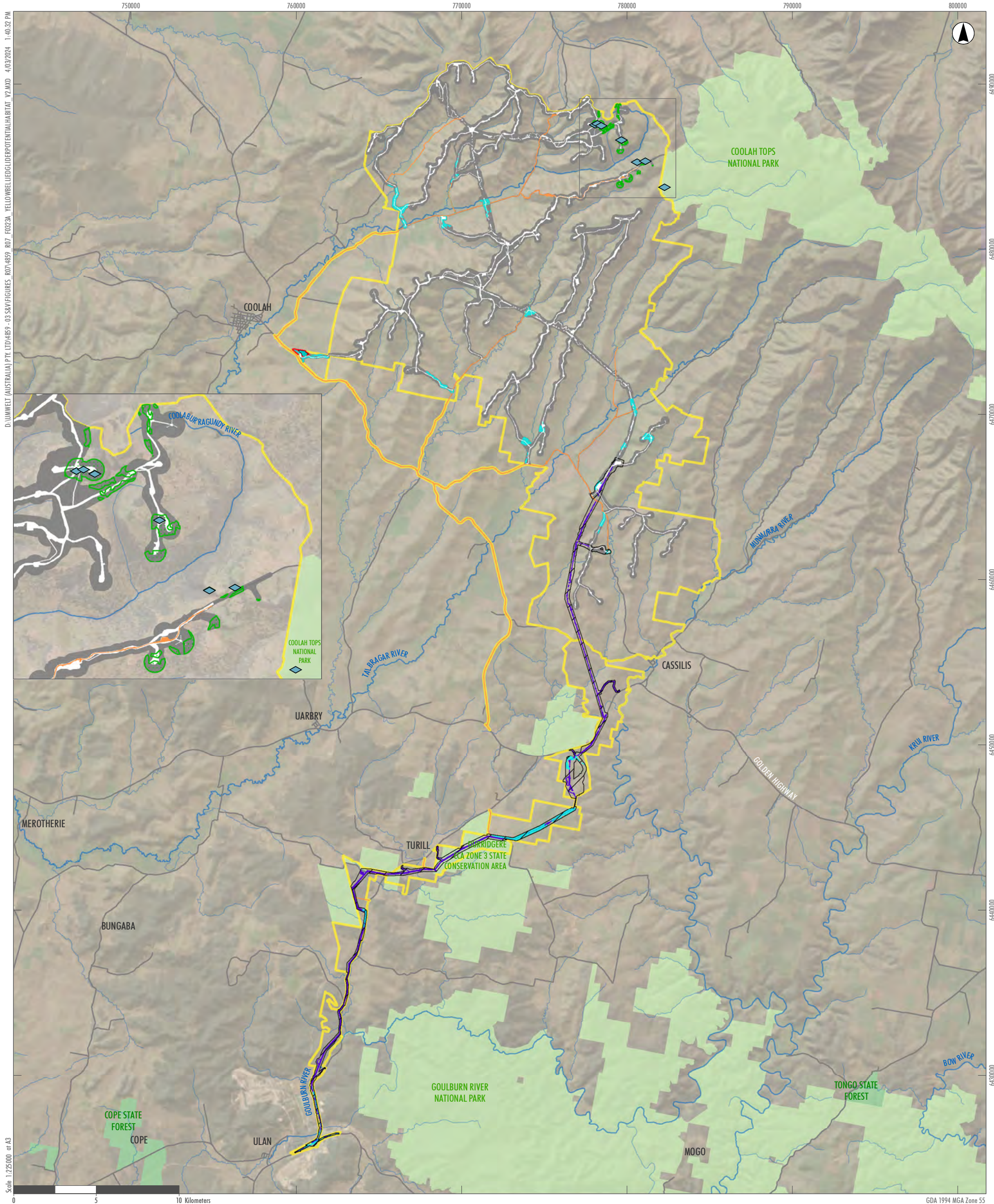
None of the PCTs in the Development Corridor are identified in the NSW TBDC as habitat for the yellow-bellied glider.

Habitat for the yellow-bellied glider in the Development Corridor has been defined as PCT 490 for the Proposed Action as sightings in the Development Corridor and Proposed Action Area were associated with this PCT. Remnants of PCT 490 occurs as fragmented habitat on the steep slopes of the Liverpool Range to the west of Coolah Tops National Park (refer to **Figure 3.23**).

The Development Corridor provides 87.4 ha of potential habitat, of which 15.2 ha would be impacted by the Proposed Action. No potential habitat for the yellow-bellied glider is predicted to occur in the Development Corridor – External Transmission Line or Development Corridor – Public Road Upgrades.

3.8.5.5 Impact Assessment Required?

The impact of the Proposed Action on the yellow-bellied glider is considered in **Section 5.5.5**.



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Legend

Proposed Action Area	Land Category 1 - Exempt Land	Umwelt and NGH TS Records
Development Corridor	Yellow-bellied Glider Potential Habitat	Yellow-bellied Glider
Development Corridor - Wind Farm	Road	
Development Corridor - TWA Facility	Drainage Line	
Development Corridor - External Transmission Line	National Parks (NPWS Estate)	
Indicative Development Footprints	State Forest	
Indicative Development Footprint - Wind Farm		
Indicative Development Footprint - TWA Facility		
Indicative Development Footprint - External Transmission Line		
Indicative Development Footprint - Public Road Upgrades		

FIGURE 3.23

Yellow-bellied Glider potential habitat and records

Image Source: ESRI Basemap (2021) Data source: NSW LPI (2021), NSW DSFI (2021), NPWS Estate (2019), NSW Bionet Atlas records (2021), (NGH Environmental 2013a, 2013b and 2017)

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

3.8.6.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

The koala (combined populations of Qld, NSW and the ACT) is listed as endangered under the EPBC Act. The listed population of the koala has a wide but patchy distribution that spans the coastal and inland areas of Queensland north to the Herberton area, extending westwards into hotter and dryer semi-arid climates of central Queensland, New South Wales and the Australian Capital Territory. The koala's distribution is not continuous across this range, and it occurs in several subpopulations that are separated by cleared land or unsuitable habitat (DAWE 2022d).

In NSW the koala is found along much of the coast with major populations in the northern coastal areas and more scattered populations in the south coast (DAWE 2022e). The northern NSW distribution also includes the Mulga Lands (NSW Section), Darling Riverine Plains, Brigalow Belt South, Nandewar, New England Tablelands, and South East Queensland (NSW Section) bioregions. Their western NSW distribution extends into the South-Eastern Highlands, NSW South Western Slopes, Cobar Peneplain, Riverina, and Murray Darling Depression bioregions. The distribution of the koala in NSW has contracted significantly in the north-western and southern margins with localised declines in coastal areas due to high anthropogenic pressure (DAWE 2022e).

The number of mature individuals is estimated in the conservation advice as 92,184 down from an estimate of 115,600 in 2012 and 184,748 in 2001 (DAWE 2022d). The number of subpopulations is declining as climate suitable habitat shrinks (DAWE 2022d). Four genetically important populations of the koala have been identified nationally:

- Queensland and NSW populations north of the Clarence River Valley (Grafton).
- In NSW south of the Clarence River Valley to the northern extent of the Sydney Basin.
- In NSW, south of the Sydney Basin to about the NSW/Victorian border.
- Victoria and South Australian (DAWE 2022d).

Low-density populations also occur west of the Great Dividing Range in semi-arid environments and are considered to be isolated from their eastern subpopulations (DAWE 2022D). Habitat in these areas is fragmented and this has resulted in a patchy distribution of koalas across their range with significant numbers occurring on privately owned land (DAWE 2022d).

Koalas occupy a wide range of habitats defined by the availability and nutritional quality of food trees, presence of suitable resting trees and microclimates, age structure of the vegetation, history and impediments to dispersal (DAWE 2022e). The majority of koalas in NSW are found in forests and subhumid woodlands on the central and north coast, and to the west across the Western Plains and slopes, within the Pilliga forest, low woodland and forested areas (DAWE 2022d).

3.8.6.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- Conservation advice for *Phascolarctos cinereus* (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory (DAWE 2022d).
- There is no listing advice for this species, listing assessment information may be available in the Approved Conservation Advice.
- National recovery plan for the koala: *Phascolarctos cinereus* (combined populations of Queensland, New South Wales and the Australian Capital Territory) (DAWE 2022e).
- There is no adopted/made threat abatement plans, identified as being relevant for this species.
- Other policy statements and guidelines:
 - Administrative Guidelines – Identify habitat for the endangered koala (DCCEEW 2022d).
 - Administrative Guidelines – Referral guidance for the endangered koala (DCCEEW 2022e).

3.8.6.3 Survey Effort and Results

Spotlighting surveys were undertaken in October 2012, October 2013, March 2015, May 2020, May 2021, January 2023, February 2023 and May 2023. Additionally, Koala Spot Assessment Technique searches were undertaken in May 2020, June 2020, October 2020, January 2021 and May 2021. Passive acoustic recorders were also deployed during the January 2023 survey in the north-east section of the Development Corridor where the Proposed Action adjoins the Coolah Tops National Park. Habitat assessments and opportunistic surveys were also conducted during all surveys. Dates for all koala survey programs are presented below:

- 8–19 October 2012
- 1–9 October 2013
- 20–23 March 2015
- 4–6 October 2016
- 8–9 April 2020
- 17 April 2020
- 4–8 May 2020
- 25–29 May 2020
- 15–19 June 2020
- 17–21 August 2020
- 7–9 October 2020
- 18–22 January 2021

- 10–14 May 2021
- 20–24 September 2021
- 16–20 January 2023
- 27 February to 3 March 2023
- 16–25 May 2023.

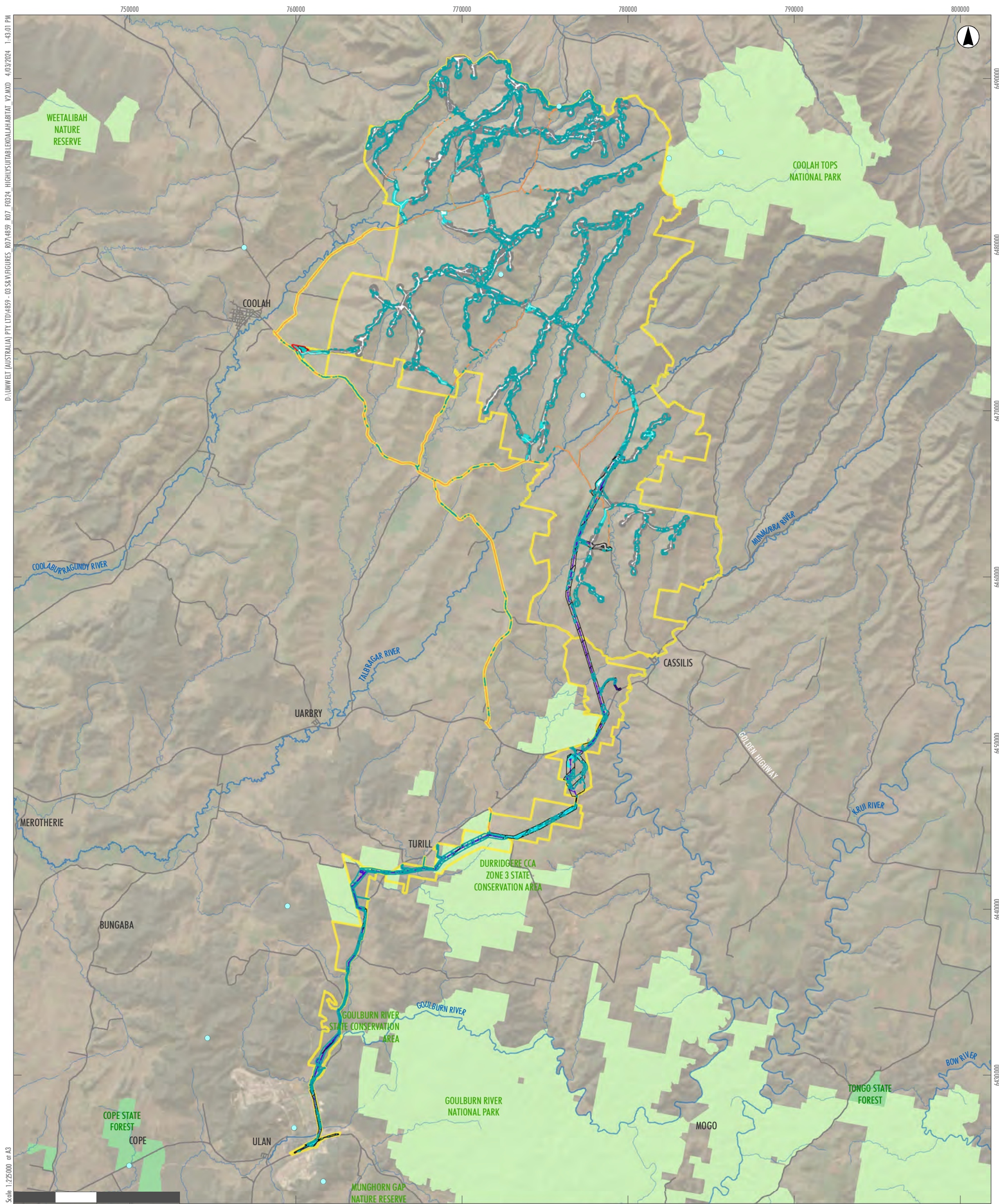
Approximately 178 person days of targeted survey have been completed for this species as part of the Proposed Action.

The species was not recorded in the Indicative Development Footprints despite extensive surveys since 2012.

There are 24 known records of the species within 10 km of the Development Corridor, of which four occur within the Wind Farm component and five occur within the External Transmission Line component of the Development Corridor (DPIE 2021a) (refer to **Figure 3.24**). There are seven (7) records in the locality in the last five years including three (3) from the Moolarben area to the south-east of the Development Corridor, Ulan Cemetery, 1 from north of Coolah, and Barracks Campground in the Coolah Tops National Park.

Figure 3.24 does not show recent sightings of population of 42 koala recently detected in Coolah Tops National Park as part of statewide surveys (pers. Comm. Tilt Renewables 2023) as the location of these sightings are not publicly available. With extrapolation of the recent sightings, it is estimated that approximately 100 koala individuals reside in the Coolah Tops National Park.

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a), as part of the NSW Mod-1 Application response to submissions phase, in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys.



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GDA2020 MGA Zone 55

Legend

- | | | |
|---|-------------------------------|---------------------------|
| Proposed Action Area | Land Category 1 - Exempt Land | NSW Bionet Records |
| Development Corridor | Highly Suitable Koala Habitat | Koala |
| Development Corridor - Wind Farm | Road | |
| Development Corridor - TWA Facility | Drainage Line | |
| Development Corridor - External Transmission Line | National Parks (NPWS Estate) | |
| Indicative Development Footprints | State Forest | |
| Indicative Development Footprint - Wind Farm | | |
| Indicative Development Footprint - TWA Facility | | |
| Indicative Development Footprint - External Transmission Line | | |
| Indicative Development Footprint - Public Road Upgrades | | |

FIGURE 3.24

Highly suitable Koala habitat and records

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022), NSW Bionet Atlas records (2023), (NGH Environmental 2013a, 2013b and 2017)

3.8.6.4 Proposed Action Habitat Assessment

The assessment of koala habitat prepared by NGH (2013a, b) determined that the Approved Proposed Action Area supported potential koala habitat in some locations where white box (*Eucalyptus albens*) constitutes over 15 per cent of the tree canopy but that there was no evidence of koalas or koala use such that the potential habitat would be considered core koala habitat. Habitat was defined as marginal for the wind farm site (NGH 2013a) and the transmission line (NGH 2013b).

PCT 281, PCT 479, PCT 481, PCT 483, PCT 488, PCT 490, PCT 495, PCT 1661 and PCT 1675 generally support 15 per cent of regionally relevant eucalypt species for the koala, much of the Moderate/Good condition habitat in the Development Corridor is likely to be deemed 'Highly Suitable Koala Habitat'. Together, these PCTs contain multiple koala tree species across the Proposed Action recognised as koala feed trees in the koala habitat information base technical guide (DPIE 2019) in the north-west slopes koala management area, including Blakely's red gum (*Eucalyptus blakelyi*), white box (*Eucalyptus albens*), rough-barked apple (*Angophora floribunda*), broad-leaved ironbark (*Eucalyptus fibrosa*), narrow-leaved ironbark (*Eucalyptus crebra*), narrow-leaved stringybark (*Eucalyptus sparsifolia*), grey box (*Eucalyptus moluccana*), large-flowered bundy (*Eucalyptus nortonii*), silvertop stringybark (*Eucalyptus laevopinea*), mountain gum (*Eucalyptus dalrympleana*), brittle gum (*Eucalyptus mannifera*), bundy (*Eucalyptus goniacalyx*), red stringybark (*Eucalyptus macrorhyncha*), yellow box (*Eucalyptus melliodora*) and mugga ironbark (*Eucalyptus sideroxylon*).

Approximately 3,725.7 ha occurs within the Development Corridor (refer to **Figure 3.24**), of which about 2,554.9 ha is thinned Low condition vegetation zones (that is vegetation zones 7 and 11) and 1,170.8 ha or 31 per cent are Moderate/Good condition vegetation zones.

3.8.6.5 Impact Assessment Required?

The impact of the Proposed Action on the koala is considered in **Section 5.5.6**.

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

3.8.7.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

The grey-headed flying-fox is listed as vulnerable under the EPBC Act. Its range extends from Bundaberg in Queensland to Melbourne in Victoria, from the coast and inland to the western slopes of New South Wales. There have also been recent reports of the species within South Australia (DAWE 2021).

Grey-headed flying-fox feeds primarily on blossoms and fruit in canopy vegetation. Major food plants include fruit and blossom of rainforest species (especially figs) and blossom of *Eucalyptus*, *Corymbia*, *Angophora*, *Melaleuca*, *Banksia* and *Syzygium* species. They forage over large areas flying up to 40 km from their roosts or camps.

Habitat critical to the survival of the species including vegetation communities that:

- Support winter and spring flowering resources (*Eucalyptus tereticornis*, *Eucalyptus albens*, *Eucalyptus crebra*, *Eucalyptus fibrosa*, *Eucalyptus melliodora*, *Eucalyptus paniculata*, *Eucalyptus pilularis*, *Eucalyptus robusta*, *Eucalyptus seeana*, *Eucalyptus sideroxylon*, *Eucalyptus siderophloia*, *Banksia integrifolia*, *Castanospermum austral*, *Corymbia citriodora*, *Corymbia eximia*, *Corymbiamaculata*, *Grevillea robusta*, *Melaleuca quinquenervia*, *Syncarpia glomulifera*).

- Native species flowering during the final weeks of gestation, birth, lactation and conception (August to May).
- Native species for foraging within 20 km of a nationally important camp as identified on the flying-fox viewer.
- Native and/or exotic species used for roosting at the site of a nationally important camp as identified on the flying-fox viewer (DAWE 2021).

The grey-headed flying-fox is considered to be a single mobile population. Grey-headed flying-foxes are highly mobile and appear to be a highly adaptable species in response to changes in their habitat and surrounding environment. The grey-headed flying-fox occupancy and relative abundance varies widely seasonally and temporally in response to flowering and fruiting. There are a small number of local areas that support a continuous presence while others are associated with regular, annual patterns of use (DAWE 2021). A number of “urban” roost sites that are occupied year-round (Sydney suburbs, Botanic Gardens in Sydney and Melbourne) have become established due to consistently available food resources and suitable roosting habitat. At other “non-permanent” roost sites, Grey-headed Flying-foxes have shown themselves to be able to respond rapidly to the presence/absence of food availability (TSSC 2001).

During spring, the grey-headed flying-fox is uncommon south of Nowra but widespread in other areas of their range. In summer they are widespread throughout their range and in autumn they occupy coastal lowlands and are uncommon inland. In winter they congregate in coastal lowlands north of the Hunter Valley and are occasionally found where flowering spotted gum (*Corymbia maculata*) and north-west slopes with flowering white box (*Eucalyptus albens*) or mugga ironbark (*Eucalyptus sideroxylon*) (DAWE 2021).

3.8.7.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- There is no approved conservation advice for this species.
- Commonwealth Listing Advice on *Pteropus poliocephalus* (Grey-headed Flying-fox) (TSSC 2001).
- National recovery plan for the grey-headed flying-fox *Pteropus poliocephalus* (DAWE 2021).
- There are no adopted/made threat abatement plans, identified as being relevant for this species.
- Other policy statements and guidelines:
 - Survey guidelines for Australia’s threatened bats. Guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (DEWHA 2010b).
 - Referral guideline for management actions in Grey-headed and Spectacled flying-fox camps. EPBC Act Policy Statement (CoA 2015b).

3.8.7.3 Survey Effort and Results

All nocturnal surveys completed by NGH (2013a, 2013b, 2017) (refer to **Table 3.3** and **Table 3.4**) and Umwelt (refer to **Table 3.6**), would allow for detection of the grey-headed flying-fox foraging, these are listed below:

- 8–19 October 2012
- 1–9 October 2013
- 20–23 March 2015
- 25–29 May 2020
- 10–14 May 2021
- 16–20 January 2023
- 27 February–3 March 2023.

Approximately 90 person days of targeted survey have been completed for this species as part of the Proposed Action.

There are no BioNet records of the grey-headed flying-fox within 10 km of the Development Corridor (refer to **Figure 3.25**). The grey-headed flying-fox was not recorded by NGH (2013a, 2013b, 2017). Two individuals were recorded overhead during bird and bat utilisation surveys in January 2023 in the north of the Development Corridor.

3.8.7.4 Proposed Action Habitat Assessment

The national flying-fox viewer identifies a number of flying fox camps in the region the closest of which is at Mudgee about 42 km to the south-west of the Development Corridor. Individuals may forage in the Referral Area from the camp at Mudgee however this camp is over 40 km from the southern end of the Development Corridor and more than 90 km to the south-west of where the two individuals were observed in January 2023.

The closest nationally important flying fox camp is at Muswellbrook which is over 100 km to the south-east of the southern end of the Development Corridor. There are another two nationally important camps at Tamworth however both of these camps are over 110 km to the north-east of the northern end of Development Corridor.

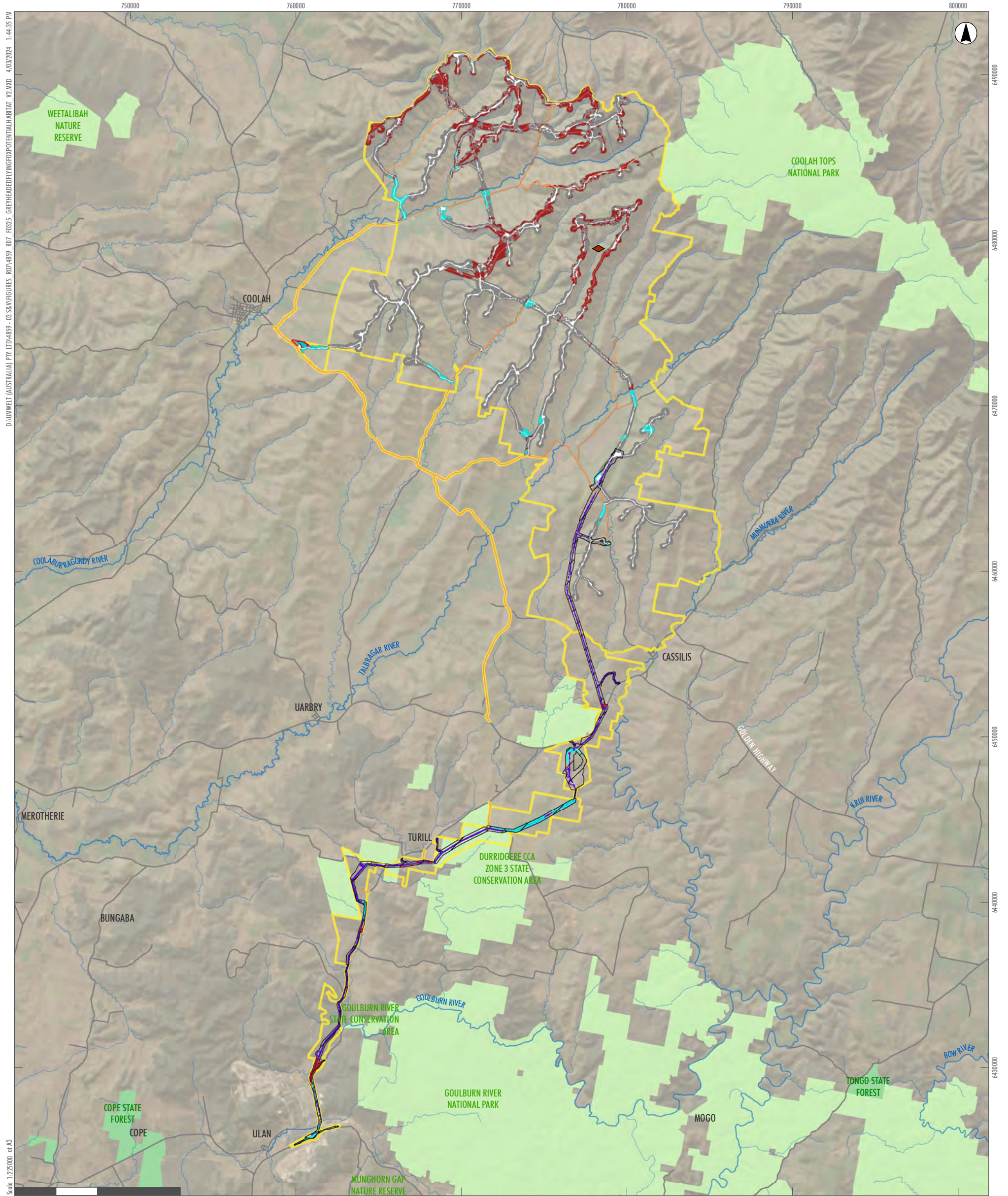
Notwithstanding the lack of records and excessive distance to known camps, based on the NSW TBDC and BAM – Credit Calculator, suitable seasonal foraging habitat is present within the Development Corridor in PCT 84, 281, 488, and 495 but excluding those vegetation zones low densities of trees. In total there is about 1,731.4 ha of potential seasonal foraging habitat within the Development Corridor as shown in **Figure 3.25**, of which 312.0 ha will be impacted by the Proposed Action.

Based on the definitions summarised in **Section 3.8.7.1**, the Development Corridor does not provide critical habitat for the grey-headed flying-fox.

NSW BCS, at the most recent agency review of the NSW BDAR (Umwelt 2023a), as part of the NSW Mod-1 Application response to submissions phase, in November 2023, have reviewed the assessment approach, the survey technique and effort for the Proposed Action under the state-based BAM (DPIE 2020a) and deemed it as adequate and there has been no request for additional surveys.

3.8.7.5 Impact Assessment Required?

The impact of the Proposed Action on the grey-headed flying-fox is considered in **Section 5.5.7**.



Legend

- | | | |
|---|--|----------------------------------|
| Proposed Action Area | Land Category 1 - Exempt Land | Umwelt and NGH TS Records |
| Development Corridor | Grey-headed Flying-fox Potential Habitat | Grey-headed Flying-fox |
| Development Corridor - Wind Farm | Road | |
| Development Corridor - TWA Facility | Drainage Line | |
| Development Corridor - External Transmission Line | National Parks (NPWS Estate) | |
| Indicative Development Footprints | State Forest | |
| Indicative Development Footprint - Wind Farm | | |
| Indicative Development Footprint - TWA Facility | | |
| Indicative Development Footprint - External Transmission Line | | |
| Indicative Development Footprint - Public Road Upgrades | | |

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022), NSW Bionet Atlas records (2023)

FIGURE 3.25

Grey-headed Flying-fox potential habitat and records

3.9 Listed Migratory Species

The following migratory species have been discussed in Section 3.7.6 as the species is also listed as threatened under the EPBC Act:

- White-throated Needletail (*Hirundapus caudacutus*) – Vulnerable, Listed migratory (CAMBA, JAMBA and ROKAMBA).

3.9.1 Rufous Fantail (*Rhipidura rufifrons*)

3.9.1.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

The rufous fantail is listed as a migratory species in the Convention of the Conservation of Migratory Species of Wild Animals (Bonn Convention) and as a listed marine species under Section 248 of the EPBC Act. There are two subspecies of rufous fantail recognised in Australia:

- *R. r. intermedia* occurs along the north-eastern seaboard of Australia from northern NSW along the coast to the Cape York Peninsula.
- *R. r. rufifrons* occurs in southeastern mainland Australia, from approximately Brisbane, through NSW and Victoria and across to the eastern side of the Adelaide Hills.

In NSW, the rufous fantail is widespread on and east of the Great Dividing Range, sometimes recorded further west from near Boggabri to the Macquarie Marshes and Walgett south to Dubbo (Birdlife Australia 2023a).

Rufous fantail (*R. r. rufifrons*) inhabits moist, dense habitats, including mangroves, rainforest, riparian forests and thickets, and wet eucalypt forests (Birdlife Australia 2023a). Structural features of suitable habitat include a moderately dense canopy cover often with two lower strata: a 2–6 m high layer and a shrubby or heath understorey 1–2 m high (Birdlife Australia 2023a). Rufous Fantails forage mostly in the dense low understorey of forests and rainforest but will use other strata including the canopy and sub-canopy, rarely the ground (Birdlife Australia 2023a).

R. r. rufifrons primarily breeds in forests within 300 km of the coast. This subspecies is one of the most precisely predictable migratory species in Australia. It migrates northwards during nonbreeding periods, departing usually in March to early April (Birdlife Australia 2023a). It is virtually absent from south-east Australia in winter spending winter in coastal lowlands and offshore islands in south-east Queensland, north to Cape York. The birds return to breeding grounds August to December.

When on passage the rufous fantail occurs in a wider range of wooded habitats including dry eucalypt forests and woodlands, including Spotted Gum (*Corymbia maculata*), Yellow Box (*Eucalyptus melliodora*), ironbarks or stringybarks, often with a shrubby or heath understorey (Birdlife Australia 2023a).

3.9.1.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- There is no approved Conservation Advice for this species.
- There is no listing advice for this species.

- There is no adopted or made Recovery Plan for this species.
- There are no adopted/made threat abatement plans, identified as being relevant for this species.
- Policy statements and guidelines: Draft referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE 2015), administration guideline.

3.9.1.3 Survey Effort and Results

All bird surveys and habitat searches completed by Umwelt and NGH during spring and summer would allow for targeted sampling and opportunistic detection of the rufous fantail. The rufous fantail has not been recorded in the Development Corridor (NGH 2013a, 2013b, 2017, Umwelt 2023a).

3.9.1.4 Proposed Action Habitat Assessment

There are no records of the rufous fantail within 10 km of the Development Corridor. Records further removed including to the west of Durrigere State Conservation Area in Goulburn River National Park, east of Ulan mine and in Coolah Tops National Park. The Coolah Tops National Park Plan of Management identifies that the rufous fantail is known from the park and highlights that this park represents the western limit of its distribution (NPWS 2003a).

The rufous fantail may occur on occasion most likely during migration but is not likely to rely on the Development Corridor for any stage of the lifecycle.

While migrating, the rufous fantail may occur in wooded habitats including dry eucalypt forests and woodlands, including Spotted Gum (*Corymbia maculata*), Yellow Box (*Eucalyptus melliodora*), ironbarks or stringybarks, often with a shrubby or heath understorey. Potential marginal habitat may occur in moderate/good condition PCT 479, PCT 481, PCT 1661 and PCT 1675 in the Development Corridor – External Transmission Line where there is a heathy or shrubby understorey. Vegetation zone 18 (PCT 1661) has been excluded as it lacks a shrubby or heath understorey. There is approximately 412.8 ha of marginal potential seasonal habitat in the Development Corridor that may be occupied by the rufous fantail when migrating.

3.9.1.5 Impact Assessment Required?

There is a low likelihood of the rufous fantail relying on habitats in the Development Corridor based on presence of marginal habitat and absence of sightings or records from others within the Development Corridor or locality. An impact assessment is not required.

3.9.2 Satin Flycatcher (*Myiagra cyanoleuca*)

3.9.2.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

The satin flycatcher is listed as a migratory species under the Bonn Convention and as a listed marine species under Section 248 of the EPBC Act.

The satin flycatcher is widespread in eastern Australia and vagrant to New Zealand. In NSW, they are widespread on and east of the Great Dividing Range and sparsely scattered on the western slopes, with very occasional records on the western plains (Birdlife Australia 2023b).

Satin flycatchers are eucalypt forest and woodland inhabitants. They are particularly common in tall wet sclerophyll forest, often in gullies or along water courses (Birdlife Australia 2023b). In eucalypt woodlands they prefer open understorey, grassy woodland. The diversity of occupied habitats expands during migration, with the species recorded in most wooded habitats. They tend to forage in the canopy and subcanopy, though occasionally forage in lower strata or descend to drink at forest streams.

The core breeding distribution of the Satin Flycatcher is in the wet eucalypt forests with tall shrubby understorey, sometime dry sclerophyll forest and woodlands along the east coast and across south-eastern mainland Australia and Tasmania. On mainland Australia the species is a high-attitude breeder at more than 600 m above sea level. They breed from November to early January.

The satin flycatcher shows a north-south migration throughout this range. It is a breeding summer migrant to the south-east and Tasmania, being almost entirely absent from this region in winter. The species winters in northern Queensland, New Guinea and the Bismarck Archipelago. After breeding, satin flycatchers leave southern Australia in February–April. In NSW, they depart in February and March, and around Sydney they are mainly recorded on passage moving north between February and April. Satin flycatchers arrive in NSW, or are recorded on passage, between September and October.

While most birds migrate north through the eastern coastal region, a small number consistently deviate from the coast and migrate inland through South Australia, generally recorded between December–June.

The global population size has not been quantified, but the species is reported to be commonest in the south of its range in Australia (especially Tasmania) and scarce in the north. The range of the population and the extent of the habitat used suggest that the population is at least tens of thousands.

3.9.2.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- There is no approved Conservation Advice for this species.
- There is no listing advice for this species.
- There is no adopted or made Recovery Plan for this species.
- There are no adopted/made threat abatement plans, identified as being relevant for this species.
- Policy statements and guidelines: Draft referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE 2015), administration guideline.

3.9.2.3 Survey Effort and Results

All bird surveys and habitat searches completed by Umwelt and NGH in spring and summer particularly during migration (between February and April then September and October) would allow for targeted sampling and opportunistic detection of the satin flycatcher.

The satin flycatcher has not been recorded in the Development Corridor (NGH 2013a, 2013b, 2017, Umwelt 2023a).

3.9.2.4 Proposed Action Habitat Assessment

The satin flycatcher may occur on occasion in dry open woodland most likely during migration. There are no records of the bird in BioNet in the Development Corridor or Proposed Action Area. There are a number of publicly known records of the species in Coolah Tops National Park, from 2001 and 2003 (NPWS 2003a). The Atlas of Living Australia has five records in Coolah Tops National Park between 1998 and 2003 (ALA 2023).

While migrating, the satin flycatcher may occur in wooded habitats including dry eucalypt forests and woodlands dominated by Blakely's red gum (*Eucalyptus blakelyi*), mugga ironbark (*Eucalyptus sideroxylon*), Yellow Box (*Eucalyptus melliodora*), white box (*Eucalyptus albens*), manna gum (*Eucalyptus viminalis*) or stringybarks (Birdlife Australia 2023b). Potential marginal habitat may occur in moderate/good condition PCT 281, PCT 481, PCT 483 and PCT 488 in the Development Corridor. Other areas of woodland have been excluded as these areas lack a shrubby or heath understorey. There is about 542.3 ha of potential seasonal migratory habitat in the Development Corridor that may be occupied by the satin flycatcher when migrating, of which 101.8 ha would be impacted by the Proposed Action.

3.9.2.5 Impact Assessment Required?

There is a low likelihood of the satin flycatcher relying on habitats in the Development Corridor based on presence of marginal habitat and absence of sightings or records from others within the Development Corridor (despite extensive surveys) and absence of recent sightings within 5 km of the Development Corridor.

An impact assessment is required for this species as the Development Corridor may provide habitat for the satin flycatcher during migration and while not recent there are records in the adjacent habitat, so accordingly, we have adopted the precautionary principle.

3.9.3 Black-faced Monarch (*Monarcha melanopsis*)

3.9.3.1 Information on the Abundance, Distribution, Ecology and Habitat Preferences

The black-faced monarch is listed as a migratory species under the Bonn Convention and as a listed marine species under Section 248 of the EPBC Act.

The black-faced monarch (*Monarcha melanopsis*) is a small insectivorous bird that is widespread in eastern Australia. In NSW, the species occurs along the eastern slopes and tablelands of the Great Dividing Range, inland to Coutts Crossing, Armidale, Widden Valley, Wollemi national Park, Wombeyan Caves and Canberra (Birdlife Australia 2023c). It is rarely recorded inland being recorded south of the Referral Area in Munghorn Gap Nature Reserve in January 1995 and near Narrabri in December 1994 (Birdlife Australia 2023c).

The black-faced monarch is a wet forest specialist, occurring mainly in rainforests and riparian vegetation. In wet sclerophyll forest, the species mostly frequents sheltered gullies and slopes with a dense understorey of ferns and/or shrubs (Birdlife Australia 2023c). They forage mainly gleaning from foliage or branches of trees and shrubs or by taking insect prey from the air (sallying).

They breed in rainforest habitat in eastern coastal Australia during summer (October to March) and migrate to spend the non-breeding winter period in New Guinea. A portion of the population (likely immature birds) overwinters in northern Australia rather than making the full migration to New Guinea (Birdlife Australia 2023c).

The global population size has not been quantified, but the species has an extensive breeding range in south-eastern Australia from Cooktown to eastern Victoria so the population is likely to be at least tens of thousands.

3.9.3.2 Guidelines and Policy Statements

Relevant guidelines and policy statements available for this species include:

- There is no approved Conservation Advice for this species.
- There is no listing advice for this species.
- There is no adopted or made Recovery Plan for this species.
- Adopted/made threat abatement plans: Threat abatement plan for predation by feral cats (CoA 2015a).
- Policy statements and guidelines: Draft referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE 2015), administration guideline.

3.9.3.3 Survey Effort and Results

All bird surveys and habitat searches completed by Umwelt and NGH in spring and summer would allow for targeted sampling and opportunistic detection of the black-faced monarch.

The black-faced monarch has not been recorded in the Development Corridor (NGH 2013a, 2013b, 2017, Umwelt 2023a). There are no BioNet records of the black-faced monarch within 10 km radius of the Development Corridor.

3.9.3.4 Proposed Action Habitat Assessment

The black-faced monarch inhabits rainforest and wet sclerophyll forest. Potential habitat does not occur in the Development Corridor.

3.9.3.5 Impact Assessment Required?

Black-faced monarch is not expected to occur in the Development Corridor and an impact assessment is not required.

4.0 Impact Assessment

The following sections describe and quantify the potential impacts (direct, indirect, consequential, and cumulative) on the environment and biodiversity values, associated with the construction, operation and decommissioning of the Proposed Action.

The following factors were considered when assessing potential impacts:

- The magnitude of the impact, taking into account the severity and scale of the impact.
- The timing, duration and frequency of the impact including whether the impact is temporary or permanent.
- The likelihood that any given impact would occur.
- Whether any impacts are unknown, unpredictable or irreversible.
- The relevant component and stage of the Proposed Action.

Avoidance, mitigation and management measures are discussed in **Section 6.0**.

4.1 Land Use Impacts

The land use proposed by the Proposed Action is a wind farm with transmission line and connection infrastructure, as well as ancillary infrastructure (refer to Figure 2.1) consistent with the Approved Action (refer to Figure 1.2). The main land use impacts will be potential for temporary disruption of existing agricultural land uses during construction, change in the rural setting of the locality given the presence of multiple wind turbines and additional transmission line infrastructure, potential increase in land management costs and activities due to weed spread from vehicle movements, potential changes to aerial land management practices and minor fragmentation of continuity of landholdings during construction. The Proposed Action will also have positive impacts on land use through improving and maintaining access to remote properties, facilitating land management activities and bushfire management (Umwelt 2023e).

The private landowners associated with the Proposed Action typically own large rural holdings and generally either live on their property and run agricultural enterprises or lease their land to other local residents and/or operate agricultural enterprises while living in other areas. The Proponent has entered into agreements with private landowners within the Development Corridor to secure the tenure required for the Proposed Action.

Access rights over the Crown land required for the Proposed Action will be obtained via a licence or the closure of some Crown road reserves, where the land is used for public access, in accordance with the requirements of the *NSW Crown Land Management Act 2016*.

The external transmission line is not inconsistent with other land uses in the Proposed Action Area which includes existing transmission lines, agriculture and mining infrastructure.

The areas of disturbance associated with the construction of public road upgrades are anticipated to be contained within the existing road reserves. However, 3D terrain modelling indicates that some sections of anticipated public road upgrades extend into adjacent private properties, some of which are owned by participating landowners. This is due to the inconsistencies between the publicly available cadastral boundaries and the constructed public road reserves and fenced property boundaries. During the detailed design phase, the precise extent of ground disturbance associated with the public road upgrades will be determined in consultation with the relevant road authorities, and physical boundary surveys will be completed wherever necessary. Wherever required the Proponent will enter into agreements, or otherwise, to secure access with relevant adjacent landowners prior to commencing construction of the relevant sections of the public road upgrades.

The TWA Facility will temporarily change the land use associated with Lot 160 DP 750744 for the duration of the construction period (approximately four years). The TWA Facility has been largely cleared of vegetation due to extensive historical cultivation and is currently subject to cattle grazing. Upon completion of wind farm construction, the TWA Facility is expected to be demobilised, and the TWA Facility site rehabilitated to restore its land capability to allow re-establishment of the existing land use, subject to landowner agreement (see **Section 7.1.2**). There may be an opportunity to leave infrastructure (on-site or in/around nearby communities) that is important to the landowner and the local community in place once construction has ceased and the construction workforce has demobilised. This could include groundwater bores (for firefighting purposes for instance), potential water/sewerage treatment facilities, housing or community infrastructure. It is not proposed as part of the Proposed Action to repurpose or convert the TWA Facility to a permanent facility or allow it to be used for a different use following the completion of construction.

As discussed in **Section 1.6**, the Proposed Action Area is located within the CWO REZ, an area experiencing rapid change due to multiple renewable energy projects either approved or in planning and assessment phases. The development of multiple large scale renewable projects will cause a range of cumulative land use impacts. These are discussed in **Section 4.5**.

4.2 Construction Impacts

The Indicative Development Footprints (refer to **Section 2.1.2**) are the estimated extent of all ground disturbance and vegetation removal associated with the Proposed Action. The total Indicative Development Footprint is estimated to be approximately 1,803 ha, comprised of the:

- Indicative Development Footprint – External Transmission Line (244.4 ha).
- Indicative Development Footprint – Public Road Upgrades (184.7 ha).
- Indicative Development Footprint – TWA Facility (9 ha).
- Indicative Development Footprint – Wind Farm (1,364.9 ha).

For the purposes of this assessment, the Indicative Development Footprint is the ‘disturbance footprint’. It includes permanent infrastructure such as turbines, wind turbine hardstands, internal and external access roads, substations, operations and maintenance facilities and transmission lines. It includes temporary facilities including calibration met masts, concrete batch plants, construction compound/laydown areas, TWA Facility and trenching for utility installation.

Impacts to MNES may include:

- Vegetation clearing resulting in loss of habitat.
- Habitat fragmentation and reduced connectivity.
- Fauna injury or mortality during clearing and potential entrapment in trenches when installing underground utilities.
- Collision risk for birds and bats.
- Fauna injury or mortality due to vehicle strike.
- Wildlife disturbance due to dust, noise and light emissions.
- Changes to surface water flows with increase in hardstand area.
- Reduced water quality due to erosion and sedimentation.
- Potential spill of hazardous materials.
- Introduction or increased or prevalence of pests and weeds due to increased vehicle movements and vegetation clearance.
- Increased risk of bushfire due to potential ignition sources on site associated with construction activities.

These are discussed in more detail in the following sections. Impact assessment of individual MNES are provided in **Section 5.3** (threatened ecological community), **Section 5.4** (threatened birds), **Section 5.5** (threatened mammals) and **Section 5.6** (migratory species).

It is important to note that proposed avoidance, minimisation and mitigation measures for these potential impacts are identified and discussed in **Section 6.1** and **Section 6.2**, respectively. Outlines of management plans to be implemented during construction, operation and decommissioning are provided in **Section 6.3**.

4.2.1 Vegetation and Habitat Clearance and Modification

The development of the Proposed Action will result in direct impacts on biodiversity values. Direct impacts include the loss of vegetation and fauna habitats as a result of clearance works and subsequent operation of the wind farm. **Table 4.1** outlines the direct impacts on native vegetation, which totals approximately 1,629.1 ha. This includes 768.6 ha of vegetation described as ‘low condition derived native grassland’ and ‘exotic’ in condition, being Vegetation Zones 8 and 12. While these two vegetation zones have been identified as ‘exotic’ due to their degraded nature, they still meet the formal definition of ‘native vegetation’ as per Section 60B under the LLS Act.

The Development Corridor contains a range of habitat features (such as hollow-bearing trees and fallen logs) and species-credit species have been identified to occur within the Indicative Development Footprints. The direct and indirect impacts of habitat clearance on threatened species is provided in detail in **Section 5.4** and **Section 5.5**.

Table 4.1 Clearance and/or Modification (Partial Direct Impacts) of Vegetation Zones

Veg Zone	Current PCT name and condition	Area in Development Corridor (ha)	Area in Indicative Development Footprints (ha)					Impacts for transmission lines (ha)		
			Wind farm	External Transmission Line	Public Road Upgrades	TWA	Total	Partial direct impact	Full direct impact	Total
1	PCT 84 – River Oak – Rough-barked Apple – red gum – box riparian tall woodland (wetland) of the Brigalow Belt South Bioregion and Nandewar Bioregion <i>Moderate/Good</i>	78.5	7.9	0	1.6	0	9.5	4.4	5.1	9.5
2	PCT 281 – Rough-Barked Apple– red gum– Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion <i>Moderate/Good</i>	45.7	0.7	12.0	0.7	0	13.4	8.4	5.0	13.4
4	PCT 479 – Narrow-leaved Ironbark- Black Cypress Pine – stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion and Sydney Basin Bioregion <i>Moderate/Good</i>	54.8	0	19.1	0.7	0	19.8	13.3	6.5	19.8
5	PCT 481 – Rough-barked Apple– Blakely’s Red Gum – Narrow-leaved Stringybark +/- Grey Gum sandstone riparian grass fern open forest on in the southern Brigalow Belt South Bioregion and Upper Hunter region <i>Moderate/Good</i>	48.8	0	12.7	0	0	12.7	5.9	6.8	12.7

Veg Zone	Current PCT name and condition	Area in Development Corridor (ha)	Area in Indicative Development Footprints (ha)					Impacts for transmission lines (ha)		
			Wind farm	External Transmission Line	Public Road Upgrades	TWA	Total	Partial direct impact	Full direct impact	Total
6	PCT 483 – Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley <i>Moderate/Good</i>	117.0	10.5	5.7	0	0	16.2	8.9	6.9	15.8
7	PCT 483 – Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley <i>Low</i>	1,455.6	205.4	51.4	10.4	0	266.8	76.2	190.6	266.8
8	PCT 483 – Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley <i>Low Condition DNG</i>	1,627.4	319.5	2.8	73	0	395.2	-	-	-
9	PCT 488 – Silvertop Stringybark – Yellow Box +/- Nortons Box grassy woodland on basalt hills mainly on northern aspects of the Liverpool Range, Brigalow Belt South Bioregion <i>Moderate/Good</i>	330.8	59.5	0	0	0	59.5	11.4	47.5	58.9
10	PCT 488 – Silvertop Stringybark – Yellow Box +/- Nortons Box grassy woodland on basalt hills mainly on northern aspects of the Liverpool Range, Brigalow Belt South Bioregion <i>Moderate/Good-Shrubby</i>	3.0	0.5	0	0	0	0.5	0.5	-	0.5
11	PCT 488 – Silvertop Stringybark – Yellow Box +/- Nortons Box grassy woodland on basalt hills mainly on northern aspects of the Liverpool Range, Brigalow Belt South Bioregion <i>Low</i>	1,099.3	194.8	4.9	5.7	0	205.4	35.7	169.6	205.3

Veg Zone	Current PCT name and condition	Area in Development Corridor (ha)	Area in Indicative Development Footprints (ha)					Impacts for transmission lines (ha)		
			Wind farm	External Transmission Line	Public Road Upgrades	TWA	Total	Partial direct impact	Full direct impact	Total
12	PCT 488 – Silvertop Stringybark – Yellow Box +/- Nortons Box grassy woodland on basalt hills mainly on northern aspects of the Liverpool Range, Brigalow Belt South Bioregion <i>Exotic</i>	1,658.5	360.3	0	13.1	0	373.4	-	-	-
13	PCT 490 – Silvertop Stringybark – Forest Ribbon Gum very tall moist open forest on basalt plateau on the Liverpool Range, Brigalow Belt South Bioregion <i>Moderate/Good</i>	87.4	15.2	0	0	0	15.2	-	-	-
14	PCT 495 – Brittle Gum – Silvertop Stringybark grassy open forest of the Liverpool Range, Brigalow Belt South Bioregion <i>Moderate/Good</i>	174.2	23.7	0	0	0	23.7	8.0	15.7	23.7
15	PCT 1661 – Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin <i>Moderate/Good</i>	194.9	0	55.0	0.3	0	55.3	37.5	17.8	55.3
16	PCT 1675 – Scribbly Gum – Narrow-leaved Ironbark – <i>Bossiaea rhombifolia</i> heathy open forest on sandstone ranges of the Sydney Basin <i>Moderate/Good</i>	114.3	0	31.5	0.5	0	32.0	22.8	9.1	31.9
17	PCT 483 – Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, upper Hunter Valley <i>DNG</i>	979.7	101.1	26.6	0.2	0	127.9	-	-	-

Veg Zone	Current PCT name and condition	Area in Development Corridor (ha)	Area in Indicative Development Footprints (ha)					Impacts for transmission lines (ha)		
			Wind farm	External Transmission Line	Public Road Upgrades	TWA	Total	Partial direct impact	Full direct impact	Total
18	PCT 1661 – Narrow-leaved Ironbark – Black Pine – Sifton Bush heathy open forest on sandstone ranges of the upper Hunter and Sydney Basin <i>DNG</i>	32.9	0	2.5	0	0	2.5	-	-	-
-	No vegetation cover (includes waterbodies, roads and tracks)	112.7	13.2	7.1	76.3	0	96.4	-	-	-
-	Category 1 exempt land including vegetation that is not native and areas cropped/ploughed or significantly disturbed for agriculture and/or areas disturbed by approved activities.	517.4	52.6	13.2	2.7	9	77.4	-	-	-
	Total area (ha)	8,732.7	1364.9	244.4	184.7	9	1,803	68.3.0	42.6	110.9
	Total area of native vegetation (ha)	8,102.7	1,299.1	224.2	106.2	0.0	1,629.1	233.0	480.6	713.6

The impacts assessed for the Proposed Action are a more realistic estimate of the likely ground disturbance and vegetation removal, particularly when compared to the Approved Action, as the 3D terrain modelling used to develop the Indicative Development Footprints provide an accurate representation of the areas required for construction including both temporary and permanently disturbed areas. Opportunities to further reduce impacts will be explored during detailed design.

The Proponent confirmed the easement specifications required for the Proposed Action for the future operation of the proposed transmission lines, through consultation with Transgrid as the transmission networks service provider (TNSP) for the region.

Transgrid's easement guidelines recommend an approximately 60 m wide easement for the transmission line with vegetation that is currently or can grow equal to or greater than 4 m tall (Transgrid nd). For vegetation zones that meet these characteristics, vegetation would be modified that is subject to partial direct impacts. The area within the 60 m wide easement that is not subject to ground disturbance from civil works (that is access tracks, pole/tower pad disturbance areas, and string pad disturbance areas) is referred to as the 'balance of easement'. As grasses, shrubs and bushes below 4 m in height at full maturity are not proposed to be removed within the 'balance of easement' area, this area has been assessed under the NSW BAM as subject to partial indirect impacts (provided by Section 8.1.1.2 of the BAM (DPIE 2020a)), that is the future vegetation integrity score for the balance of easement is not reduced to the default score of 0 (no biodiversity value). Ground disturbance areas for pole/towers, string pads, and access tracks associated with the transmission line are included in the direct impact calculations.

Within the balance of easement area, a proportion of biodiversity values will remain within select vegetation zones following construction and during the operation of the wind farm. All Vegetation Zones, except Vegetation Zones 8, 12, 13, 17 and 18 (being derived grasslands and therefore less than 4 m in height) were assigned partial impact values where they occurred within the transmission line easements (i.e., Vegetation Zones 1, 2, 4, 5, 6, 7, 9, 10, 11, 14, 15 and 16) for both the external transmission line and the transmission line within the Development Corridor - Wind Farm. The extent of partial direct impact assessed for each of the applicable vegetation zone is presented in **Table 4.1**. Detailed discussion of how partial direct impacts have been determined is provided in Section 5.1.2 of the NSW BDAR (Umwelt 2023a) in **Appendix D**.

In total 233.0 ha of native vegetation is assessed as being impacted within the balance of easement area within the internal and external transmission lines. A breakdown of this is provided below:

- 101.6 ha of vegetation greater than 4 m in height at full maturity within the balance of easement of the Internal Transmission Line (i.e. within the wind farm).
- 131.5 ha of vegetation greater than 4 m in height at full maturity within the balance of easement of the External Transmission Line (i.e. between the wind farm and the approved connection point at Ulan).

Partial direct impacts within the balance of easement were applied to relevant sections of the proposed transmission line. This has only been undertaken where there is confidence that biodiversity values will persist. This confidence is based on extensive project experience assessing other transmission line easements within NSW where biodiversity values have been confirmed to persist following the construction of transmission lines and its associated easement. The assessment is consistent with the partial direct impact assessment undertaken by EnergyCo CWO REZ Transmission Line Infrastructure project (EnergyCo 2023).

The application of partial direct impacts within the proposed internal and external transmission lines of the Proposed Action is considered appropriate for the nature of proposed impacts. Eldegard et al., (2017) found that transmission easements recover into novel habitats over time following clearing activities. Post clearing monitoring of transmission line clearings has found that floristic and composition attributes differ between control vegetation (not thinned) and thinned canopy treatments, specifically grasses and forbs increased proportionally (Tsai et al., 2018). This was found to be linked to increased canopy openings causing substantial effects on understorey micro environmental conditions, in turn resulting in enhanced establishment and growth of ground stratum flora species (Tsai et al., 2018).

While canopy thinning leads to proportional increases in understorey composition, it also results in reduced species richness due to competition. Conversely, where shrub and ground stratum cover increase, species richness has been found to decrease due to stronger competition of more dominant species. Several studies have found that flora species with a greater tolerance of direct sunlight and species that reproduce through clonal growth benefit through canopy thinning activities (Luken, et al., 1992, Eldridge, et al. 2017 and Walker & Koen 1995).

It should be noted that, in the event that the CWO REZ transmission line, currently proposed by EnergyCo, becomes a viable connection option and is adopted by the Proposed Action, the External Transmission Line component would no longer be required and all impacts on biodiversity values associated with the External Transmission Line would no longer apply. Removal of the External Transmission Line component would result in the avoidance of impact to approximately 224.2 ha of native vegetation including approximately 17.7 ha of impact to Commonwealth Box Gum Woodland CEEC.

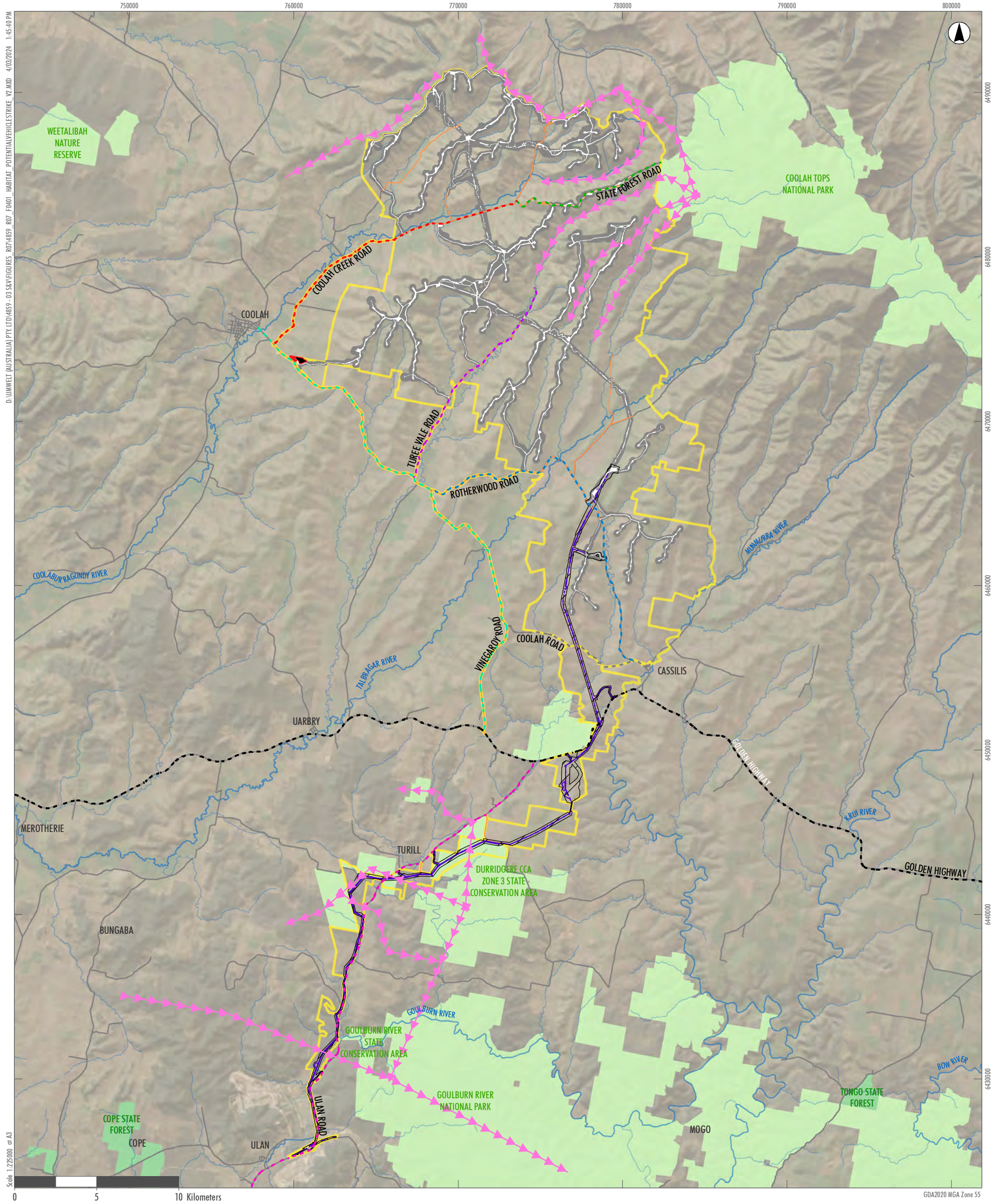
4.2.2 Habitat Connectivity, Fragmentation and Edge Effects

The Development Corridor is located in a region of NSW that has been extensively modified and disturbed as a result of a long history of agricultural land uses. Specifically, the Development Corridor is comprised of agricultural landscapes on the valley floors and low slopes, with substantial areas of intact vegetation associated with the network of public reserves, upper slopes, and ridgetops.

Broadly speaking, much of the Indicative Development Footprints occur where the connectivity of native vegetation and habitat corridors has been previously compromised by historical agricultural land uses. However, there are specific locations within the Development Corridor where substantial areas of intact native vegetation and associated fauna habitat is recognised to occur. Primarily this occurs:

- To the north (private land) and east (Coolah Tops National Park) of the Development Corridor – Wind Farm.
- To the north, east (Durrigere State Conservation Areas, State Forest land, national park estate – The Drip, Goulburn River National Park) and west of the Development Corridor – External Transmission Line (refer to **Figure 4.1**).

The Indicative Development Footprint – External Transmission Line will introduce a new interruption (modification of vegetation structure over a width of up to 60 m) to habitat connectivity in the national park estate, state forest and private landholdings. A summary of the potential interruption of habitat connectivity is presented below in **Table 4.2**. While the transmission line easement is a new disruption to habitat connectivity, its width and nature of impact will not prevent connection of habitat for flora and fauna species in the region.



Legend

- | | | |
|---|------------------------------|-----------------------|
| Proposed Action Area | Habitat Corridor | Road Locations |
| Development Corridor | Road | COOLAH CREEK ROAD |
| Development Corridor - Wind Farm | Drainage Line | COOLAH ROAD |
| Development Corridor - TWA Facility | National Parks (NPWS Estate) | GOLDEN HIGHWAY |
| Development Corridor - External Transmission Line | State Forest | ROTHERWOOD ROAD |
| Indicative Development Footprints | | STATE FOREST ROAD |
| Indicative Development Footprint - Wind Farm | | TUREE VALE ROAD |
| Indicative Development Footprint - TWA Facility | | ULAN ROAD |
| Indicative Development Footprint - External Transmission Line | | VINEGARROY ROAD |
| Indicative Development Footprint - Public Road Upgrades | | |

FIGURE 4.1

Habitat connectivity and potential vehicle strike impact locations

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022)

Table 4.2 Interruption of Habitat Connectivity identified in the Indicative Development Footprint

Location of Habitat Connectivity	Summary of Interruption
<p>Indicative Development Footprint – External Transmission Line (along Ulan Road)</p>	<ul style="list-style-type: none"> • Clearance and/or modification of vegetation cover for the external transmission line easement will introduce a new interruption to habitat connectivity within the Durridgere State Conservation Areas; State Forest land and National Park land near Ulan Road, as well as large intact patches of vegetation connected to these reserves on private land. • The Proposed Action transmission line easement will introduce an interruption approximately 60 m in width. • Within these reserves, the construction of the easement will pose the risk of introducing weed and pathogens into adjacent vegetation and habitat. This will be a focus in the preparation of the required BMP. • This interruption will not remove all biodiversity values within the easement, with canopy, mid-storey and ground-storey flora species able to grow and persist in the easement. However, the height of this vegetation will be a maximum of 4 m generally in accordance with Transgrid guidelines. Therefore, this easement will no longer support mature trees and hollow bearing trees. • While the Proposed Action transmission line easement is a new disruption to habitat connectivity, its width and nature of impact will not completely prevent connection of habitat for flora and fauna species in the region. • The Durridgere State Conservation Area will experience the introduction of approximately four kilometres length (approximately 60 m width) of interruption to habitat connectivity. • State Forest land will experience the introduction of approximately six kilometres length (approximately 60 m width) of interruption to habitat connectivity. • National Park Land will experience the introduction of approximately 1.2 km length (approximately 60 m width) of interruption to habitat connectivity. • Land owned by the Proponent on the south side of Cliffdale Road will experience the introduction of approximately 1.2 km (approximately 60 m width) of interruption to habitat connectivity.
<p>Northern connection corridors along main ridgelines within the Indicative Development Footprint – Wind Farm</p>	<ul style="list-style-type: none"> • The Wind Farm site supports several ridges, prominent in the landscape, that comprise treed patches of woodland and forests. These patches however are degraded in their condition, to varying degrees, due to being exposed to a long history of intensive (i.e., cropping) and passive (i.e., stock grazing) agricultural land use. • Three of these ridgelines connect directly with Coolah Tops National Park. • One ridgeline that forms the northern boundary of the Proposed Action Area also connects directly with Coolah Tops National Park, providing a habitat corridor north-west beyond the Proposed Action Area. Another internal ridgeline connects directly with this corridor.

Location of Habitat Connectivity	Summary of Interruption
	<ul style="list-style-type: none"> • One ridgeline provides a connection of habitat south-west beyond the Proposed Action Area. • The Proposed Action has the potential to impact movement patterns of migratory species due to the configuration of turbine arrays along multiple ridges within the Development Corridor. <p>The Proposed Action is not considered likely to introduce substantial interruptions to habitat connectivity in these corridors, as the habitat of the corridors is degraded due to historical and current land use. While the Proposed Action will involve the direct removal of habitat within the corridors, it is not considered likely to be of the extent where it would prevent the movement of fauna or movement of genetic flora material.</p>
Interruption of aerial habitat connectivity Indicative Development Footprint – Wind Farm	<ul style="list-style-type: none"> • The 185 wind turbines proposed as part of the Proposed Action will introduce an interruption of aerial habitat through the introduction of potential turbine strike and barotrauma. • The proposed wind turbines introduce an interruption to 23,235 m² of aerial habitat per turbine or 430 ha in total. • An assessment of this interruption and its associated potential risk of turbine strike for avifauna is presented below in Section 4.3.1. <p>Turbine spacing has been maximised in the Proposed Action to provide birds and bats greater opportunity to move through the landscape between the wind turbines, aiming to reduce bird and bat strike. In general, the turbines are a minimum of 500 metres apart, with the majority between 550 metres and 600 metres apart.</p>

Within areas of remnant vegetation and through the national park estate the easement will pose the risk of introducing weeds and pathogens. As noted in **Section 4.2.1**, the easement will not remove all biodiversity values with canopy, mid-storey and ground-storey flora species able to grow and persist in the easement. However, the height of this vegetation will be a maximum of four metres, generally in accordance with Transgrid guidelines. Therefore, this easement will no longer support mature trees and hollow bearing trees.

It is considered likely that the Proposed Action could potentially interrupt the connectivity of threatened species, but not threatened ecological communities, however these impacts are likely to be temporary in nature. Importantly, there will be no severing of connection as the extent of direct impacts of the Proposed Action will not introduce a permanent barrier that would permanently inhibit the movement of animals or plant material between patches of habitat. Temporary interruptions to the connectivity of threatened species habitat will be experienced during the construction phase of the Proposed Action, a scenario that will be far more experienced by threatened animal species than it will for threatened flora species. The latter which will barely experience the interruption. Threatened animals will be exposed to the interruptions in connection through the introduction of increased vehicle and machinery utilisation, increase noise and vibration as well as new permanent and temporary structures. As the widths of direct impacts of the Proposed Action are generally less than tens of metres wide, following completion of construction activities, fauna activity will readily recover. These are presented in **Figure 4.1**.

In the event that the CWO REZ transmission line currently proposed by EnergyCo becomes a viable connection option and is adopted by the Liverpool Range Wind Farm project, the External Transmission Line component would no longer be required. In which case, much of the information provided below regarding assessment of the Proposed Action's impacts on connectivity of habitat would no longer apply.

The Proposed Action is not considered likely to result in significant increased residual impacts to connectivity, as the habitat of the corridors is degraded due to historical and current land use and substantial impact mitigation strategies are proposed. While the Proposed Action will involve the direct removal of habitat within the corridors, it is not considered likely to be of the extent where it would prevent the movement of fauna or movement of genetic flora material. Further, given the general widths of proposed impacts by the Proposed Action are in the tens of metres, rather than hundreds of metres, impacts to connectivity will only be experienced temporarily during the construction phase of the Proposed Action. Following completion of this phase of the Proposed Action and removal of vehicular and machinery activity, reduction in human presence, removal of noise and vibration levels associated with the construction activities, it is considered highly likely that flora and fauna connectivity between areas of habitat will largely recover.

4.2.3 Weed and Pests

Weeds compete with native species and therefore the introduction and/or spread of weed species within the Indicative Development Footprints has the potential to degrade vegetation condition and decrease the value of extant vegetation to native species.

Due to the long history of intensive agricultural land use within the wind farm component of the Development Corridor and Indicative Development Footprints, a large number of weed species are already widespread in these areas. Therefore, it is unlikely that the Proposed Action will inadvertently introduce new weed species that are not already present in the area. Nonetheless, the Proponent will implement measures to minimise the risk of introduction of weed species not already present in the landscape.

Conversely, there is a risk that during construction weed species may be introduced to the intact vegetation along the Development Corridor – External Transmission Line. This vegetation remains relatively free of weed species, particularly high threat weeds. Therefore, the Proponent will carefully manage any movement of machinery, equipment, and materials to minimise the risk of foreign organic material being imported to intact vegetation proximate to the Indicative Development Footprint – External Transmission Line prior to undertaking construction works south of the Golden Highway.

Populations of feral fauna species such as goats, foxes, rabbits and cats can increase and quickly populate new areas as a result of disturbance. Clearing, thinning of vegetation and the creation of tracks have the ability to assist the establishment and spread of feral fauna species. However, goats, foxes and rabbits already occur throughout the Development Corridor and Indicative Development Footprints as a result of the historical land use. Of particular relevance for the Proposed Action is a large goat population that occurs across the majority of the wind farm component of the Development Corridor and Indicative Development Footprints. It is possible, if not likely, that this population could cause interruptions to construction work by direct interactions with works and also damage to materials. Alternatively, the construction works may deter the population out of the Development Corridor and Indicative Development Footprints and into surrounding areas which include the adjoining Coolah Tops National Park.

Generally, there will be no substantial change to impacts from weeds or feral animals, given that the Proposed Action is located within, and adjacent to, a landscape exposed to historical and current agricultural land uses. Mitigation measures implemented for the Proposed Action will further minimise the risk of any additional adverse impacts.

The indirect impacts associated with weed and feral animal encroachment that will result from the Proposed Action are generally considered to be consistent to those that were presented, discussed, and assessed as part of the original approval, including Biodiversity Assessments (NGH 2013a, 2013b) and Biodiversity Addendum Report (NGH 2017).

4.2.4 Dust

Air quality impacts have the theoretical potential to adversely impact native species during construction of the Proposed Action as a result of heavy vehicle movements, crushing and screening processes, concrete batching, use of mobile plant and equipment (such as loaders, excavators, generators, cranes) and potentially blasting. Potential impacts include dust covering adjacent vegetation thereby potentially reducing vegetation health and growth.

The Proposed Action will include implementation of mitigation measures to minimise the potential for adverse dust impacts during construction including the use of dust suppression watering as required and the implementation of erosion and sedimentation controls in line with existing approvals. With these controls in place, dust impacts on vegetation associated with construction and decommissioning activities are expected to be isolated to the immediate vicinity of the access tracks (i.e., within a few metres) and are not expected to result in material impacts outside of the Indicative Development Footprints.

4.2.5 Noise and Vibration

The construction period for the Proposed Action will include activities such as road construction, civil works, excavation, foundation construction, electrical infrastructure works, and turbine erection. These construction activities require processes which generate noise and/or vibration such as heavy vehicle movements, crushing and screening, concrete batching, use of mobile plant and equipment (such as loaders, excavators, generators, cranes) and potentially blasting, subject to site conditions.

A Predictive Noise Impact Assessment was undertaken by Sonus Pty Ltd (Sonus 2023) as part of assessment documentation required for Amendment 1 of the NSW Mod-1 Application. The noise assessment updated the noise levels predicted and approved as part of the Approved Action to account for the project changes included as part of the Proposed Action.

In NSW, construction noise is assessed with reference to the *Interim Construction Noise Guideline* (DECC, 2009). The Construction Noise Guideline provides an emphasis on implementing 'feasible' and 'reasonable' noise reduction measures and does not establish mandatory objective criteria. However, the Construction Noise Guideline does establish different 'management levels' based on the existing background noise levels. Additional road traffic generated during the construction period is assessed with reference to the *NSW Road Noise Policy* (DECCW 2011).

The Sonus assessment determined that separation distances between construction activities and sensitive receivers (i.e., non-associated residences, conservation areas) are no less than those previously assessed for the Approved Action and construction traffic generation would also be similar. The assessment therefore concluded that the Proposed Action would not result in an increased construction noise impact from that previously assessed and approved.

In relation to MNES, during construction, noise and vibration may have an indirect impact on wildlife through the disruption of nesting, roosting and foraging behaviour of fauna species and may reduce the occupancy of some areas of suitable habitat. However, any indirect impacts resulting from construction noise emissions are likely to be localised and temporary due to project staging and limits on construction hours and are not expected to be of any level of significance in relation to threatened species, populations and communities. Such indirect impacts can be adequately managed through the implementation of a detailed BMP that will be required to be prepared and finalised prior to construction.

4.2.6 Changes to Surface Water, Hydrology and Erosion

During the construction of the Proposed Action, soils would be subject to disturbance through vegetation removal, excavation works and stockpiling of materials which can potentially lead to sediments and/or pollutants mobilising in runoff and entering local waterways. In addition, the use of mobile mechanical equipment increases the risk of hydrocarbon spills and associated soil and water contamination. The construction of waterway crossings also has the potential to change local hydrological conditions.

NSW conditions of approval for the Approved Action will continue to be applicable to the Proposed Action and include the following measures to control and minimise any impacts on water resources:

- Wind turbine pads, ancillary infrastructure, access roads and any other land disturbances will have appropriate drainage and erosion and sediment controls designed, installed and maintained in accordance with *Managing Urban Stormwater – Soils and Construction Volume 1* (Landcom 2004) and *Managing Urban Stormwater – Soils and Construction Volume 2C Unsealed Roads* (DECC 2008), or their latest versions, to minimise erosion and control sediment generation.
- All waterway crossings will be constructed in accordance with:
 - *Controlled Activities – Guidelines for watercourse crossings on waterfront land* (DPE 2022).
 - *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge 2003), or its latest version.
- All dangerous or hazardous materials on site will be stored and handled in accordance with *AS1940-2004: The storage and handling of flammable and combustible liquids*, or its latest version.
- Concrete batching plants and substations will be suitably bunded.
- Any spills of hazardous materials or hydrocarbons will be minimised and cleaned as soon as possible after they occur.

With the implementation of appropriate control measures, minor alterations to surface water flow and quality may be experienced during construction and decommissioning, however these are likely to be localised and temporary for the period of construction within a particular sub-catchment. Any resultant impacts to MNES are not expected to be of any level of significance in relation to threatened species, populations and communities.

4.2.7 Groundwater Use at TWA Facility

As outlined in **Section 2.2.2**, the Proposed Action includes a TWA Facility to accommodate the peak construction workforce during the construction phase. A total capacity of approximately 600 rooms is proposed, which considers a construction peak workforce of approximately 550 and additional rooms for staff required to operate and maintain the TWA Facility. As an existing potable water supply is not available at the site, the TWA Facility will need to rely on alternate water supplies such as groundwater.

A letter requesting further information was provided to the Proponent by DCCEEW on 18 March 2024 in relation to the Proponent's request to vary the Referred Action under Section 156A of the EPBC Act (see **Section 1.5**). DCCEEW requested further information be included in the PER, regarding the potential impacts from groundwater extraction at the TWA Facility, and whether or not there could be potential groundwater drawdown within the area.

DCCEEW requested further information regarding:

1. Potential impacts of groundwater extraction on groundwater drawdown.
2. Potential impacts on nearby surface water (rivers and creeks) flows.
3. How and if, potential changes to surface water and groundwater (e.g. groundwater drawdown) could impact (directly or indirectly) threatened species and ecological communities.

A response to DCCEEW's request for further information is provided below.

4.2.7.1 Groundwater levels at TWA Facility

Recent groundwater drawdown and recovery testing conducted by ARDG (Works Approval 80WA001705) at the Proposed Action area from 11–15 March 2024 have confirmed the presence of a high yielding groundwater aquifer located within quartzose sandstone of the Middle Triassic-age Napperby Formation. The top of the aquifer was intercepted by drilling at a depth of approximately 61 m below ground level (bgl). The hydraulic head in the aquifer pushed the standing water level (SWL) in the bore to 50.37 m bgl (refer **Figure 4.2**) indicating the potentiometric water level associated with this groundwater source is approximately 50 m below ground level at this location.

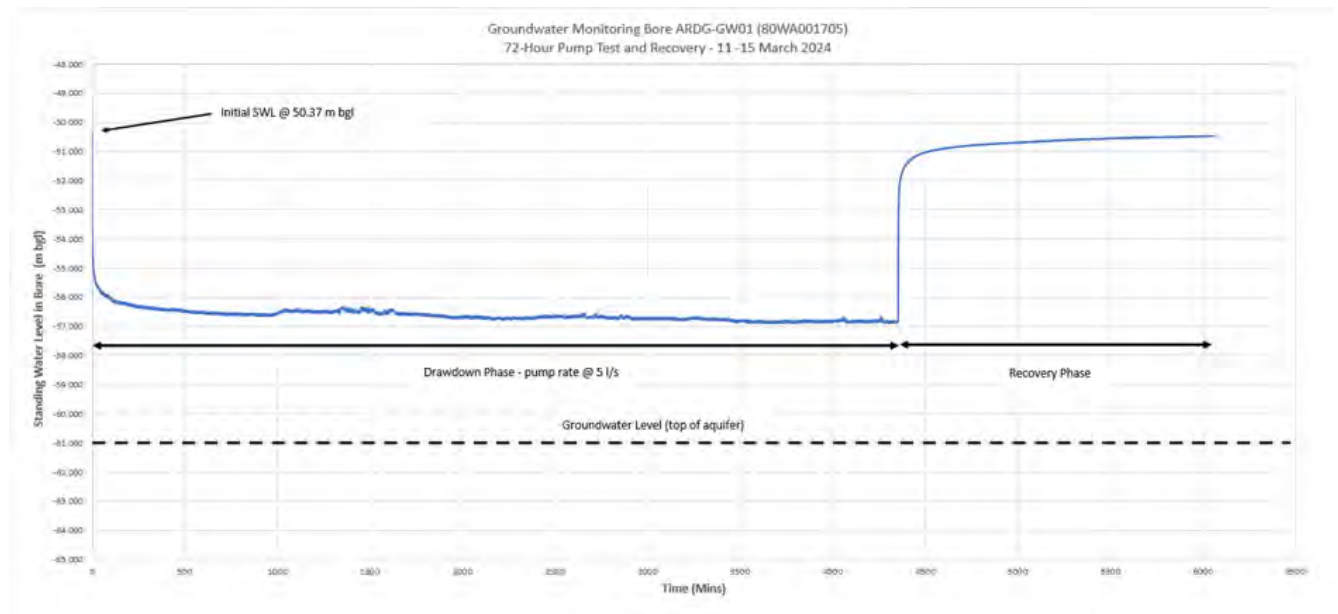


Figure 4.2 72 hour pump test and recovery groundwater bore at the TWA Facility

4.2.7.2 Groundwater yield and potential for drawdown

The expected water use requirements of the TWA Facility are as follows:

- TWA Facility Construction: approximately 2,000 litres / day (0.002 ML/day) for dust suppression and vehicle/equipment washdown).
- TWA Facility Operations: Peak usage of approximately 75 kilolitres / day (0.075 ML/day) for the TWA Facility at maximum capacity (approximately 600 people) for potable/domestic water use. Demand is generally expected to be lower than this as the number of staff accommodated will ramp up and ramp down in conjunction with the progress of construction activities.

Pump testing of the bore at a constant rate of 5 l/s over 72-hours (approximately 1.3 ML) dropped the standing water level in the bore by 6.53 m bgl (from 50.37 m to 56.9 m bgl (refer Figure 4.2), which is well above the top of the aquifer (61 m bgl). As the aquifer is confined below 61 m bgl at the point of extraction and the pump test did not result in water levels in the bore dropping below this height, there is no physical drawdown in the aquifer predicted from extraction at a 5l/s rate. At the completion of pump testing, ground water level recovery was effectively instantaneous, indicating very high recharge rates associated with a large groundwater resource. The effect on potentiometric water table in the vicinity of the bore during pumping is therefore considered to be extremely limited.

The extraction rate undertaken for the pump test (approximately 432 kilolitres per day) is significantly higher than the predicted peak water demand for the TWA facility (approximately 75 kilolitres today). This level of extraction would not need to be maintained on a permanent basis over the operational period of the TWA facility. Instead, only intermittent pumping would be needed to maintain adequate supply levels in storage tanks. This approach to pumping further limits the potential magnitude and impact of any localised drawdown effects associated with the reduced potentiometric head during pumping.

The assessment assumes full supply by groundwater bore but opportunities to supply demand through rainfall interception would reduce bore supply requirements.

All water extracted from the bore would require licensing under the NSW *Water Management Act 2000* (refer to **Section 9.2.7**) with limits of annual rates of extraction (approximately 27 ML) well within the calculated sustainable yield and currently available water allocation for this groundwater resource under the Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2020.

4.2.7.3 Potential impacts on Terrestrial Vegetation

As described in **Section 3.3.2**, the majority of the land within the Development Corridor – TWA Facility has been cropped for many years and does not support native vegetation, derived or otherwise. The designated no-go-area within the Development Corridor – TWA Facility that follows the existing waterway contains vegetation that is representative of Vegetation Zone 8 PCT 483 Grey Box x White Box grassy open woodland on basalt hills in the Merriwa region, Upper Hunter Valley Low Condition Derived Native Grassland. The grassland is poor quality. Patches of native vegetation, representative of the NSW Box Gum Woodland CEEC, are located in Proposed Action Area adjoining the travelling stock reserve and road reserve along Vinegaroy Road. The woodland in the travelling stock reserve is about 100 m to the west of the waterway near the SAP reducing to about 40 m to the west of the waterway downstream of the Proposed Action Area.

The depth to the potentiometric head of the water table (approximately 50 m bgl) being targeted for use for the TWA Facility, is well below the expected rooting depth of terrestrial vegetation in the immediate area and, even allowing for a zone of drawdown, would still be well below the expected rooting depth of riparian vegetation along nearby waterway, even allowing for the lower terrain at those locations (approximately 20 m below the collar height at the bore).

4.2.7.4 Surface-groundwater interaction

As described in **Section 4.2.7.1**, recent groundwater drilling tests have confirmed the groundwater aquifer at the TWA Facility site is located at a depth of approximately 61 m bgl. The Development Corridor – TWA Facility is intersected by an ephemeral waterway and another ephemeral waterway also forms the eastern boundary of the area. Figure 4.3 illustrates that the waterways in the vicinity of the TWA Facility site have relatively shallow channels (not deeply incised) with the lowest points at elevations within approximately 20 m of the bore collar elevation at the TWA Facility (i.e. approximately 30 m above the potentiometric head recorded at the bore for the target aquifer). Given the potentiometric head of the target aquifer is well below the base of the waterway, it is highly unlikely that there are any significant surface-groundwater interactions occurring with this groundwater source in the local area.

The proposed rate of extraction from the bore is unlikely to have any observable impact on more remote surface water systems that may be connected to this groundwater resource and the allowable rates of extraction mandated under the water sharing plan applicable to this groundwater resource are based on sustainable yield predictions and have had regard to the contributions of groundwater systems to surface flows. The extraction is subject to the Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources 2020 within the Sydney Basin Murray Darling Basin (MDB) Groundwater Source. The long-term average annual extraction limit for the Sydney Basin MDB Groundwater Source is 19,100 ML/year. The projected water demand for the TWA Facility is well within the available water allocations for this groundwater resource under the Water Sharing Plan.

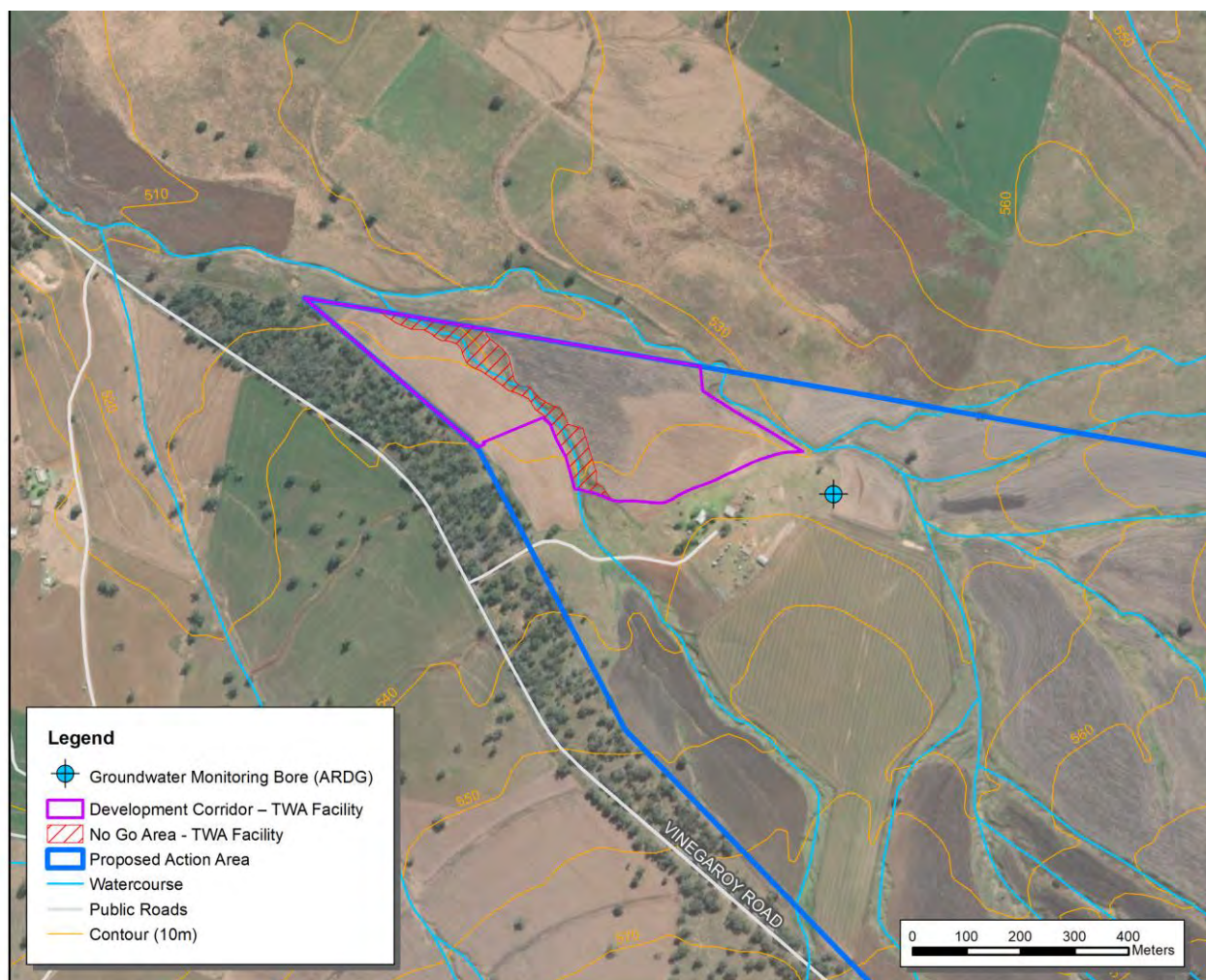


Figure 4.3 Location of groundwater monitoring bore at TWA Facility showing elevations of surrounding waterways (10 m contours)

The Proponent will obtain all required licences and permits for the establishment and use of a production bore at the TWA Facility from WaterNSW (refer to **Section 9.2.7**).

4.2.8 Vehicle Movements

Potential impacts to threatened fauna species (or fauna species that form part of a threatened ecological community) were assessed as prescribed impacts in the BDAR (Umwelt 2023a).

The Proposed Action will result in an increase of vehicle activity through construction of a network of internal access tracks, predominantly between turbine locations but also within the transmission line easement for servicing purposes. These internal access tracks are located on private properties and access will be restricted to landholders and the Proponent's employees and contractors. Internal access tracks will have enforced speed restrictions to adequately reduce the risk of interaction between animals and vehicles.

No new public roads will be constructed for the Proposed Action, however multiple sections of existing public roads will be upgraded. The upgrade works will be the responsibility of the Proponent but have been designed in consultation with BCS and relevant local Councils. The main public roads of relevance to the Proposed Action are Golden Highway, Vinegaroy Road, Ulan Road, Rotherwood Road, Turee Vale Road, Coolah Creek Road and State Forest Road.

Golden Highway, Vinegaroy Road and Ulan Road are part of the primary road network in the region and already support high vehicle volumes. Rotherwood Road, Turee Vale Road, Coolah Creek Road and State Forest Road currently support lower vehicle volumes that are largely limited to local residents' vehicles. During operations, traffic levels will be minor and will not materially increase current traffic levels, such that threatened species, populations and communities should be placed at increased risk. However, during construction and decommissioning, there will be a noticeable increase in traffic along the primary road network, with approximately 337 one-way vehicle movements per day during the peak construction period. Further information relating to the impacts of the Proposed Action on these public roads is provided in the Supplementary Traffic Impact Assessment prepared as part of the NSW Submissions Report and Amendment Report (Constructive Solutions 2023a) for Amendment 1 of the NSW Mod-1 Application.

Traffic movements associated with the construction workforce were assessed as part of the Approved Project, however the proposed TWA Facility changes the assumptions made in the assessment based on number of movements and transport routes utilised, particularly the number and type of turning movements and the required turn treatments at relevant intersections along Vinegaroy Road. A Traffic Impact Assessment (TIA) for the TWA Facility has been prepared by Constructive Solutions Pty Ltd to assess the traffic and transport impacts associated with the TWA Facility (Constructive Solutions 2023b) for Amendment 2 of the NSW Mod-1 Application. Potential traffic and transport impacts can be appropriately managed and mitigated through appropriate intersection design and compliance with the Traffic Management Plan (TMP) as required under the existing NSW Development Consent.

As a result of increased construction and decommissioning traffic movements, Golden Highway, Vinegaroy Road, Ulan Road, Rotherwood Road, Turee Vale Road, Coolah Creek Road and State Forest Road are all identified as potential fauna impact locations (refer to **Figure 4.1**). The following MNES have been identified as being at risk of vehicle strike:

- glossy black-cockatoo
- spotted-tailed quoll
- koala
- large-eared pied bat.

Due to the disturbed condition of the Proposed Action Area, and the fact that the potential impact locations are all existing public roads that will not have a change in speed limit as a result of the Proposed Action, it is unlikely that any of these MNES would be adversely impacted by the increase in vehicle movements.

Traffic movements associated with adjacent major roads will increase during the construction phase with additional traffic generation. This traffic will be subject to a Construction Traffic Management Plan. On site, traffic controls including speed limits will be put in place to minimise risk. These construction phase controls, particularly the onsite speed limits will assist in minimising risk.

4.3 Operational and Maintenance Impacts

Operational activities for the Proposed Action are described in **Section 2.4.2** for the TWA Facility and the wind farm. Impacts of operation of the TWA Facility have been considered in **Section 4.2**, as they are associated with construction of the Proposed Action.

The main operational impacts of the Proposed Action are associated with the operating wind turbines including risk of collision for birds and bats (see **Section 4.3.1**) and noise impacts (see **Section 4.3.2**). Impacts associated with maintenance activities including vehicle movements and spills risks for the wind farm (see **Section 4.3.3**). The OEMP would contain specific monitoring program and reporting requirements.

Once operational, wind farm projects typically have minimal impact on the overall hydrologic regime of receiving waterways and catchments. The area of impervious surfaces in relation to the turbine and transmission network for the Proposed Action are not likely to result in a noticeable increase of runoff from the site and as a result the impacts to threatened species, populations and communities are likely to be negligible.

Air emissions during the operational phase of the Proposed Action will be negligible and are therefore not expected to have any level of significance in relation to threatened species, populations and communities.

4.3.1 Collision Risk

Threatened and migratory species and other species groups of concern (e.g. microbats, raptors and waterfowl) may be impacted by operation of the wind farm through direct collision with turbine towers and blades/rotors but also through flying through turbulence associated with the rotor. Risk of collision exists when birds/bats are in flight within the rotor-swept area.

The transmission line may also present a collision risk for avifauna particularly where the transmission lines are bordered by remnant woodland and forest. Species that are susceptible to injury include the white-throated needletail. As with other recent approved BBAMPs, the Proposed Action is likely to include surveys along and in proximity to the transmission line to reasonably assess the direct impacts of this infrastructure through the operational phase. Specific mitigation measures are also being considered as to how such impacts may be managed should a particular impact trigger occur with relation to transmission line strike. These may include, but are not limited to the use of transmission line flagging, markers...etc.

In keeping with the NSW BAM (DPIE 2020a) a detailed prescribed impact assessment has been prepared to consider the potential impacts associated with turbine strike and barotrauma on protected bird and bat species. This assessment has been prepared in accordance with Sections 6.1.5 and 8.3.5 of the BAM (DPIE 2020a). The prescribed impact assessment is provided in full in Appendix G of the BDAR (Umwelt 2023a) in Appendix D and a summary is provided below.

The BAM identifies impacts associated with a wind farm to the flyways and migration routes of bird and bat species as 'prescribed impacts' that require specific assessment in accordance with Section 6 of the BAM (DPIE 2020a). The BDAR (Umwelt 2023a) had regard to the impacts to species that may use the Indicative Development Footprint – Wind Farm as a flyway or migration route, including:

- a. resident threatened aerial species
- b. resident raptor species, and
- c. nomadic and migratory species that are likely to fly over the Indicative Development Footprint – Wind Farm.

The turbine parameters used for this assessment are based on the Vestas V172 7.2 MW turbine (the preferred turbine identified by the Proponent) for the purpose of interpreting observations and species flight behaviour in relation to collision risk associated with the Proposed Action. The rotor swept area (RSA) that is the area swept by the rotating blades during turbine operation, is between 40 metres above ground level (agl) (i.e., minimum ground clearance) and 215 metres agl (i.e., maximum blade tip height), equating to an area of approximately 23,235 m² per turbine or approximately 430 ha of total aerial space for the 185 proposed turbines. This presents a reduction of 11,401 m² per turbine (33 per cent) or 332 hectares (44 per cent) of total aerial space compared to the Referred Action. The variation in proportion of difference in the aerial impact area is a result of the per turbine measure being in square metres while the total aerial impact space is measured in hectares.

The 185 wind turbines proposed as part of the Proposed Action will introduce an interruption of aerial habitat through the introduction of potential turbine strike and barotrauma. The nature of impacts associated to aerial fauna species from wind energy projects include direct turbine blade strike and barotrauma, the latter being injury caused by a sudden or substantial change in air pressure. While literature exists as to the nature of such impacts, the rate of occurrence and likelihood of impact is very difficult to accurately determine. A contributing factor to this difficulty is the range of environmental variables that interact with such impacts, variables which can differ within a single action at any given time as well as varying between different actions. Additionally, the wind farm industry is currently dealing with challenges relating to vast inconsistencies with the way in which baseline and ongoing monitoring surveys are being undertaken, including how and what data is being collected. Such inconsistencies either prevent or inhibit comparative analysis. State and Federal guidelines are currently being prepared to address these challenges.

Candidate species considered as part of this analysis were selected based on recorded flight data collected during bird and bat utilisation surveys (BBUS) between 2012 and 2015 by NGH and between 2020 and 2023 by Umwelt at the Proposed Action Area (further details on surveys is provided in **Section 5.7.1**). The assessment considered 29 species, comprising 18 threatened species (13 bird and five bat species) and 11 non-threatened species (nine bird and two bat species). This assessment was not limited to listed MNES or migratory species. Of the 29 species considered, 22 species (16 birds and six bat species) were considered to have a reasonable potential of being impacted by turbine strike, based on understood flight behaviour and/or record of mortality at wind projects in NSW.

The risk assessment approach is described in detail in Appendix G of the BDAR (Umwelt 2023a) in **Appendix D** and summarised in **Section 5.7**. For the 22 assessed species, four (4) species considered a High risk, 15 species considered to be at Moderate risk and the remaining three (3) species were considered a Minor risk of being impacted by turbine strike and barotrauma as a result of the Proposed Action.

No bird or bat species were considered to result in an extreme risk rating as a result for the Proposed Action.

Several MNES were identified as having a ‘High’ or ‘Moderate’ risk rating (Umwelt 2023a) (refer to **Table 4.3**). The overall risk rating of High for swift parrot and regent honeyeater reflects the very small remaining population sizes, coupled with each species’ migratory nature, the extent of habitat fragmentation in the local area and region and the species’ critically endangered status. The overall risk rating of High for white-throated needletail largely reflects the High likelihood of collision of birds in the Proposed Action Area given their known susceptibility to blade strike at other wind farms in Australia. The potential operational impacts and risk ratings have been considered in the impact assessments for these individual MNES in **Section 5.0**.

Table 4.3 MNES Turbine Strike Risk Rating

MNES	Likelihood	Consequence	Risk Rating
white-throated needletail <i>Hirundapus caudacutus</i>	High	Moderate	High
regent honeyeater <i>Anthochaera phrygia</i>	Moderate	High	High
swift parrot <i>Lathamus discolor</i>	Moderate	High	High
large-eared pied bat <i>Chalinolobus dwyeri</i>	Moderate	Moderate	Moderate
Corben’s long-eared bat <i>Nyctophilus corbeni</i>	Moderate	Moderate	Moderate
painted honeyeater <i>Grantiella picta</i>	Moderate	Moderate	Moderate
superb parrot <i>Polytelis swainsonii</i>	Moderate	Moderate	Moderate

The nature of impacts associated to aerial fauna species from wind energy projects include direct turbine blade strike and barotrauma, the latter being injury caused by a sudden or substantial change in air pressure. While literature exists as to the nature of such impacts, the rate of occurrence and likelihood of impact is very difficult to accurately determine. A contributing factor to this difficulty is the range of environmental variables (including minimum, maximum and average wind speeds, drought conditions, frequency and intensity of storm cells, etc.) that interact with such impacts, variables which can differ within a single project at any given time as well as varying between different projects. Additionally, the wind farm industry is currently dealing with challenges relating to vast inconsistencies with the way in which baseline and ongoing monitoring surveys are being undertaken, including how and what data is being collected. Such inconsistencies either prevent or inhibit comparative analysis. State and Federal guidelines are currently being prepared to address these challenges.

The preparation (i.e., completion of baseline monitoring) and subsequent implementation (i.e., ongoing monitoring) of the Bird and Bat Adaptive Management Plan (BBAMP) for the Proposed Action will be essential in providing a framework to measure impacts on aerial fauna species by the Proposed Action. Furthermore, this plan will develop trigger levels and mitigation measures designed to manage such impacts through the operational phase of the Proposed Action. An outline of the BBAMP is provided in **Section 6.3.3**.

There is currently no information on the degree to which wind turbines disturb aerial species in Australia. For this reason, the likely zone of disturbance around wind turbines is unknown. In the absence of such information being published or formally recognised, Umwelt has buffered each of the proposed 185 wind turbines by 170 m to indicate a potential likely zone of disturbance. This zone of disturbance is shown in Figure 11.1 of Appendix G in the BDAR (Umwelt 2023a) in **Appendix D**. This 170 m buffer considers the proposed blade length of 85 metres, plus an additional 85 m and has been applied following consideration of NSW BCSs submission on the BDAR (Umwelt 2022a) exhibited in September 2022 as part of the NSW Mod-1 Application. This represents a total 'likely zone of disturbance' of 96,211 m² per turbine or approximately 1,780 ha across the Proposed Action. This area represents the area of aerial indirect impact zone. It is acknowledged that this represents a potential likely zone of disturbance in plain view, i.e., view of the impact area as projected on a horizontal plane.

Avoidance behaviour is considered as a behavioural change by a particular species whereby either specific habitat, locality or wider region is avoided. The potential indirect impacts associated with such avoidance behaviour may have on migratory or partly migratory species is difficult to predict given the lack of relevant information available. Assessment against such criterion will be only possible through the preparation (i.e., completion of baseline monitoring) and subsequent implementation (i.e., ongoing monitoring) of the BBAMP for the Proposed Action.

Species for which a high proportion of their population exhibits migratory behaviour (such as white-throated needletail, superb parrot, regent honeyeater and swift parrot) may be more likely to be affected by impacts (direct and indirect) than sedentary species though the magnitude and nature of such impacts on each is unknown. Mitigation measures prepared as part of the BBAMP will aim to consider potential impacts of avoidance behaviour.

4.3.2 Noise and Vibration

Once operational, noise emissions from the Proposed Action will be limited to those associated with the operation of the wind turbines and ancillary infrastructure such as substations. In NSW, the *Wind Energy: Noise Assessment Bulletin* (the Bulletin) (DPE 2016) is referenced for the assessment of operational noise from wind turbine generators. The criteria in the Bulletin have been developed to address potential noise impacts on the amenity of residents and other relevant receivers in the vicinity of a proposed wind energy project.

The Sonus assessment predicted noise levels at nearby receivers from the concurrent operation of all 185 proposed wind turbines and associated ancillary infrastructure at a range of wind speeds. Predicted noise levels were all below project noise criteria determined in accordance with the Bulletin. Consideration was also given to cumulative noise impacts in conjunction with the operation of the proposed Valley of the Winds project (refer to **Section 1.6**). The assessment determined that there are no residences that will be exposed to noise levels of 30 dB(A) or higher from both projects simultaneously and therefore no cumulative noise impacts were predicted.

The Sonus assessment also included an assessment of noise levels within Coolah Tops National Park and predicted that noise levels of less than 35 dB(A) would be achieved at all locations inside the national park during operation of the Proposed Action.

Based on the results of noise assessments, operational noise emissions are not expected to have any level of significance in relation to threatened species, populations and communities.

4.3.3 Maintenance

During the operations phase, maintenance will be required of wind turbines, transmission lines, and related infrastructure established for the Proposed Action. No additional or repeated impacts on MNES are expected to result from maintenance activities during the operations phase.

Vehicle movements for maintenance will be minimal in the operations phase and therefore dust, noise, vibration and weed impacts from vehicle movements are not expected to have any level of significance in relation to threatened species, populations and communities.

4.4 Decommissioning Impacts

As highlighted in **Section 2.4.3**, the Proposed Action is expected to have a commercial life of approximately 30 years. Decommissioning of the Proposed Action would involve reinstating temporary construction compound/laydown areas to facilitate decommissioning of the wind farm above ground structures. The areas to be impacted during decommissioning would not support native vegetation and it is anticipated that there will be no direct impacts on potential habitat for MNES.

Indirect impacts of decommissioning would include noise and vibration, vehicle movements, dust and weed and pests. These impacts would be similar to those described in **Section 4.2** however the duration and intensity will be of lesser magnitude than operational impacts.

No additional adverse impacts on habitat fragmentation, connectivity and edge effects are expected to occur in the decommissioning phase. Revegetation activities associated with decommissioning (see **Section 7.0**) are expected to reduce residual impacts on these aspects over the longer term.

The approach to rehabilitation and decommissioning is further discussed in **Section 7.3**.

4.5 Cumulative Impacts

4.5.1 Cumulative Impacts with the Temporary Quarry

As mentioned above in **Section 1.6.1**, the Proponent has identified an opportunity to establish a temporary project-specific hard rock quarry (Temporary Quarry) for the sole purpose of producing and supplying quarry products to support the construction of the Proposed Action. The Temporary Quarry has a separate Proponent from the Proposed Action and is subject to a separate assessment process under the EPBC Act. Other than this cumulative impact discussion, the Temporary Quarry is therefore not considered in detail in this PER.

A biodiversity assessment is currently being completed for the proposed Temporary Quarry in accordance with the BAM. Additional targeted flora and fauna surveys are being undertaken through 2024, however in the absence of these surveys four species have been assumed present, being bluegrass (*Dichanthium setosum*), koala (*Phascolarctos cinereus*), striped legless-lizard (*Delma impar*) and pink-tailed legless-lizard (*Aprasia parapulchella*). All four of which are MNES.

In addition to the direct impacts proposed by the Proposed Action (as presented throughout this PER), the Temporary Quarry may impact the following MNES:

- Commonwealth Box Gum Woodland CEEC (2.9 ha)
 - the total cumulative impact on Commonwealth Box Gum Woodland CEEC from the Proposed Action and Temporary Quarry is 34.6 ha.
- bluegrass (18.2 ha)
 - assumed presence, with additional targeted surveys committed to in early 2024
 - the total cumulative impact on bluegrass from the Proposed Action and Temporary Quarry is the 18.2 ha of the Temporary Quarry.
- koala (18.2ha)
 - assumed presence, with additional targeted surveys committed to in early 2024
 - the total cumulative impact on koala from the Proposed Action and Temporary Quarry is 738.8 ha.
- striped legless-lizard (18.2ha)
 - assumed presence, with additional targeted surveys committed to in late 2024
 - the total cumulative impact on striped legless-lizard from the Proposed Action and Temporary Quarry is 18.2ha of the Temporary Quarry.
- pink-tailed legless-lizard (18.2 ha)
 - assumed presence, with additional targeted surveys committed to in late 2024
 - the total cumulative impact on pink-tailed legless-lizard from the Proposed Action and Temporary Quarry is 18.2ha of the Temporary Quarry.

Given its proximity to the Proposed Action, sourcing of construction materials from the Temporary Quarry would significantly reduce traffic on the local and regional road network for the construction of the Proposed Action. This would result in substantial reduction in adverse cumulative impacts of the Proposed Action and tangible benefits for the local and broader community by:

- Reducing construction traffic noise amenity impacts for residents and road users, in particular those along the construction traffic haul route.
- Improving road safety (substantially reducing heavy/light vehicle interactions).
- Reducing heavy vehicle wear and potential damage to the local and regional road network by significantly reducing total distance travelled on the local and regional road network.
- Reducing the risk of collisions of vehicles with wildlife across the road network.

4.5.2 Cumulative Impacts with Other Wind Farm Projects

The management of cumulative impacts is currently a key issue for renewable energy projects, given the scale and rate of change that is occurring both within the CWO REZ and more broadly across NSW. In this regard, the Proponent has committed to collaborate where possible with other candidate foundation generators (CFG) and EnergyCo to manage the potential impacts of concurring developments.

While the Approved Action was one of the first wind farms to be approved in the locality, since that time, and due primarily to the designation of the CWO REZ, an increasing number of renewable energy projects and associated infrastructure projects are currently being progressed. As such, there is now potential for additional cumulative impacts due to interactions between projects. To date, however, there are no approved or constructed wind farm projects within 50 km of the Proposed Action. The nearest proposed wind farm is the Valley of the Winds (VOTW) project, being developed by ACEN Australia, located approximately 13 km west of the Proposed Action. The VOTW project is still progressing through its development application process and as part of that process will need to consider cumulative impacts associated with the construction of the Proposed Action.

Due to the nature of wind farm projects, most of the potential cumulative impacts are associated with the construction phase (particularly traffic, social and biodiversity impacts), operational phase (biodiversity impacts) with some visual impacts that may also be cumulative in nature. Many of the other potential impacts associated with the operations phase of wind farm projects are generally limited, due to physical separation of the projects, reduced vehicle movements, and minimal works required during this phase.

In NSW the *Cumulative Impact Assessment (CIA) Guidelines for State Significant Projects* (DPE 2022c) require consideration of a project together with the impacts of other relevant future and existing projects in order to determine potential cumulative impacts. The *NSW Wind Energy Guideline* (DPE 2016a) also identifies the requirement to address cumulative impacts in relation to any other proposed, approved or operating wind energy projects in the vicinity particularly with regard to landscape, noise, biodiversity and traffic impacts.

As part of the cumulative impact assessment process a review of other projects (existing and proposed renewable projects and other major developments) within the region was undertaken (refer to **Table 4.4**). Projects are listed according to their development status (in planning, response to submissions, approved, under construction, operational) to assist in identifying where cumulative impacts may be experienced with projects that are likely to overlap/correspond with the timing of the Proposed Action. While there are many other projects currently taking place or undergoing planning assessment within the vicinity of the Proposed Action Area due to its location within the CWO REZ, some were excluded from further cumulative assessment due to either distance or timing (i.e., the low likelihood of overlap of construction periods) based on the available information at the time of writing.

For some technical matters, where the Proposed Action will only result in minor impacts that can be effectively managed using standard management techniques and design features (e.g., water/soils/dust) and where impact envelopes are contained within the Proposed Action Area (e.g., hazard and risk), the Proposed Action is not considered to materially contribute to potential cumulative impacts.

Table 4.4 Cumulative Impact Assessment

Project	Detail	Status	Distance from Proposed Action	Potential Cumulative Impacts
Barneys Reef Wind Farm	CFG 440 MW wind farm 340 peak construction workforce Construction to commence in 2025 for 28 months	EPBC Act controlled action (bilateral agreement applies) NSW SSD – EIS in preparation	50 km Heading 211.70°	Potential cumulative traffic, biodiversity, visual and social impacts due to overlapping construction timeframes and proximity of projects
Tallawang Solar Farm	CFG 500 MW solar farm with battery storage 580 peak construction workforce Construction to commence in 2024	EPBC Act controlled action, in assessment phase NSW SSD – (bilateral agreement applies) assessment in submissions phase	78.5 km Heading 251°	Potential cumulative traffic, biodiversity and social impacts due to overlapping construction timeframes and proximity of projects
Birriwa Solar and Battery Project	CFG 600 MW solar farm with battery storage 360 peak construction workforce Construction to commence in 2024 for 28 months	NSW SSD – in assessment phase following submission of submissions report	46 km Heading 220°	Cumulative impacts unlikely due to distance from Proposed Action
Stubbo Solar Farm	CFG 400 MW solar farm 400 peak construction workforce Construction commenced in 2023	Approved Currently under construction Not a controlled action.	55 km Heading 205.25°	Cumulative impacts unlikely due to distance from Proposed Action and unlikely overlap of construction timeframes
Valley of the Winds Wind Farm	CFG 800 MW wind farm 400 peak construction workforce	EPBC Act controlled action (bilateral agreement applies) NSW SSD – in assessment phase following submission of the submissions report	22 km Heading 225	Potential cumulative traffic, biodiversity, visual and social impacts due to overlapping construction timeframes and proximity of projects. Closest to the Proposed Action.

Project	Detail	Status	Distance from Proposed Action	Potential Cumulative Impacts
Cobbora Solar Farm	CFG 700 MW solar farm 700 peak construction workforce	EPBC Act controlled action (bilateral agreement applies) NSW SSD – EIS in preparation	68 km Heading 231.25°	Cumulative impacts unlikely due to distance from Proposed Action and unlikely overlap of construction timeframes
Dapper Solar Farm	CFG 300 MW solar farm 350 peak construction workforce Construction to commence in 2025	NSW SSD – EIS in preparation	72 km Heading 232°	Cumulative impacts unlikely due to distance from Proposed Action and unlikely overlap of construction timeframes
Orana Wind Farm	CFG 700 MW wind farm 250 construction workforce Construction to commence 2025/26	EIS in preparation	60 km Heading 46.5°	Cumulative traffic, biodiversity and social impacts are likely given overlapping construction timeframes and proximity of projects
Sandy Creek Solar Farm	CFG 750 MW solar farm 700 peak construction workforce	EIS in preparation	70 km Heading 229°	Cumulative impacts unlikely due to distance from Proposed Action and unlikely overlap of construction timeframes
Spicers Creek Wind Farm	CFG 700 MW wind farm 117 wind turbines 330 construction workforce	NSW assessment in assessment phase following submissions	71 km Heading 239.21°	Cumulative impacts unlikely due to distance from Proposed Action
CWO REZ Transmission Line Project	Critical State Significant Infrastructure 1,800 peak construction workforce Construction to commence in late 2025	NSW assessment in submissions phase	70 km Heading 169.31°	Potential cumulative traffic, biodiversity, visual and social impacts due to overlapping construction timeframes and proximity of projects.

While cumulative impacts relating to the Proposed Action and proposed Valley of the Winds Wind Farm are considered possible, they are not considered to pose a threat to localised populations of avifauna. The extent of these cumulative impacts is likely to be consistent with such impacts of other closely located operational wind projects in NSW, such as:

- Bango Wind Farm and Rye Park Wind Farm.
- Capital Wind Farm and Woodlawn Wind Farm.
- Collector Wind Farm and Cullerin Range Wind Farm.
- Gunning Wind Farm, Gullen Range Wind Farm, Biala Wind Farm and Crookwell Wind Farm.
- Sapphire Wind Farm and White Rock Wind Farm.

As outlined in **Table 4.4**, the key potential cumulative adverse impacts associated with the Proposed Action relate to:

- Cumulative social and economic impacts including accommodation shortages and impacts on local community and support services, focussed during the construction phase of the Proposed Action.
- Traffic impacts, with the cumulative impact focus primarily on the state road network including the Golden Highway and the broader transport route to the site, including for OSOM vehicles (focussed in the construction phase of the Proposed Action).
- Cumulative visual impacts of the Proposed Action combined with other projects in the viewshed, particularly wind and transmission line projects.
- Cumulative biodiversity impacts.

The cumulative impacts identified for the Proposed Action have been further addressed in the relevant updated specialist assessments and the key findings are summarised in **Table 4.5**. It should be noted that cumulative impacts to MNES are discussed in further detail in **Section 5.0**.

Table 4.5 Cumulative Impact Summary

Key Cumulative Impacts	Key Mitigation Measures
<p>Social</p> <p>The Social Impact Management Overview (SIMO) prepared as part of the documentation for the NSW submissions phase (Amendment 1 of NSW Mod-1 Application) assessed cumulative impacts that may result from interaction between the Proposed Action and surrounding developments (either operational, under construction or in planning).</p> <p>Key potential cumulative impacts identified were:</p> <ul style="list-style-type: none"> • adverse impacts on housing availability and access to services due to overlapping construction time frames and proximity between projects • positive impacts on economic benefits and shared employment opportunities. 	<p>The key mitigation strategies identified in the SIMO included:</p> <ul style="list-style-type: none"> • environmental management plans • noise and visual impact mitigation strategies • social management plans including: <ul style="list-style-type: none"> ○ Community and Stakeholder Engagement Plan ○ Industry and Aboriginal Participation Plan ○ Accommodation and Employment Framework ○ Traffic Management Plan ○ Benefit Sharing Plan ○ Complaints Register ○ Complaints Management Plan.

Key Cumulative Impacts	Key Mitigation Measures
<p>Traffic</p> <p>Local roads – cumulative traffic impacts are not expected as no other projects are proposed to use the same local roads as the Proposed Action.</p> <p>State Roads – OSOM vehicle movements between the Port of Newcastle and the CWO REZ have been acknowledged as a source of potential cumulative impact by EnergyCo and TfNSW and are now excluded from the Proposed Action.</p>	<ul style="list-style-type: none"> • EnergyCo and TfNSW have identified all required upgrades to the state road network between the Port of Newcastle and the CWO REZ to facilitate OSOM movements. • All required road upgrade works will be planned and delivered by TfNSW. • OSOM movements and their escort requirements will be coordinated by EnergyCo and TfNSW to optimise efficiency and minimise disruptions to local traffic.
<p>Visual</p> <p>The Visual Impact Assessment assessed the cumulative visual impacts associated with the Valley of the Winds project (13 km to the west of the Proposed Action). 13 non-associated dwellings have been identified within 8,000 m of both projects and of these:</p> <ul style="list-style-type: none"> • nine will have turbines within up to two 60-degree sectors, which is deemed acceptable, and • four will have turbines within up to three 60-degree sectors however intervening vegetation and structures are likely to reduce this. <p>Assessment of views from Coolah township found that due to existing built form and vegetation, there would be limited opportunities to view the two projects concurrently.</p>	<p>The key mitigation strategies include:</p> <p>For non-associated dwellings up to 4,250 m from the nearest turbine:</p> <ul style="list-style-type: none"> • Screen planting (where little to no intervening vegetation or structures currently exist) and supplementary planting (where some intervening vegetation or structures currently exist) will be implemented in consultation with landowners. <p>For transmission lines:</p> <ul style="list-style-type: none"> • Use of subtle colours and a low reflectivity surface treatment, where practical, to ensure that glint is minimised. • Micro-site transmission line wherever possible within the Development Corridor to reduce visibility from surrounding areas and to minimise vegetation loss. <p>For internal access tracks:</p> <ul style="list-style-type: none"> • Where possible, utilise or upgrade existing roads, trails or tracks to reduce the need for new roads. • Consider downsizing roads or restoring roads to existing condition following construction where agreed with relevant road authority. • Minimise cut and fill and avoid the loss of vegetation. • Utilise local materials where possible and practical to ensure appearance is in keeping with the surrounding character. • Implement progressive rehabilitation of temporarily disturbed areas. <p>For permanent ancillary structures that are highly visible from a public road or non-associated dwellings:</p> <ul style="list-style-type: none"> • Avoidance of unnecessary signage, logos and lighting (in recognition of the Proposed Action’s location within the Dark Sky Region of NSW). • Design buildings to be sympathetic to existing architectural elements in the landscape. • Minimise cut and fill and loss of existing vegetation throughout the construction process.

Key Cumulative Impacts	Key Mitigation Measures
	<ul style="list-style-type: none"> • For buildings, use of a recessive colour palette which blends into the existing landscape. • Use of boundary screen planting.
<p>Biodiversity</p> <p>Cumulative biodiversity impacts are likely to arise where multiple projects result in clearing of the same vegetation communities as the Proposed Action, or where the same threatened species are impacted.</p>	<p>The Proposed Action has minimised its contribution to cumulative biodiversity impacts through avoiding and minimising the area of required clearing of native vegetation through consideration of project alternatives and refinements in the design process and through the planned implementation of management and mitigation measures during construction, operations and decommissioning phases.</p> <p>The Proposed Action will also provide biodiversity offsets in accordance with the NSW BOS for all residual impacts to biodiversity. This scheme, which applies to the Proposed Action and all of the other State Significant projects in the region, is designed to ensure that there is no net loss to biodiversity in NSW. The offsets policy therefore addresses cumulative biodiversity impacts.</p> <p>The Proposed Action has identified additional mitigation measures to minimise SAI including conservation of additional areas of Box Gum Woodland CEEC offsite at an additional BSA site (refer to Section 6.2.2).</p> <p>Cumulative impacts are more likely to be felt by nomadic or migratory populations within the CWO REZ, given the potential for them to pass through multiple project turbine layouts. It is impractical to predict and manage given the large spatial range of some species (e.g., swift parrot and white-throated needletail). The extent to which these cumulative impacts are realized is not possible to assesses or determine in the absence of all projects being publicly available.</p>

5.0 Significant Impact Assessment

5.1 Guidance Relevant to the Impact Assessment

In addition to the PER Guidelines for the Proposed Action (refer to **Appendix A**), the statutory requirements of the EPBC Act, the MNES specific guidelines and policy statements listed in **Section 3.5** to **Section 3.8**, the following guidance has been considered in assessing the significance of potential impacts to MNES identified as requiring assessment (refer to **Section 5.2**).

5.1.1 Significant Impact Guidelines

The Significant Impact Guidelines for MNES (DoE 2013) provide overarching guidance on determining whether an action is likely to have significant impacts on a MNES. The definitions and concepts as outlined in the Significant Impact Guidelines 1.1 (DoE 2013) that have been applied in these assessments are summarised in **Table 5.1**.

Table 5.1 Key Concepts in the Significant Impact Guidelines (DoE 2013)

Concept	Definition
Significant impact	<p>A significant impact is an impact which is important, notable, or of consequence, having regard to its context or intensity.</p> <p>A significant impact is likely if there is a real or not remote chance or possibility. In determining this the following matters are considered:</p> <ul style="list-style-type: none"> • The sensitivity of the environment which will be impacted. • The timing, duration and frequency of the action and its impacts. • All on-site and off-site impacts. • The total impact which can be attributed to the action over the entire geographic area affected and over time. • Existing levels of impact from other sources. • The degree of confidence with which the impact of the action are known and understood.
A population of an endangered or critically endangered species	<p>A population of a species is an occurrence of the species in a particular area. Occurrences of the species are not limited to:</p> <ul style="list-style-type: none"> • A geographically distinct regional population, or collection of local populations, or • A population, or collection of local populations, that occurs within a particular bioregion.
An important population of a vulnerable species	<p>In the case of a vulnerable species, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:</p> <ul style="list-style-type: none"> • Key source populations either for breeding or dispersal; or • Populations that are necessary for maintaining genetic diversity, and/or • Populations that are near the limit of the species range.

Concept	Definition
Important habitat for migratory species	<p>An area of ‘important habitat’ for a migratory species is:</p> <ul style="list-style-type: none"> • 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.
Population of a migratory species	<p>The entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries including Australia.</p>
Habitat critical to the survival of a species or ecological community	<p>Habitat critical to the survival of a species or ecological community refers to areas that are necessary:</p> <ul style="list-style-type: none"> • for activities such as foraging, breeding, roosting, or dispersal • for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators) • to maintain genetic diversity and long term evolutionary development, or • for the reintroduction of populations or recovery of the species or ecological community. <p>Such habitat may be but is not limited to:</p> <ul style="list-style-type: none"> • habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or • habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.
Register of Critical Habitat	<p>Section 207A of the EPBC Act provides for a register of critical habitat including the location and extent information based on up to date scientific information available to the Threatened Species Scientific Committee and the Minister. At the time of preparation of the PER there are only five areas of critical habitat listed in the register. None of the threatened species and ecological communities assessed in this PER are included in the register of critical habitat.</p>

5.1.2 International Obligations

The PER guidelines require, justification, with supporting evidence, how the proposed action will not be inconsistent with:

- Australia’s obligations under the Biodiversity Convention, the Convention on Conservation of Nature in the South Pacific (Apia Convention), and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
- A recovery plan or threat abatement plan.

The following discusses Australia's obligations under these international agreements and how the proposed action will not be inconsistent with these obligations.

5.1.2.1 CITES

The EPBC Act regulates movements of animals, plants and products to and from Australia. The EPBC Act helps to protect the environment from risks associated with the international movement of wildlife. It is how Australia meets its obligations under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES is an international agreement between governments that aims to ensure that the international trade in wildlife does not threaten wild populations of plants and animals. The Proposed Action does not provide for trade or movement of animals or plants protected under CITES and is not inconsistent with Australia's obligations under CITES.

5.1.2.2 The Apia Convention

The main objective of the Convention on Conservation of Nature in the South Pacific (Apia Convention) is to commit the parties to take action for the conservation, utilisation and development of natural resources of the South Pacific region through careful planning and management for the benefit of present and future generations. The purpose of the Apia Convention is to encourage the creation of protected areas, national parks and reserves and to commit to not alter national parks so as to reduce their area except after the fullest investigations.

The Apia Convention was suspended with effect from 13 September 2006 and many of the commitments in the Apia Convention have been superseded by commitments under the Convention on Biological Diversity, 1992.

There are a number of conservation areas within the immediate locality of the Proposed Action (refer to **Section 3.1.7**). The Proposed Action has been designed to avoid direct and indirect impacts to Coolah Tops National Park and does not impact on Goulburn River National Park. The Development Corridor – External Transmission Line intersects with large tracts of native vegetation in and around Durrigere State Conservation Area and Community Conservation Area Zone 3 in the locality of Turill (refer to **Figure 3.1**), and through remnant vegetation in private land holdings to the north of Ulan, NSW. The Indicative Development Footprint – External Transmission Line will clear an easement up to 60 metres wide over a distance of four kilometres of vegetation within the Durrigere State Conservation Area.

Durrigere State Conservation Area Community Conservation Area Zone 3 is reserved under the NSW *National Parks and Wildlife Act 1974* (NPW Act) to protect and conserve areas that:

- contain significant or representative ecosystems, landforms or natural phenomena or places of cultural significance
- are capable of providing opportunities for sustainable visitor or tourist use and enjoyment, the sustainable use of buildings and structures, or research
- are capable of providing opportunities for uses permitted under other provisions of the NPW Act (OEH 2014).

Under Section 30G of the NPW Act, the State Conservation Area is managed to:

- conserve biodiversity, maintain ecosystem functions, protect natural phenomena and maintain natural landscapes
- conserve places, objects and features of cultural value
- provide for the undertaking of uses permitted under other provisions of the NPW Act (including uses permitted under section 47J such as mineral exploration and mining), having regard to the conservation of the natural and cultural values of the state conservation area
- provide for sustainable visitor or tourist use and enjoyment that is compatible with conservation of the area's natural and cultural values and with uses permitted in the area
- provide for sustainable use (including adaptive reuse) of any buildings or structures or modified natural areas having regard to conservation of the area's natural and cultural values and with other uses permitted in the area
- provide for appropriate research and monitoring.

While clearance within the Durrigere State Conservation Area for the external transmission line is not consistent with the commitments of the Apia convention, it is noted that the easement is permissible under Section 153 of the NPW Act. This impact is approved as part of the Approved Action and the impact of the Proposed Action is consistent with an existing approval. Further, if the CWO REZ transmission line, currently proposed by EnergyCo, becomes a viable connection option and is adopted by the Liverpool Range Wind Farm project, the External Transmission Line component would no longer be required and all impacts on biodiversity values associated with the External Transmission Line would no longer apply.

5.1.2.3 The Biodiversity Convention

The Convention on Biological Diversity 1992 is dedicated to the conservation of biological diversity, sustainable use of biodiversity components and sustainable development. The Convention identifies a common problem, sets overall goals and policies, and identifies general obligations for signatory countries. Under the Convention, governments undertake to conserve and sustainably use biodiversity. Obligations include:

- Development of national biodiversity strategies and action plans to be integrated into broader national plans for environment and development.
- Identifying and monitoring the important components of biodiversity that need to be conserved and used sustainably.
- Establishing protected areas to conserve biodiversity while promoting environmentally sound development around these areas.
- Rehabilitation and restoring degraded ecosystems and promoting the recovery of threatened species in collaboration with local residents.
- Respecting, preserving and maintaining traditional knowledge of the sustainable use of biodiversity.

- Preventing the introduction of, controlling, and eradicating alien species that could threaten ecosystems, habitats or species.
- Controlling the risks posed by organisms modified by biotechnology.
- Promoting public participation, particularly in assessing environmental impacts of developments that threaten biodiversity.
- Education and reporting on goals (Secretariat of the Convention of Biological Diversity 2000).

Australia's Biodiversity Conservation Strategy 2010-2030 (CoA 2010) has been developed to meet these obligations. The strategy identifies national priorities for action to help stop the decline of Australia's biodiversity (engaging all Australians in biodiversity conservation, building ecosystem resilience in a changing climate and getting measurable results) and is the guiding policy framework for the governments and private sector approach to biodiversity conservation.

The strategy, identifies the main threats to Australia's biodiversity as:

- habitat loss, degradation and fragmentation
- invasive species
- unsustainable use and management of natural resources
- changes to the aquatic environment and water flows
- changing fire regimes
- climate change.

These threats are inherently considered in the assessment of impact of the Proposed Action on MNES as provided in **Section 5.3** to **Section 5.6** and in the environmental impact assessment framework of the EPBC Act and BC Act. The Proposed Action will result in and/or exacerbate some of these threats to biodiversity particularly habitat loss, degradation and fragmentation. Through detailed design the extent of these threats may be avoided and minimised. Implementation of management plans will minimise these threats.

Building ecosystem resilience to climate change is recognised in the strategy as a national priority action. Climate change is increasing the rate at which we are losing biodiversity by amplifying existing pressures and introducing new threats, particularly long-term changes in rainfall and temperature patterns, rising sea levels, and changes to frequency and severity of extreme events (CoA 2010). Transition from reliance on fossil fuel energy sources to renewable energy is fundamental to reducing human-induced elements of climate change. Maintaining and building resilience in ecosystems is the other main way to improve chances of a reasonable future for biodiversity (CoA 2010). This is to be achieved through reducing impacts of existing threats and maintaining large areas of linked habitat.

The Proposed Action has been designed to avoid and minimise clearance of large tracts of native vegetation and higher quality patches. As described in **Section 4.2.2**, broadly speaking, much of the Indicative Development Footprints occur where the connectivity of native vegetation and habitat corridors has been previously compromised by historical agricultural land uses. However, there are specific locations within the Development Corridor where substantial areas of intact native vegetation and associated fauna habitat is recognised to occur.

Primarily this occurs:

- to the north (private land) and east (Coolah Tops National Park) of the Development Corridor – Wind Farm
- to the north, east (Durrigere State Conservation Areas, State Forest land, national park estate – The Drip, Goulburn River National Park) and west of the Development Corridor – External Transmission Line.

The strategy identifies 10 national targets. The targets and how the Proposed Action is consistent with the targets are provided in **Table 5.2**.

Table 5.2 Australia’s National Targets for Biodiversity Conservation

National Target	Proposed Action Response
By 2015, achieve a 25 per cent increase in the number of Australians and public and private organisations who participate in biodiversity conservation activities	The Proposed Action has encouraged public participation in the environmental assessment process. More details are provided in Section 10.0 .
By 2015, achieve a 25 per cent increase in employment and participation of Indigenous peoples in biodiversity conservation.	The Proposed Action has engaged with local First Nations communities in the development the Proposed Action (refer to Section 10.1.2). It is expected that there will be First Nations employment and participation targets established for the LRWF project as part of the access tender process to connect into the CWO REZ transmission line. Opportunities for First Nations participation in management of offset sites will be explored.
By 2015, achieve a doubling of the value of complementary markets for ecosystem services.	The sub-priority action in the Strategy, to enhance strategic investments and partnerships, relates to this target. Part of this sub-priority action is to protect biodiversity, increase in markets and incentives for managing biodiversity and ecosystem services, increase private expenditure and public-private partnerships in biodiversity conservation (CoA 2010). The Proposed Action will contribute to reducing human-induced elements of climate change. The Proposed Action has been designed to avoid conservation areas and impacts will be offset in keeping with the NSW BOS, consistent with the sub-priority action. The Proponent has identified additional mitigation measures to minimise the risk of serious and irreversible impacts and committed to offsets above and beyond the NSW BOS (refer to Section 6.2.2.1).

National Target	Proposed Action Response
<p>By 2015, achieve a national increase of 600,000 km² of native habitat managed primarily for biodiversity conservation across terrestrial, aquatic and marine environments.</p>	<p>With the incorporation of rehabilitation activities and environmental offsets, in addition with the proposed additional and appropriate measures relating to the Commonwealth Box Gum Woodland CEEC (refer to Section 8.3.2), the Proposed Action has been designed to result in no net loss in biodiversity including terrestrial and aquatic environments. The Proponent has identified additional mitigation measures to minimise the risk of serious and irreversible impacts and committed to offsets above and beyond the NSW BOS (refer to Section 6.2.2.1).</p>
<p>By 2015, 1,000 km² of fragmented landscapes and aquatic systems are being restored to improve ecological connectivity.</p>	<p>The Proposed Action risks fragmenting the environment particularly in the Development Corridor – External Transmission Line. Design measures have been incorporated to reduce this risk in siting of permanent disturbance areas. Specific measures to maintain connectivity for fauna across the landscape include retaining canopy connectivity to the greatest extent possible, rehabilitation as soon as possible on completion of construction, retaining habitat trees where possible, minimising clearance and using structures that do not block fish passage at waterway crossings.</p>
<p>By 2015, four collaborative continental-scale linkages are established and managed to improve ecological connectivity.</p>	<p>This is beyond the scope of the Proposed Action.</p>
<p>By 2015, reduce by at least 10 per cent the impacts of invasive species on threatened species and ecological communities in terrestrial, aquatic and marine environments.</p>	<p>Invasive species are well established across the area. The Proposed action will implement control procedures to limit the spread of invasive species further and aim to minimise threats posed by invasive species with the Development Corridor, as far as reasonably practicable.</p>
<p>By 2015, nationally agreed science and knowledge priorities for biodiversity conservation are guiding research activities.</p>	<p>Surveys completed have contributed to understanding of the distribution of MNES through documentation of new records to expand national databases.</p>
<p>By 2015, all jurisdictions will review relevant legislation, policies and programs to maximise alignment with Australia’s Biodiversity Conservation Strategy.</p>	<p>The Proposed Action will not contribute to and is not inconsistent with its intent.</p>
<p>By 2015, establish a national long-term biodiversity monitoring and reporting system.</p>	<p>The Proposed Action will implement long-term monitoring and reporting program in the Development Corridor and environmental offset management areas. Adaptive management strategies will be implemented based on the outcomes of this monitoring program.</p>

The Australia's Biodiversity Conservation Strategy 2010–2030 was reviewed, and the updated strategy was released in 2017. Australia's Strategy for Nature 2019–2030 (CoA 2019) is the overarching framework for all national, state/territory and local strategies, legislation, policies and actions that target nature (CoA 2019). The Strategy for Nature has three priority goals. Relevant to the Proposed Action is the goal of care for nature in all diversity. The conservation of biological diversity refers to the maintenance of species richness, ecosystem diversity and health and the links and processes between them.

The design of the Proposed Action includes measures to avoid and minimise impacts on the abundance and distribution of flora, fauna and ecological communities for the short and long term, including but not limited to:

- Siting the Development Corridor and Indicative Development Footprints in areas previously cleared of native vegetation and/or on lands subject to clearing activities associated with agricultural uses and avoiding moderate/good condition vegetation zones.
- Siting the Development Corridor and Indicative Development Footprints to avoid habitat features. The layout and design of the Proposed Action has been revised since referral, to further avoid habitats for MNES (refer to **Section 6.1**), in particular areas of Box Gum Woodland CEEC, significant reduction of potential habitat in the Development Corridor for some species.
- Development and implementation of biodiversity offsets strategy in accordance with the requirements of applicable state and Commonwealth polices and regulations.

All environmental components, ecosystems and habitat values potentially affected by the Proposed Action have been assessed in the BDAR (Umwelt 2023a) which includes detailed measures to avoid and minimise impacts to biodiversity.

5.2 MNES to be Assessed

Section 3.5 to **Section 3.9** have described information on the abundance, distribution, ecology and habitat preferences and a description of habitat and population in the Development Corridor and adjacent areas for MNES known or with a high to moderate likelihood of occurrence. MNES that require impact assessment are highlighted in **Table 5.3**.

Table 5.3 Summary of which MNES require Impact Assessments

MNES	Scientific Name	EPBC Act Status	Potential habitat in		Impact Assessment Required	NSW BAM Ecosystem or Species-credit species	Refer to
			Development Corridor (ha)	Indicative Development Footprints (ha)			
White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grassland		CEEC	174.1	31.6	Yes	-	Section 5.3.1
-	<i>Homoranthus darwinioides</i>	V	None	None	No	Species credit	-
-	<i>Ozothamnus tessellatus</i>	V	None	None	No	Species credit	-
Regent Honeyeater	<i>Anthochaera phrygia</i>	CE	3,233.4	603.9	Yes	Ecosystem	Section 5.4.1
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	E	45.7	13.4	Yes	Ecosystem Not species credit species as no breeding habitat.	Section 5.4.2
South-eastern Glossy Black-Cockatoo	<i>Calyptorhynchus lathami lathami</i>	V	508.0	83.7	Yes	Ecosystem	Section 5.4.3
			5.4	2.0	Yes	Species credit species as breeding habitat.	
Grey Falcon	<i>Falco hypoleucos</i>	V	None	None	No	Ecosystem	-
Painted Honeyeater	<i>Grantiella picta</i>	V	3,407.5	627.6	Yes	Ecosystem	Section 5.4.4
White-throated Needletail (terrestrial habitat)	<i>Hirundapus caudacutus</i>	V, CAMBA, JAMBA, ROKAMBA	2,348.6	463.2	Yes	Ecosystem	Section 5.4.5
White-throated Needletail (rotor swept area)			-	4,298,475 m ² or 430 ha for the 185 wind turbines			
Swift Parrot	<i>Lathamus discolor</i>	CE	1,653.0	302.5	Yes	Ecosystem	Section 5.4.6
Superb Parrot	<i>Polytelis swainsonii</i>	V	124.2	22.9	Yes	Ecosystem	Section 5.4.7

MNES	Scientific Name	EPBC Act Status	Potential habitat in		Impact Assessment Required	NSW BAM Ecosystem or Species-credit species	Refer to
			Development Corridor (ha)	Indicative Development Footprints (ha)			
Pilotbird	<i>Pycnoptilus floccosus</i>	V	None	None	No	NA	-
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V	572.0	106.7 ha	Yes	Species credit	Section 5.5.1
Spotted-tail Quoll (SE mainland population)	<i>Dasyurus maculatus maculatus</i>	E	941.4	193.9	Yes	Ecosystem	Section 5.5.2
Corben's Long-eared Bat	<i>Nyctophilus corbeni</i>	V	721.5	156.8	Yes	Ecosystem	Section 5.5.3
Greater Glider (southern and central)	<i>Petauroides volans</i>	E	111.3	19.3	Yes	Species credit	Section 5.5.4
Yellow-bellied Glider (south-eastern)	<i>Petaurus australis australis</i>	V	87.4	15.2	Yes	Ecosystem	Section 5.5.5
Koala (<i>Phascolarctos cinereus</i>) (combined populations of Qld, NSW and the ACT)	<i>Phascolarctos cinereus</i>	E	3,725.7	720.6	Yes	Ecosystem	Section 5.5.6
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	1,731.4	312.0	Yes	Ecosystem	Section 5.5.7
Black-faced Monarch	<i>Monarcha melanopsis</i>	marine; migratory (Bonn)	None	None	No	NA	-
Satin Flycatcher	<i>Myiagra cyanoleuca</i>	marine; migratory (Bonn)	542.3	101.8	Yes	NA	Section 5.6
Rufous Fantail	<i>Rhipidura rufifrons</i>	marine; migratory (Bonn)	412.8	119.8	No	NA	-

5.3 Threatened Ecological Communities

5.3.1 White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grassland

5.3.1.1 Relevant Guidelines and Policy Statement

The following documents were used to support the assessment of significance for the Commonwealth Box Gum Woodland CEEC:

- Approved conservation advice for Commonwealth Box Gum Woodland CEEC (DCCEEW 2023).
- Listing advice for Commonwealth Box Gum Woodland CEEC (TSSC 2006). The recently released conservation advice does not present a revision, update or copy of the original listing advice from 2006 (DCCEEW 2023).
- National recovery plan for Commonwealth Box Gum Woodland CEEC (DECCW 2010a).
- EPBC Act policy statement for Commonwealth Box Gum Woodland CEEC (DEH 2006).
- Adopted/made threat abatement plans:
 - Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads (DSEWPac 2011).
 - Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*) (2017) (DoEE 2017b).
 - Threat abatement plan for disease in natural ecosystems caused by *Phytophthora cinnamomi* (DoEE 2018).

5.3.1.2 Potential Construction Impacts

Construction of the Proposed Action will impact up to 31.6 ha of the Commonwealth Box Gum Woodland CEEC, being:

- 13.2 ha or 42 per cent associated with the Indicative Development Footprint – Wind Farm and civil works including 7 ha of complete removal and 5.2 ha of partial direct impact within the Internal Balance of Easement.
- 17.7 ha or 56 per cent in the Indicative Development Footprint – External Transmission Line. The total 17.7 ha of partial direct impacts to Commonwealth Box Gum Woodland CEEC includes 12.1 ha of the External Balance of Easement.
- 0.7 ha or 2 per cent in the Indicative Development Footprint – Public Road Upgrades.

It is important to note that this area corresponds to the upper limit of impacts associated with the Indicative Development Footprints and actual impacts are expected to be less mainly through micro-siting of infrastructure at the final design stage.

Significantly this represents a reduction in impact to the Commonwealth Box Gum Woodland CEEC relative to the Referred Action (42.1 ha) by 10.4 ha attributed to changes in the design and layout of the wind farm.

Approximately 174.1 ha of Commonwealth Box Gum Woodland CEEC under the EPBC Act was identified within the Development Corridor and 142.4 ha (or 82 per cent) will not be impacted by the Proposed Action and will persist within the wider Development Corridor, and considerable amounts of the Commonwealth Box Gum Woodland CEEC occur beyond the Development Corridor in the local region.

Of the 31.6 ha of impact identified to the Commonwealth Box Gum Woodland CEEC under the EPBC Act, 17.3 ha (approximately 55 per cent) will be partially directly impacted within the transmission line 'balance of easement' proposed by the Proposed Action, as described in **Section 4.2.1**. The Proposed Action will reduce the quality of patches of this community from complete or partial loss of patches possibly conforming to this community over a maximum area of 31.6 ha. Within the balance of the easements (17.3 ha [5.2 ha within the Internal Balance of Easement and 12.1 ha of External Balance of Easement]) these impacts will result in changes in species composition and vegetation structure, including the loss of overstorey species, and potentially important species used in the condition thresholds for determining a listed community.

In the event that the CWO REZ transmission line currently proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action the External Transmission Line component would no longer be required. Removal of the External Transmission Line component would result in the avoidance of impact to approximately 17.7 ha of impact to Commonwealth Box Gum Woodland CEEC, representing 56 per cent of the total potential impacts to the community.

5.3.1.3 Potential Operational Impacts

In the long term, the partially retained patches, particularly those within the easements, would likely involve a proliferation of tolerant species (typically grasses and shrubs), a reduction in floristic diversity (particularly of small herbs) and reduced structural complexity due to the development of a continuous grass cover with little or no inter-tussock space. The Proposed Action is also likely to alter the availability of food for attracting fauna into these habitats.

The quality of retained patches of this community has the potential to change due to edge effects such as increased light, wind, altered hydrology and weed invasion. Given the already disturbed nature of the land within the Development Corridor due to historical clearing and ongoing grazing pressures, edge effects are unlikely to cause substantial change.

As the Development Corridor already has ongoing disturbances from agricultural land uses, the presence of weeds and grazing have likely resulted in the historical and ongoing use of fertilisers, herbicides or other chemicals or pollutants. It is unlikely that the impacts of the Proposed Action will cause a substantial reduction in Commonwealth Box Gum Woodland CEEC quality for retained patches. Weeds are likely to invade the adjacent edges of the community. However, under the current land use regime, changes to the quality or integrity of the patch are likely to be negligible. Thus, the Proposed Action is not expected to cause a reduction in quality or integrity of the Commonwealth Box Gum Woodland CEEC occurrence through assisting invasive species to become established or causing regular mobilisation of fertilisers.

5.3.1.4 Potential Decommissioning Impacts

Decommissioning of the Proposed Action would impact areas cleared during construction and is unlikely to clear areas that meet condition thresholds for the Commonwealth Box Gum Woodland. Ancillary sites to facilitate decommissioning will be located in areas that are not representative of the Commonwealth Box Gum Woodland.

5.3.1.5 Significant Impact Criteria Consideration

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:
reduce the extent of an ecological community
<p>Box-gum woodlands and associated grasslands occur along the western slopes and tablelands of the Great Dividing Range from southern Queensland through NSW to central Victoria. It is suggested that at least 92 per cent of box-gum woodlands have been cleared with those remaining representing isolated remnants. The 2006 Commonwealth Listing Advice estimates its national extent to be approximately 416,000 ha including areas in poor condition. Of that about 250,729 ha was estimated to occur in NSW and about 93 per cent of the community in NSW had been cleared since European occupation (TSSC 2006). While the extent of occurrence is very large it has undergone a severe decline in area of occupancy.</p> <p>The Proposed Action will impact the Commonwealth Box Gum Woodland CEEC through removal of up to 31.6 ha including partial impact (clearing of canopy) of about 17.3 ha in the balance of the easements. Importantly, the Proposed Action represents a reduction in the area of clearance of the Commonwealth Box Gum Woodland CEEC, relative to the Referred Action (42.1 ha) through design and layout revision since the referral.</p> <p>At a local scale the Proposed Action will result in the partial or total loss of several discontinuous patches of vegetation with a further 142.4 ha in the Development Corridor avoided. This loss has the potential to reduce the extent of the community at a local scale, especially when the Commonwealth Box Gum Woodland CEEC is considerably threatened by further fragmentation.</p>
Fragment or increase fragmentation of an ecological community
<p>The currently remaining extent of the Commonwealth Box Gum Woodland CEEC is highly fragmented, occurring in small, isolated patches within a cleared environment, or within a landscape of other disturbed woodlands (DCCEEW 2023a). Modification of most of the community since European settlement has increased the range of structural forms now present with tree cover and stem density now varying substantially (DCCEEW 2023a). Given the marked decline in extent of the community, processes associated with fragmentation are likely to have a greater effect.</p> <p>Much of the connectivity of this community in the Development Corridor has been previously disturbed by historical and current agricultural land use. The Proposed Action will increase fragmentation with the loss of small patches which contribute to landscape scale connectivity for this community. Some patches may be entirely lost whereas others will be partially retained. Construction of linear infrastructure (i.e., underground cabling and access tracks) will reduce the current patch sizes.</p> <p>The Proposed Action is likely to increase fragmentation of this community in an area characterised by disturbed and fragmented landscape.</p>
Adversely affect habitat critical to the survival of an ecological community
<p>Habitat critical to the survival of the Commonwealth Box Gum Woodland CEEC is defined in the conservation advice as all areas of the ecological community that meet the minimum condition criteria (DCCEEW 2023a).</p> <p>No critical habitat is defined under Section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat at this time (DCCEEW 2023a).</p> <p>The Proposed Action will result in permanent loss and/or modification of up to 31.6 ha of box-gum grassy woodland habitat that meet the minimum condition criteria threshold and are therefore considered habitat critical to the survival of the Commonwealth Box Gum Woodland CEEC.</p>

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:
Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns
<p>While the Proposed Action will impact on abiotic factors necessary for the survival of the Commonwealth Box Gum Woodland CEEC, this is limited to potential for altered surface hydrology during construction, particularly on steep slopes where increase overland surface water flows or sediment movement could run off into the retained Commonwealth Box Gum Woodland CEEC patches and remove topsoil. Implementation of site-specific rehabilitation and revegetating temporarily disturbed areas during the construction phase would minimise these effects. These actions would be considered in the preparation and implementation of a Biodiversity Management Plan that would be required for the Proposed Action. In conclusion, these impacts are not considered likely to modify or destroy abiotic factors necessary for the survival of the Commonwealth Box Gum Woodland CEEC.</p>
Cause substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, or
<p>The quality of retained patches of this community has the potential to change due to edge effects such as increased light, wind, altered hydrology and weed invasion. Given the already disturbed nature of the land within the Development Corridor due to historical clearing and ongoing grazing pressures, edge effects are unlikely to cause substantial change.</p> <p>The Proposed Action will reduce the quality of patches of this community from complete or partial loss of patches possibly conforming to this community over a maximum area of 31.6 ha. Within the balance of the easements (17.3 ha [5.2 ha within the Internal Balance of Easement and 12.1 ha of External Balance of Easement]) these impacts will result in changes in species composition and vegetation structure, including the loss of overstorey species, and potentially important species used in the condition thresholds for determining a listed community. In the long term, these partially retained patches would likely involve a proliferation of tolerant species (typically grasses), a reduction in floristic diversity (particularly of small herbs) and reduced structural complexity due to the development of a continuous grass cover with little or no inter-tussock space. The Proposed Action is also likely to alter the availability of food for attracting fauna into these habitats.</p> <p>In conclusion, the Proposed Action is expected to cause a minor change in the species composition of the Commonwealth Box Gum Woodland CEEC adjacent to the impact area and will modify species composition in the Commonwealth Box Gum Woodland CEEC along the transmission line where the canopy is removed.</p>
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
<ul style="list-style-type: none"> • assisting invasive species that are harmful to the listed ecological community to become established, or
<ul style="list-style-type: none"> • 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
<p>As the Development Corridor already has ongoing disturbances from agricultural land uses, the presence of weeds and grazing have likely resulted in the historical and ongoing use of fertilisers, herbicides or other chemicals or pollutants. It is unlikely that the impacts of the Proposed Action will cause a substantial reduction in Commonwealth Box Gum Woodland CEEC quality for retained patches. Weeds are likely to invade the adjacent edges of the community. However, under the current land use regime, changes to the quality or integrity of the patch are likely to be negligible.</p> <p>The Proposed Action is not expected to cause a reduction in quality or integrity of the Commonwealth Box Gum Woodland CEEC occurrence through assisting invasive species to become established or causing regular mobilisation of fertilisers.</p>

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:

Interfere with the recovery of an ecological community.

The national recovery plan (DECCW 2010a) promotes the recovery and prevention of Commonwealth Box Gum Woodland CEEC extinction. It identifies five key objectives:

4. Achieving no net loss in extent and condition of the ecological community throughout its geographic distribution.
5. Increasing protection of sites with high recovery potential.
6. Increasing landscape functionality of the ecological community through management and restoration of degraded sites.
7. Increasing transitional areas around remnants and linkages between remnants.
8. Bringing about enduring changes in participating land manager attitudes and behaviours towards environmental protection and sustainable land management practices to increase extent, integrity and function of Box-Gum Grassy Woodland.

The Proposed Action will interfere with the recovery of this community through clearing of up to 31.6 ha, particularly through the loss in extent and condition in relation to Objective 1. The Proposed Action has identified offsets in keeping with the NSW BOS for residual impacts to provide for no net loss of the Commonwealth Box Gum Woodland CEEC. In addition, the Proponent has developed a proposal to set-aside additional areas over and above the requirements of the NSW BOS to reduce the risk of serious and irreversible impacts to Box Gum Woodland CEEC (refer to **Section 6.2.2**).

5.3.1.6 Discussion

The Proposed Action will impact the Commonwealth Box Gum Woodland CEEC through removal of up to 31.6 ha including partial impact (clearing of canopy) of about 17.3 ha in the balance of the easements. All patches of the Commonwealth Box Gum Woodland CEEC within the Development Corridor are considered to be locally important to the Commonwealth Box Gum Woodland CEEC.

The actual impacts to the Commonwealth Box Gum Woodland CEEC are expected to be less through the detailed design phase to further avoid the Commonwealth Box Gum Woodland CEEC. This commitment has already been demonstrated by the Proponent since referral whereby the Proposed Action represents a reduction in the area of clearance of the Commonwealth Box Gum Woodland CEEC, relative to the Referred Action (42.1 ha) through design and layout revision of the wind farm since the referral.

If the CWO REZ transmission line proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action, the Development Corridor – External Transmission Line component would no longer be required. Removal of the Indicative Development Footprint – External Transmission Line component would result in the avoidance of impact to 17.7 ha (or 56 per cent) of Commonwealth Box Gum Woodland CEEC.

The Proposed Action is likely to adversely modify or reduce the composition and quality of retained vegetation through edge effects. Through consideration of this assessment, the Proposed Action will potentially have a significant impact on the Commonwealth Box Gum Woodland CEEC. In keeping with the Approved Action, the Proposed Action includes measures to minimise clearance through detailed design and micro-siting of infrastructure and identified offsets in keeping with the NSW BOS for residual impacts to the Commonwealth Box Gum Woodland CEEC.

5.4 Listed Threatened Birds

5.4.1 Regent Honeyeater

5.4.1.1 Potential Construction Impacts

A total of 3,233.4 ha of potentially suitable regent honeyeater habitat has been assessed within the Development Corridor. Construction of the Proposed Action would reduce the extent of potential foraging habitat in the Proposed Action Area by about 603.9 ha, therefore, 2,629.5 ha of potentially suitable regent honeyeater habitat will not be impacted by the Proposed Action within the wider Development Corridor, and considerable amounts of the potentially suitable habitat occur beyond the Development Corridor in the local region.

The Proposed Action does not impact directly or indirectly on any areas of habitat identified as important habitat for the regent honeyeater in the NSW BAM.

In the event that the CWO REZ transmission line currently proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action the External Transmission Line component would no longer be required. Removal of the External Transmission Line component would result in the avoidance of impact to approximately 105.8 ha (or 17 per cent) of impact to potentially suitable regent honeyeater habitat.

Opportunities to further reduce impacts will be explored during detailed design.

5.4.1.2 Potential Operational Impacts

Operation of the Proposed Action, including risk of blade strike, will not impact on known breeding habitat or important habitat as defined by NSW DPIE and identified in the recovery plan (DoE 2016). However, there is a Moderate likelihood and overall High risk rating (refer to **Section 4.3.1**) of impacting individuals moving between important areas to the south and north of the Proposed Action Area. Considering their current population size and short-term population projections, any occurrence of blade strike during the lifecycle of the regent honeyeater would be of considerable importance.

5.4.1.3 Potential Decommissioning Impacts

Decommissioning will not clear any potential terrestrial habitat for the regent honeyeater. Decommissioning will remove operational impacts for the regent honeyeater.

5.4.1.4 Significant Impact Criteria Consideration

For the purposes of this assessment, criteria are assessed under the following assumptions identified in the National Recovery Plan for the Regent Honeyeater (DoE 2016), that:

- There is only one single population of regent honeyeater, that is the national population.
- Habitat critical to the survival of the regent honeyeater in NSW include key breeding and foraging areas at:
 - Bundarra-Barraba and subsidiary area of Pilliga Woodlands, Warrumbungles, Inverell-Ashford-Emmaville. Bundarra-Barraba habitat area is about 130 kilometres to the north of the Development Corridor and Proposed Action Area.

- Capertee Valley and subsidiary area of Mudgee-Munghorn Gap-Wollar and Burragorang River Valleys. The Mudgee-Wollar area is about 10 kilometres to the south of the southern end of the transmission line at Ulan.
- Hunter Valley/Central Coast areas in NSW extending from lower Hunter Valley to Upper Hunter Valley and the Goulburn River valley. Goulburn River National Park at the upper reaches of the Goulburn River catchment is contiguous with the southern end of the transmission line.

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:
lead to a long-term decrease in the size of a population
<p>The regent honeyeater is a single national population. The conservation advice for the regent honeyeater identifies that the number of mature individuals was estimated to be 350 to 400 by 2010 with a population decline of greater than 80 per cent within three generations (DoE 2015a).</p> <p>The Proposed Action may impact on the regent honeyeater’s population:</p> <ul style="list-style-type: none"> ● Through removal of up a total of 603.9 ha of potentially suitable habitat. ● Potential (moderate likelihood) for blade strike. <p>Approximately 2,629.5 ha of potentially suitable regent honeyeater habitat will not be impacted by the Proposed Action within the wider Development Corridor, and considerable amounts of the potentially suitable habitat occur beyond the Development Corridor in the local region. Opportunities to further reduce impacts will be explored during detailed design.</p> <p>The Proposed Action, including risk of blade strike, will not impact on known breeding habitat or important habitat as defined by NSW DPIE and/or identified in the recovery plan (DoE 2016). However, there is a Moderate likelihood and overall High-risk rating of impacting individuals moving between important areas to the south and north of the Proposed Action Area.</p> <p>Considering their current population size and short-term population projections, any occurrence of blade strike during the lifecycle of the Proposed Action would be of considerable importance. Implementation of pre-clearing inspections and bird and bat adaptive management plan (BBAMP) will minimise risk of the Proposed Action leading to a long-term decrease in the size of the population. However, given the small size of the national population, the Proposed Action may contribute further to a decrease in the regent honeyeater’s population size.</p>
Reduce the area of occupancy of the species
<p>The area of occupancy for the regent honeyeater is estimated to be 300 km² and decreasing (DoE 2015a). The species is not listed as critically endangered due to area of occupancy (DoE 2015a). The Proposed Action would reduce the extent of potential foraging habitat in the Proposed Action Area by about 603.9 ha, therefore, 2,629.5 ha of potentially suitable regent honeyeater habitat will not be impacted by the Proposed Action within the wider Development Corridor, and considerable amounts of the potentially suitable habitat occur beyond the Development Corridor in the local region.</p> <p>Habitat to be removed is likely to be rarely utilised by regent honeyeater given the absence of records in the Proposed Action Area and aggregation of records in the important Mudgee-Wollar area to the south of the Proposed Action Area.</p> <p>Extensive areas of known and potential habitat remain in the surrounding landscape in national park estate (Munghorn Gap, Wollemi and Goulburn River) in the Mudgee-Wollar important area. However, it is noted that parts of this habitat were burnt in the 2019/2020 wildfires which could lead in changes to utilisation of the species throughout its NSW range.</p>

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:
Fragment an existing population into two or more populations
<p>The decline of the national population of the regent honeyeater is attributed to clearing, fragmentation and degradation of its habitat (DoE 2015a). The population of regent honeyeater has not been recorded within the Proposed Action Area. Records within 40 kilometres of the impact area are concentrated to the south and south-east of the transmission line with very few records north of Ulan.</p> <p>Habitat within the Proposed Action Area is already largely fragmented, particularly in the Development Corridor – Wind Farm and in the Development Corridor – External Transmission Line north of Durrigere State Conservation Area (SCA). However, there are larger tracts of potential habitat south of Durrigere SCA with connectivity with large stands of remnant vegetation in reserves to the east of Ulan. In this southern area the main impact will be the Indicative Development Footprint – External Transmission Line which, which while removing potential foraging trees, will not have a risk of blade strike. The regent honeyeater is highly dispersive, and it is unlikely that the Proposed Action would create a significant change to the species’ dispersal capacity or create a significant barrier to the movement of the species.</p> <p>It is unlikely that the proposed Action would result in the fragmentation of the existing national population into two or more populations.</p>
Adversely affect habitat critical to the survival of a species
<p>Habitat critical to the survival of the regent honeyeater include key breeding and foraging areas:</p> <ul style="list-style-type: none"> • Bundarra-Barraba and subsidiary area of Pilliga Woodlands, Warrumbungles, Inverell-Ashford-Emmaville • Capertee Valley and subsidiary area of Mudgee-Munghorn Gap-Wollar and Burragorang River Valleys • Hunter Valley/Central Coast areas in NSW extending from lower Hunter Valley to Upper Hunter Valley and Goulburn River (DoE 2016). <p>The Mudgee-Wollar area is about 10 kilometres to the south of the southern end of the Development Corridor – External Transmission Line. Habitat in Capertee Valley and Burragorang Valley have both experienced wildfires in 2019/2020 reducing area of habitat critical to the survival of the regent honeyeater (BirdLife Australia 2021). The habitat to be removed while contiguous with, is not located within habitat critical for the regent honeyeater. Given that the species has not been recorded in or near the habitat to be removed it is unlikely that such habitat is critical to its survival.</p>
Disrupt the breeding cycle of a population
<p>The regent honeyeater mainly breeds between July and January at three key sites in NSW being the Bundarra-Barraba area, the Capertee Valley, and the Hunter Valley (DoE 2016). Breeding is in response to flowering of key eucalypts and mistletoes. The regent honeyeater has some fidelity in breeding sites but may nest within 85 km of a nest site, generally large mature trees, the following year. Breeding territories usually consists of the nest-tree and surrounding feeding areas extending up to 40 m (DoE 2016).</p> <p>There is a captive breeding program for this species which commenced in 2015 in Victoria with releases since 2020 focused on the lower Hunter Valley (National Environmental Science Program Threatened Species Research Hub 2019b). Very few breeding sites have been used by regent honeyeaters in recent years (National Environmental Science Program Threatened Species Research Hub 2019b). As noted above the Capertee Valley and Burragorang Valley have both experienced wildfires in 2019/2020 and breeding has not been recorded in recent years (BirdLife Australia 2021). The regent honeyeater has not been recorded in the Development Corridor and Proposed Action Area and there is low likelihood that the Proposed Action would disrupt breeding or nesting habitat for the species.</p>

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:
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
<p>The Proposed Action would reduce the extent of potential foraging habitat in the Proposed Action Area by about 603.9 ha, therefore, 2,629.5 ha of potentially suitable regent honeyeater habitat will not be impacted by the Proposed Action within the wider Development Corridor, and considerable amounts of the potentially suitable habitat occur beyond the Development Corridor in the local region.</p> <p>The Proposed Action is to the north of critical habitat for the regent honeyeater associated with Capertee Valley (Mudgee-Wollar area). The Proposed Action will not impact directly on critical habitat however the loss of foraging resources may have a cumulative impact on the national population of the regent honeyeater.</p>
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
<p>The conservation advice and recovery plan do not identify invasive species that are harmful to the regent honeyeater. Invasive weed species are recognised as a threat as degrading habitat (DoE 2015a).</p> <p>The Proposed Action is unlikely to result in invasive species that are harmful to the regent honeyeater becoming established in its habitat.</p> <p>While not an 'invasive species', the native noisy miner (<i>Manorina melanocephala</i>) is an aggressive nectar feeder with a preference for smaller, areas of open woodlands. The regent honeyeater is less likely to occur in remnants where noisy miners are established. The noisy miner is already present in high numbers and may limit habitat value for the regent honeyeater. The number of noisy miners may be promoted by further fragmentation of habitats.</p>
Introduce disease that may cause the species to decline, or
<p>The conservation advice and recovery plan do not identify a specific disease that the regent honeyeater is susceptible too.</p> <p>The small population size may exert pressure on recovery of the species such that the species is susceptible to disease. The Proposed Action is unlikely to result in a reduction in the population size and/or introduction disease that may cause the regent honeyeater to decline.</p>
Interfere with the recovery of the species.
<p>The National Recovery Plan for the regent honeyeater (DoE 2016) identifies the overall objectives as:</p> <ul style="list-style-type: none"> • Reverse the long-term population trend of decline and increase the numbers of regent honeyeaters to a level where there is a viable, wild breeding population, even in poor breeding years; and to • Enhance the condition of habitat across the regent honeyeater range to maximise survival and reproductive success and provide refugia during periods of extreme environmental fluctuation. <p>This includes on ground actions such as protection of intact high-quality areas of regent honeyeater breeding and foraging habitat.</p> <ul style="list-style-type: none"> • The Proposed Action does not impact directly high-quality areas of regent honeyeater breeding and foraging areas. • To best of our knowledge habitat patches and corridors have not been identified. <p>The native noisy miner (<i>Manorina melanocephala</i>) is an aggressive nectar feeder with a preference for smaller, areas of open woodlands. The regent honeyeater is less likely to occur in remnants where noisy miners are established. The noisy miner is already present in high numbers and may limit habitat value for the regent honeyeater, and subsequent recovery of the species within the Proposed Action Area.</p> <p>Other strategies and actions outlined in the National Recovery Plan for the regent honeyeater (DoE 2016) are focused on captive breeding, improving knowledge of the species and community awareness. The Proposed Action would not interfere with these recovery strategies.</p>

5.4.1.5 Discussion

The Proposed Action would reduce the extent of potential foraging habitat in the Proposed Action Area by about 603.9 ha, therefore, 2,629.5 ha of potentially suitable regent honeyeater habitat will not be impacted by the Proposed Action within the wider Development Corridor, and considerable amounts of the potentially suitable habitat occur beyond the Development Corridor in the local region. Opportunities to further reduce impacts will be explored during detailed design.

Given the status of the species there is potential that the loss of about 603.9 ha of potential foraging habitat may have an adverse effect on the local extent and long term viability of the regent honeyeater.

If the CWO REZ transmission line proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action, the Development Corridor – External Transmission Line component would no longer be required. Removal of the Indicative Development Footprint – External Transmission Line component would result in the avoidance of impact to approximately 105.8 ha (or 17 per cent) of potential habitat for the regent honeyeater.

Implementation of pre-clearing inspections and bird and bat adaptive management plan will minimise impact of the Proposed Action to the regent honeyeater. Given the Proposed Action avoids critical habitat for the national population, and given the absence of records, despite extensive surveys for the species, it is considered unlikely the Proposed Action will have a significant effect on the local extent and long-term viability of regent honeyeater.

5.4.2 Gang-gang Cockatoo

5.4.2.1 Potential Construction Impact

Based on the NSW TBDC, the only PCT which is predicted to provide habitat for the gang-gang cockatoo within the Development Corridor is PCT 281. Construction of the Proposed Action would impact approximately 13.4 ha of PCT 281 in moderate to good condition. The Development Corridor was found to support approximately 45.7 ha of habitat for gang-gang cockatoo, therefore approximately 32.3 ha of habitat for this species will not be impacted by the Proposed Action.

If the CWO REZ transmission line proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action, the Development Corridor – External Transmission Line component would no longer be required. Removal of the Indicative Development Footprint – External Transmission Line component would result in a significant reduction in the impact to potential habitat for the gang-gang cockatoo from 13.4 ha to 1.2 ha, avoiding impact to approximately 12 ha (or 90 per cent) of potential habitat for the gang-gang cockatoo.

5.4.2.2 Potential Operational Impacts

The Proposed Action will result in an increase of vehicle activity through construction of a network of internal access tracks, predominantly between turbine locations but also within the transmission line easement for servicing purposes and along public roads. Such vehicle activity poses the potential of vehicle strikes to this species, however this is considered highly unlikely.

The prescribed impact assessment prepared to consider the potential impacts associated with turbine strike and barotrauma on protected bird and bat species in accordance with Sections 6.1.5 and 8.3.5 of the BAM (DPIE 2020a), did not identify the gang-gang cockatoo as a species at risk of turbine strike and barotrauma. The species was not included in the detailed assessment of prescribe impact assessments given the unlikely nature of the species to occur in the wind farm component of the Proposed Action, as well as the unlikely nature that the species would likely utilise the air space of the RSA. The species was therefore considered unlikely to be subject to turbine strike.

5.4.2.3 Potential Decommissioning Impacts

Decommissioning will not clear any potential terrestrial habitat or nesting trees for the gang-gang cockatoo.

5.4.2.4 Significant Impact Criteria Consideration

For the purposes of this assessment, criteria are assessed under the following assumptions:

- The species' extent of occurrence and area of occupancy are estimated to be stable at 400,000 km² and 30,000 km², respectively (DAWE 2022a).
- Habitat critical to the survival of the gang-gang cockatoo includes all foraging habitat during both the breeding and non-breeding season. For the purpose of this document, this does not include exotic feeding grounds such as ornamental trees, shrubs, and hedges within urban and suburban areas.
- Gang-gang cockatoos rely on stands of suitable hollow-bearing trees, which are a key component of their breeding habitat. Habitat critical to the survival includes hollow bearing trees with known or potential gang-gang cockatoo hollow chambers that are generally around 20 cm in floor diameter, around 50.5 cm deep (range 22–90 cm) and occur between around 7.5 m (range 5–9.4 m) above the ground. Stands of trees within or adjacent to known breeding areas, that are likely to become hollow-bearing in future years, are also key components of this species' habitat.
- No Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat (DAWE 2022a).

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:
lead to a long-term decrease in the size of a population
<p>There are an estimated 25,300 (range 17,600–35,200) mature individuals in the wild with a declining trend (high reliability) (Cameron et al. 2021).</p> <p>There are no records of gang-gang cockatoo within the Development Corridor. The closest records of this species are within and south-west of Goulburn River National Park.</p> <p>Given the lack of records of gang-gang cockatoo within the Development Corridor, it is unlikely that the Proposed Action will lead to a long-term decrease in the size of a population of this species.</p>
Reduce the area of occupancy of the species
<p>The species' extent of occurrence and area of occupancy are estimated to be stable at 400,000 km² and 30,000 km², respectively (DAWE 2022a).</p> <p>A total of approximately 13.4 ha of potentially suitable habitat is proposed to be impacted by the Proposed Action. The Development Corridor was found to support approximately 45.7 ha of habitat for gang-gang cockatoo, therefore approximately 32.3 ha of habitat for this species will not be impacted by the Proposed Action.</p>

<p>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:</p>
<p>There are 11 records of gang-gang cockatoos within a 10 km radius of the Development Corridor, including five within five kilometres. Most of these records are in the Ulan area, within and south-west of Goulburn River National Park with other records from Coolah Tops, Durrigere State Conservation Area and recent records from Cassilis. There are no records of this species within the Development Corridor.</p> <p>The Proposed Action is considered unlikely to reduce the area of occupancy of the gang-gang cockatoo.</p>
<p>Fragment an existing population into two or more populations</p>
<p>Given the lack of records of gang-gang cockatoo within the Development Corridor and the mobility of the species, it is unlikely that the Proposed Action will fragment an existing population of this species into two or more populations.</p>
<p>Adversely affect habitat critical to the survival of a species</p>
<p>Habitat critical to the survival of the gang-gang cockatoo include hollow bearing trees with known or potential Gang-gang Cockatoo hollow chambers that are generally around 20 cm in floor diameter, around 50.5 cm deep (range 22–90 cm) and occur between around 7.5 m (range 5–9.4 m) above the ground (DAWE 2022a). No Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat (DAWE 2022a).</p> <p>No habitat critical to the survival of the gang-gang cockatoos was identified in the Indicative Development Footprint. Thus, the Proposed Action is unlikely to adversely affect habitat critical to the survival of the gang-gang cockatoo.</p>
<p>Disrupt the breeding cycle of a population</p>
<p>No breeding habitat was observed during surveys (Umwelt 2023a). Thus, the Proposed Action is considered unlikely to disrupt the breeding cycle of a population of the gang-gang cockatoo.</p>
<p>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</p>
<p>Based on the NSW TBDC, the only PCTs which are predicted to provide habitat for the gang-gang cockatoo within the Development Corridor is PCT 281. The Proposed Action may impact approximately 13.4 ha of PCT 281 in moderate to good condition. The Development Corridor was found to support approximately 45.7 ha of habitat for gang-gang cockatoo, therefore approximately 32.3 ha of habitat for this species will not be impacted by the Proposed Action.</p> <p>The Proposed Action will impact a minor extent of moderate to good suitable habitat for this species, however, the utilisation of this habitat is considered to be negligible given no records of gang-gang cockatoo have been made within the Development Area.</p>
<p>Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat</p>
<p>Invasive species that are identified as a significant nest-hollow competitor include feral honeybees, starlings and common mynas (DAWE 2022a). Clearing of habitat will likely enable an increase in invasive species abundances that may compete for suitable nest-hollows.</p>
<p>Introduce disease that may cause the species to decline, or</p>
<p>Gang-gang cockatoos are susceptible to Psittacine beak and feather disease. The subpopulation of gang-gang cockatoos from the Hornsby and Ku-ring-gai local government area has a high prevalence of the disease. Prevalence in other subpopulations is unknown. Beak and feather disease virus is highly prevalent in a range of abundant Australian psittacines. It is transmitted through feather dander, faeces, and saliva (DAWE 2022a).</p> <p>Loss of nesting habitat and increasing competition increases likelihood of disease transmission. The Proposed Action is unlikely increase competition for nesting habitat such that susceptibility to the disease will increase.</p>

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:

Interfere with the recovery of the species.

There is currently no recovery plan for this species. Conservation and recovery actions identified in the Conservation Advice include:

- Actively manage the landscape to minimise the risk of large wildfires, ensuring that this also meets the ecological requirements of the species.
- Ensure fire management (fire risk reduction, fire suppression and post-fire management activities) considers impacts on key breeding locations, foraging, roosting, and nesting habitat for gang-gang cockatoo.
- After fire, protect unburnt areas within or adjacent to recently burnt ground that may provide ongoing refuge.
- Cease all land clearing of habitat critical to the survival of gang-gang cockatoo.
- Retain hollow-bearing trees in all known gang-gang cockatoo nesting areas.
- Restore forests and woodlands within the known range of gang-gang cockatoo.
- Develop or improve forestry policies across the range of the species that promote the retention and recruitment of hollow-bearing trees suitable for gang-gang cockatoos.
- Protect and enhance the quality of potential habitat (both breeding and foraging) of the gang-gang cockatoo.
- Develop, implement, and monitor a nest box program to increase the number of nesting sites available to gang-gang cockatoos, to sites where nesting hollows are a limiting resource.
- Monitor nest site competition (behavioural surveys) and monitor nesting outcomes.
- Implement control programs for native and invasive species identified as significant nest/hollow competitors, such as feral honeybees, possums, starlings, noisy miners, and common mynas.
- In peri-urban and urban areas with high possum densities, use nest site protection measures to safeguard roosting/nesting sites i.e., protect nests with iron tree collars to prevent possum access.

Based on the above, it is unlikely that the Proposed Action will interfere with the recovery of the gang-gang cockatoo.

5.4.2.5 Discussion

The Proposed Action is considered to have a likely negligible impact on potential habitat for the gang-gang cockatoo given the minimal proposed habitat impacts, lack of records of the species within the Development Corridor, and a greater quality habitat for the species within the nearby Goulburn River National Park. The Proposed Action is considered unlikely to result in a significant impact on the gang-gang cockatoo.

5.4.3 South-eastern Glossy Black-cockatoo

5.4.3.1 Potential Construction Impacts

While no breeding habitat was confirmed during surveys in the Development Corridor, for the purposes of the NSW BAM (DPIE 2020a), the BDAR has assessed the glossy black-cockatoo as a species credit species for breeding habitat. Breeding habitat was mapped as those areas of PCT 488 where they occur within 200 m buffers of hollow bearing trees recorded in continuous habitat of the 28 records of the species made along the Development Corridor – External Transmission Line. Mapped breeding habitat was estimated at 5.4 ha within the Development Corridor and an estimated 2.0 ha of habitat was identified as being impacted by construction and decommissioning of the Indicative Development Footprint (see Table 3.19 Umwelt 2023a, in **Appendix D**).

The glossy black-cockatoo was also assessed as an ecosystem credit species foraging habitat associated with PCT 488 and 495. Potential foraging habitat may be associated with PCT 488 Vegetation Zones 9 and 10 and PCT 495 (Vegetation Zone 14) where canopy and midstorey layers are present that may provide foraging habitat. In total there is approximately 508.0 ha of potential foraging habitat (refer to **Figure 3.14**) within the Development Corridor, of which 83.7 ha will be impacted by construction and decommissioning of the Proposed Action being mainly within the Indicative Development Footprint – Wind Farm.

The majority of potential foraging habitat associated with PCT 488 and 495 in the Indicative Development Footprint occurs north of the Golden Highway, while records of the glossy black-cockatoo occurs south of the Golden Highway. This may be due to foraging habitat in this area occurring outside of the Indicative Development Footprint. If the CWO REZ transmission line currently proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action, the Development Corridor – External Transmission Line would no longer be required. Removal of the Development Corridor – External Transmission Line would not alter impacts on foraging habitat.

As summarised above, breeding habitat for the glossy black-cockatoo has been mapped primarily along the Development Corridor – External Transmission Line. If the CWO REZ transmission line currently proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action, the Development Corridor – External Transmission Line would no longer be required. Removal of the Development Corridor – External Transmission Line would result in the avoidance of impact to potential breeding habitat in the polygon defined under the NSW BAM.

5.4.3.2 Potential Operational Impacts

Operation of the Proposed Action will result in an increase of vehicle activity through construction of a network of internal access tracks, predominantly between turbine locations but also within the transmission line easement for servicing purposes. Such vehicle activity however is unlikely to pose a threat of vehicle strikes to this species.

The prescribed impact assessment prepared to consider the potential impacts associated with turbine strike and barotrauma on protected bird and bat species in accordance with Sections 6.1.5 and 8.3.5 of the BAM (DPIE 2020a), did not identify the glossy-black cockatoo as a species at risk of turbine strike and barotrauma.

5.4.3.3 Potential Decommissioning Impacts

Decommissioning will not clear any potential terrestrial habitat or nesting trees for the glossy black-cockatoo.

5.4.3.4 Significant Impact Criteria Consideration

Assessments relevant to the south-eastern glossy black cockatoo must consider that the subspecies:

- Has a highly specialised diet and preference of individual feed trees.
- Nests only occur in very old trees in large hollows, which take centuries to form naturally.
- Has a specific set of preferences in nesting tree species and hollow characteristics.
- Nests close to, or within, foraging habitat.
- Is a long-lived subspecies with a slow life cycle.

For the purposes of this assessment, criteria are assessed under the following assumptions:

- The conservation advice does not identify any important populations for the species (DCCEEW 2022b). As noted in **Table 5.1**, an important population of a vulnerable species is necessary for a species' long-term survival and recovery. While no evidence of a breeding population has been identified in the Development Corridor and the Proposed Action is not near the limit of the species range, it is likely that individuals observed in the Indicative Development Footprint – External Transmission Line and Public Road Upgrade, are part of an important population of the south-eastern glossy black-cockatoo occurring in habitats south of the Golden Highway.
- The extent of occurrence of the south-eastern glossy black-cockatoo is estimated at 470,000 km² and area of occupancy is estimated at 40,000 km² and likely to be contracting largely due to the 2019/2020 bushfires that affected about 48 per cent of habitat (DCCEEW 2022b).
- 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. Habitat critical to the survival of the south-eastern glossy black-cockatoo include:
 - Foraging habitat as the species feeds exclusively on seeds of *Allocasuarina* spp and *Casuarina* spp.
 - Large hollows in living or dead trees. Features of potential nest hollows for the subspecies have been documented to have the following traits: greater than 8 m above the ground, in branches greater than 30 cm in diameter with the branch or stem no more than 45 degrees from vertical and the hollow has a minimum entrance diameter of greater than 15 cm.
 - Habitat for the long-term maintenance of the 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:

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

The national population is estimated to be about 7,500 individuals with a maximum plausible population of 10,500 and minimum of 6,000 (DCCEEW 2022b). This is based on a density of one mature bird per 200 ha of ideal habitat (DCCEEW 2022b). The national population has undergone a substantial reduction in numbers over three generations, that is 35.7 years (DCCEEW 2022b). NGH recorded the glossy black-cockatoo at 28 locations in the Development Corridor – External Transmission Line south of the Golden Highway.

The Indicative Development Footprint – External Transmission Line and Indicative Development Footprint – Public Road Upgrades will only clear about 2 ha or 37 per cent of potential breeding habitat within the 200 m of potential hollow bearing trees. The Proposed Action would clear about 83.7 ha or 16 per cent of potential foraging habitat in the Development Corridor. The Development Corridor does not support an important population and it is unlikely that clearing of 16 per cent of potential foraging habitat will lead to a long-term decrease in the size of an important population of the species.

Reduce the area of occupancy of an important population

The extent of occurrence of the south-eastern glossy black-cockatoo is estimated at 470,000 km² and area of occupancy is estimated at 40,000 km² and likely to be contracting largely due to the 2019/2020 bushfires that affected about 48 per cent of habitat (DCCEEW 2022b). The Indicative Development Footprint – External Transmission Line and Indicative Development Footprint – Public Road Upgrades will only clear about 2 ha or 37 per cent of potential breeding habitat within the 200 m of potential hollow bearing trees. The Proposed Action would clear about 83.7 ha or 16 per cent of potential foraging habitat in the Development Corridor. The Development Corridor does not support an important population and it is unlikely that clearing of 16 per cent of potential foraging habitat will reduce the area of occupancy of an important population of the species.

<p>An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:</p>
<p>Fragment an existing important population into two or more populations</p>
<p>As a highly mobile species with potential foraging habitat occurring either side of the Indicative Development Footprint – External Transmission Line, clearing for the transmission line (up to 60 m wide) is not likely to fragment an existing important population into two or more populations.</p>
<p>Adversely affect habitat critical to the survival of a species</p>
<p>Habitat critical to the survival of the south-eastern glossy black-cockatoo include:</p> <ul style="list-style-type: none"> • Foraging habitat as the species feeds exclusively on seeds of <i>Allocasuarina</i> spp and <i>Casuarina</i> spp. • Large hollows in living or dead trees. Features of potential nest hollows for the subspecies have been documented to have the following traits: greater than 8 m above the ground, in branches greater than 30 cm in diameter with the branch or stem no more than 45 degrees from vertical and the hollow has a minimum entrance diameter of greater than 15 cm. • Habitat for the long-term maintenance of the species. <p>While no breeding habitat was confirmed during surveys in the Development Corridor, for the purposes of the NSW BAM (DPIE 2020a), the BDAR has assessed the glossy black-cockatoo as a species credit species for breeding habitat. Potential foraging habitat in the south of and contiguous with the Proposed Action Area is likely to be critical to the survival of an important population of the south-eastern glossy black-cockatoo. Mapped breeding habitat was estimated at 5.4 ha within the Development Corridor and an estimated 2.0 ha of habitat was identified as being impacted by the Indicative Development Footprint.</p> <p>There is also approximately 508.0 ha of potential foraging habitat within the Development Corridor of which 83.7 ha will be impacted by the Proposed Action being within the Indicative Development Footprints.</p> <p>The Proposed Action is unlikely to adversely affect habitat critical to the survival of an important population.</p>
<p>Disrupt the breeding cycle of an important population</p>
<p>The glossy black-cockatoo usually occurs in pairs, it is long lived with an estimated generation length of 11.9 years. No evidence of a breeding population of breeding habitat of this species was recorded in the Development Corridor. The Proposed Action is unlikely to disrupt the breeding cycle of an important population of this species.</p>
<p>Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline</p>
<p>The removal of only 2 ha of potential breeding habitat by Indicative Development Footprint will have negligible impact on the availability or quality of habitat for the species.</p> <p>The removal of 83.7 ha of potential foraging habitat by the Indicative Development Footprint is unlikely to impact on the availability or quality of habitat for the species to the extent that the species is likely to decline.</p>
<p>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</p>
<p>Invasive weeds have the ability to change floristics and structural characteristics of habitat however more research is required to assess the species and likely impact on the species (DCCEE 2022b).</p>
<p>Introduce disease that may cause the species to decline, or</p>
<p>The conservation advice identifies Psittacine Beak and Feather Disease, a potentially fatal disease caused by psittacine circovirus, as a relatively low threat for this species. Loss of nesting habitat and increasing competition increases likelihood of disease transmission. The Proposed Action is unlikely increase competition for nesting habitat such that susceptibility to the disease will increase.</p>

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
Interfere with the recovery of the species
<p>Conservation and recovery actions identified in the Conservation Advice include:</p> <ul style="list-style-type: none"> • Protection, restoration and enhancement of known suitable habitat (both breeding and foraging). • Protection of large old trees and ensure recruitment of large old trees for breeding habitat. • Maintain connectivity within and between regions. • Prevention of wildfires and inappropriate fire regimes. <p>The Proposed Action is not expected to:</p> <ul style="list-style-type: none"> • remove large old trees that may provide breeding habitat • result in further fragmentation of habitats such that habitat is isolated • increase inappropriate fire regimes. <p>Based on the above, it is unlikely that the Proposed Action will interfere with the recovery of an important population of the south-eastern glossy black-cockatoo.</p>

5.4.3.5 Discussion

The south-eastern glossy black-cockatoo was identified south of the Golden Highway in the Proposed Action Area however, no evidence of a breeding population was identified. The Proposed Action will clear an estimated 2 ha of breeding habitat and 83.7 ha of foraging habitat within the Indicative Development Footprints. Impacts to breeding habitat will be avoided if the CWO REZ transmission line is adopted by the Proposed Action.

The Development Corridor does not support an important population of the south-eastern glossy black-cockatoo and the Proposed Action is not anticipated to have a significant impact on an important population of the south-eastern glossy black-cockatoo or its habitat.

5.4.4 Painted Honeyeater

5.4.4.1 Potential Construction Impacts

Construction of the Proposed Action would clear up to 627.6 ha of potential habitat with 521.8 ha or 83 per cent in the Indicative Development Footprint – Wind Farm and 105.8 ha or 17 per cent of potential habitat in the Indicative Development Footprint – External Transmission Line. The Proposed Action does not propose any impacts to potential habitat for painted honeyeater within the Indicative Development Footprint – Public Road Upgrades. Much of the potential habitat north of the Golden Highway may be only rarely utilised by painted honeyeater dependent on seasonally unpredictable availability of foraging resources and given the findings of bird surveys conducted in the Development Corridor to date. The species is highly mobile and would continue to utilise habitat in the landscape.

The Proposed Action would remove up to 105.8 ha of potential habitat within the Indicative Development Footprint – External Transmission Line in the main area of occupancy of the painted honeyeater. If the CWO REZ transmission line proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action, the Development Corridor – External Transmission Line component would no longer be required. Removal of the Indicative Development Footprint – External Transmission Line would result in the avoidance of impact to approximately 105.8 ha (or 17 per cent) of potential habitat for the painted honeyeater in the area that is known to support the painted honeyeater.

Clearance of habitat is unlikely to substantially impact the area of occupancy at the landscape scale due to the presence of large areas of equivalent or higher quality habitat immediately adjacent to the Indicative Development Footprints and elsewhere in the Proposed Action Area. Of the 3,407.5 ha of potential habitat identified within the Development Corridor, 2,779.9 ha or 82 per cent will persist beyond the extent of the Indicative Development Footprints (627.6 ha).

5.4.4.2 Potential Operational Impacts

There are no predicted direct or indirect impacts from operation of the Proposed Action on habitat for the painted honeyeater. There are no published records of blade strike of painted honeyeaters in the available literature in Victoria (Moloney et al. 2019) or New South Wales (BCS unpublished data, NGH 2022, Nature Advisory 2020, Nature Advisory 2021a, Nature Advisory 2021b, CWP 2021, CWP 2022 and Eco Logical 2022). However, it is noted that this statement is qualified by acknowledging that the majority of wind farms monitored in Victoria are on the south-western edge or outside of this species' distribution. Notwithstanding the absence of mortality records for the painted honeyeater, the impact assessment in Appendix G of the BDAR (Umwelt 2023a) in **Appendix D** has identified that the overall risk rating of blade strike for the painted honeyeater is Moderate based on a Moderate likelihood of blade strike and a Moderate consequence of collision (refer to **Section 4.3.1** and **Section 5.7**).

5.4.4.3 Potential Decommissioning Impacts

Decommissioning will not clear any potential habitat for the painted honeyeater.

Decommissioning will remove operational impacts for the painted honeyeater.

5.4.4.4 Significant Impact Criteria Consideration

The painted honeyeater is a seasonal, and potentially breeding visitor to the Proposed Action Area and locality, with their occurrence correlated with the availability of flowering mistletoes. For the purposes of this assessment, criteria a, b, c and e are assessed under the assumption that there is only one single population of painted honeyeater in the south of the Development Corridor – External Transmission Line. The Proposed Action Area does not occur within any of the KBA identified for the species (CoA 2021a) but does occur in the region of three of the KBAs, being the Goonoo KBA (to the west), Capertee Valley KBA (to the south) and Pillaga Forests/Scrub (to the north-west).

Based on the definitions of an important population for a vulnerable species as provided in **Table 5.1**, it is unlikely that the population in the south of the Development Corridor is an important population for the species as it is not at the limit of distribution and there is no evidence of breeding such that it is important for maintaining genetic diversity, or dispersal.

Additional assumptions used for the purposes of this assessment include:

- The conservation advice for the painted honeyeater does not identify any important populations for the species (TSSC 2015a).
- The total number of individuals at the time of listing was estimated to be <10 000, based on an extrapolation of counts undertaken in areas of NSW and Victoria. The population is suspected to have declined by 20–29 per cent over the last three generations based on monitoring, a reduced area of occupancy and deteriorating habitat quality (TSSC 2015a).

- The extent of occurrence of the painted honeyeater is estimated to be 2,800,000 km² and area of occupancy is estimated to be 1000 km² (TSSC 2015a).
- The recovery plan (CoA 2021a) defines habitat critical to the survival of the painted honeyeater as:
 - Known or likely breeding habitat in boree/weeping myall, brigalow woodlands, box-gum woodland and box-ironbark forest on the inland slopes of the Great Dividing Range.
 - All preferred foraging species particularly mistletoes of the genus Amyema growing on forest and woodland eucalypts and Acacias.
 - Habitat for long-term survival of the species being all key biodiversity areas with painted honeyeater as a trigger species and suitable habitat in future climate niches.
- Key considerations in environmental impact assessments are that the painted honeyeater occurs across a large area and are known to be highly mobile however knowledge of their movement is not fully understood. Movement may be seasonal linked to plant productivity, food supply and drought impacts (CoA 2021a).

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
lead to a long-term decrease in the size of an important population of a species
<p>The national population of the painted honeyeater was estimated to be roughly 3,750 to 15,000 individuals (TSSC 2015a). It is unknown what the size of the population is in the Ulan – Durrigere – Goulburn River National Park area in the south of the Development Corridor – External Transmission Line.</p> <p>The Proposed Action is unlikely to lead to a long-term decrease in the painted honeyeater’s population size given:</p> <ul style="list-style-type: none"> • The importance of the habitat to be removed for breeding individuals is likely to be low due to the lack of breeding records in the Indicative Development Footprints. • The removal of up to 627.6 ha of potential habitat in the Indicative Development Footprints is unlikely to have an adverse impact on the survival of painted honeyeater utilising foraging resources within, or dispersing through, the greater region, given that the removal of known habitat in the south of the Indicative Development Footprint – External Transmission Line represents about 17 per cent of the impact area for the painted honeyeater. Large tracts of habitat occur in habitat contiguous with the Indicative Development Footprint – External Transmission Line. • The number of individuals that may be or are likely to be impacted by collision as a result of the operation of wind turbines is unlikely to lead to a long-term decrease of the painted honeyeater’s population size given the expected low frequency of individuals flying at RSA height at proposed turbine locations. Implementation of the BBAMP will include triggers levels for further investigation and measures to minimise blade strike impacts. <p>The potential cumulative impact of removal of habitat and loss of individuals due to blade strike is unlikely to lead to a long-term decrease in an important population of the painted honeyeater.</p>
Reduce the area of occupancy of an important population
<p>The extent of occurrence of the painted honeyeater is estimated to be 2,800,000 km² and area of occupancy is estimated to be 1000 km² (TSSC 2015a). The species is not listed as vulnerable due to geographic distribution. The majority of records of the painted honeyeater in the Development Corridor and immediate environs are concentrated in the area south of Durrigere State Conservation Area through to Ulan and Goulburn River National Park. This southern end of the Development Corridor – External Transmission Line appears to be main area of occupancy of the local population.</p>

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

The Proposed Action would remove or modify up to 105.8 ha of potential habitat within the Indicative Development Footprint – External Transmission Line in the main area of occupancy of the painted honeyeater. Overall, the Proposed Action would reduce potential habitat for the painted honeyeater in the Development Corridor by approximately 627.6 ha or 18 per cent of potential habitat. Much of this habitat may be only rarely utilised by painted honeyeater dependent on seasonally unpredictable availability of foraging resources and given the findings of bird surveys conducted in the Development Corridor to date. The species is highly mobile and would continue to utilise habitat in the landscape. Clearance of habitat is unlikely to substantially impact the area of occupancy at the landscape scale due to the presence of larger areas of equivalent or higher quality habitat immediately adjacent to the Indicative Development Footprints and elsewhere in the Proposed Action Area. Of the 3,407.5 ha of potential habitat identified within the Development Corridor, 2,779.9 ha or 82 per cent will persist beyond the extent of the Indicative Development Footprints.

Fragment an existing important population into two or more populations

The Proposed Action is unlikely to fragment an existing population of the painted honeyeater into two or more populations given the painted honeyeater's mobility.

Adversely affect habitat critical to the survival of a species

The recovery plan defines habitat critical to the survival of the painted honeyeater as:

- Known or likely breeding habitat in boree/weeping myall, brigalow woodlands, box-gum woodland and box-ironbark forest on the inland slopes of the Great Dividing Range.
- All preferred foraging species particularly mistletoes of the genus *Amyema* growing on forest and woodland eucalypts and Acacias.
- Habitat for long-term survival of the species being all key biodiversity areas with painted honeyeater as a trigger species and suitable habitat in future climate niches (CoA 2021).

The habitat to be removed is unlikely to be critical to the survival of the painted honeyeater given painted honeyeaters have not been recorded breeding or foraging in the Indicative Development Footprints.

Disrupt the breeding cycle of an important population

The Proposed Action is unlikely to disrupt the breeding cycle of an important population of the painted honeyeater given that the construction and operation of the Proposed Action is unlikely to prevent or adversely disrupt breeding attempts in the Proposed Action Area.

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

The removal of up to 627.6 ha of potential habitat in the Indicative Development Footprints is unlikely to cause the painted honeyeater to decline given that only 105.8 ha or 17 per cent of the impact area is in the Indicative Development Footprint – External Transmission Line, where the painted honeyeater has been recorded and the majority of habitat to be cleared is likely to be more marginal. Up to 82 per cent of potential habitat for the painted honeyeater in the Development Corridor has been avoided.

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

The listing advice identifies that predation by invasive species such as the black rat (*Rattus rattus*) is a threat to painted honeyeater (TSSC 2015a). The Proposed Action is unlikely to exacerbate establishment of black rats that are harmful to painted honeyeater becoming established in painted honeyeater habitat.

Native species identified as a threat include the aggressive noisy miner (*Manorina melanocephala*). Competition from the noisy miner may be exacerbated by clearance and modification of canopy and midstorey.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
Introduce disease that may cause the species to decline, or
The listing advice does not identify any disease that is a threat to the painted honeyeater. Clearance of habitat critical to the survival of a species and competition for resources may increase risk of stress and predisposition to disease.
Interfere with the recovery of the species.
<p>The recovery plan objectives are that by 2031:</p> <ul style="list-style-type: none"> • There is a measured and sustained positive population trend in the number of mature individuals. • The extent, condition and connectivity of habitat of the painted honeyeater has been maintained or improved (CoA 2021a). <p>The Proposed Action interferes with the recovery of the species in that it will remove potential habitat and may fragment connectivity of habitat, particularly in the Indicative Development Footprint – External Transmission Line.</p>

5.4.4.5 Discussion

This assessment has identified that the Proposed Action will clear up to 627.6 ha of potential habitat for the painted honeyeater. Habitat most likely to be used by the local painted honeyeater population occurs along the Development Corridor – External Transmission Line south of Durrigere State Conservation Area. The area around the Development Corridor – External Transmission Line supports large remnants of habitat known to support the painted honeyeater.

If the CWO REZ transmission line proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action, the Development Corridor – External Transmission Line component would no longer be required. Removal of the Indicative Development Footprint – External Transmission Line would result in the avoidance of impact to approximately 108.5 ha (or 17 per cent) of potential habitat for the painted honeyeater in the area that is known to support the painted honeyeater. The proposed operation of the wind farm has a moderate likelihood of impact on individuals from turbine collision, however the number of individuals that may be or are likely to be impacted by collision with wind turbines is unlikely to lead to a long-term decrease of the painted honeyeater’s population size.

The Proposed Action is considered unlikely to result in a significant impact on the painted honeyeater particularly as the majority of habitat identified for the species is potential habitat which may be only rarely utilised.

5.4.5 White-throated Needletail

5.4.5.1 Potential Construction Impacts

In Australia, the white-throated needletail is mostly aerial above wooded areas. Construction of the Proposed Action will clear up to 463.2 ha of wooded habitat over which the white-throated needletail may fly (and forage on insects), impacting on abundance of invertebrates and potential roost sites. The Development Corridor supports 2,348.6 ha of potential wooded habitat for the species, therefore 1,885.3 ha (80 per cent) will not be impacted by the Proposed Action.

In the event that the CWO REZ transmission line currently proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action the External Transmission Line component would no longer be required. Removal of the External Transmission Line component would result in the avoidance of impact to approximately 140.9 ha (or 30 per cent) of impact to potentially suitable terrestrial habitat for the white-throated needletail.

5.4.5.2 Potential Operational Impacts

Operation of the wind farm is likely to have direct (collision) and indirect impacts (barrier and alienation) on the white-throated needletail. Due to its flight behaviour the white-throated needletail is particularly vulnerable to blade strike and is disproportionately represented in Australian blade strike data (Hull et al 2013). A high proportion of the white-throated needletail flight activity is at RSA height. Five birds have been found during post-construction mortality monitoring conducted at 15 wind farms in Victoria from 2003 to 2018 (Moloney et al. 2019). Post-construction mortality monitoring conducted in 2015 recorded two birds at Gullen Range Wind Farm, one in summer and one in autumn (Brett Lane and Associates 2015).

There are 11 records of blade strike of white-throated needletail at both Bluff Point Wind Farm and at Studland Bay Wind Farm in north-west Tasmania (Hull et al. 2013). White-throated needletail are known to have collided with wind turbines in south-east NSW, with much of the data collected in this region being not publicly available (BCD unpublished data). There are six records of deceased white-throated needletail at Capital Wind Farm from 2012/13 on the Atlas of Living Australia. Annual post-construction monitoring recorded a flock of 10 birds at Bodangora Wind Farm within the range of RSA heights in 2021 (Nature Advisory 2021a). This was noted as an incidental observation and that no mortalities were recorded for this species during monitoring.

The prescribed impact assessment in Appendix G of the BDAR (Umwelt 2023b) in **Appendix D** has identified that the overall risk rating of blade strike is High based on a High likelihood of blade strike and Moderate consequence of collision.

5.4.5.3 Potential Decommissioning Impact

Decommissioning will not clear any potential terrestrial habitat for the white-throated needletail.

Decommissioning will remove operational impact risk of blade strike for the white throated needletail.

5.4.5.4 Significant Impact Criteria Consideration

For the purposes of this assessment, criteria are assessed under the following assumptions:

- The conservation advice does not identify any important populations for the species (TSSC 2019).
- Within Australia, the extent of occurrence is estimated at >20,000 sq km, and the area of occupancy estimated at >18,000 sq km (TSSC 2019).
- Critical habitat is undefined in the conservation advice for this species (TSSC 2019).

The referral guidelines for migratory species (DoE 2015) identifies the following considerations for assessment of the impact on the white-throated needletail:

- Important habitat is large tracts of native vegetation particularly forest. The white-throated needletail is found across a range of habitats more often over wooded areas where it is almost exclusively aerial.

- A total of 10 individuals corresponds to an ecologically significant proportion of their population at the national scale while a total of 100 individuals corresponds to an internationally significant proportion of their population (i.e., one per cent of their total population).
- Actions that have an annual mortality rate of 100 individuals constitute a serious disruption to an ecologically significant proportion of the population of white-throated needletail.

The Proposed Action Area is located within a region that is likely to occasionally support an ecologically significant proportion of the white-throated needletail's population.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
lead to a long-term decrease in the size of an important population of a species
<p>The population size of the nominate subspecies within Australia and globally has not been quantified (TSSC 2019). Construction and/or decommissioning of the Proposed Action is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the white-throated needletail is likely to decline. However, operation of the Proposed Action will modify the airspace above and around the wind farm such that white-throated needletail may be at risk of mortality resulting from blade strike while foraging at, or dispersing through, this area.</p> <p>In total there is about 2,348.6 ha of potential habitat within the Development Corridor that they may forage above and/or potentially roost in, of which 463.2 ha would be impacted by the Proposed Action. Therefore 1,885.3 ha (80 per cent) will not be impacted by the Proposed Action.</p> <p>The number of individuals that may be impacted by collision as a result of the operation of turbines in the Indicative Development Footprint – Wind Farm may potentially lead to a long-term decrease in the population size of white-throated needletail given that an ecologically significant proportion of their population is likely to utilise airspace in the vicinity of turbines on an annual basis. The lack of information regarding their level of susceptibility to blade strike in Australia, and more specifically a lack of quantitative information on the proportion of individuals that fly at RSA height that are likely to be impacted by blade strike means that there is a high level of uncertainty when estimating the actual likely number of individuals that may be impacted. Implementation of the BBAMP will include triggers levels for further investigation and measures to minimise blade strike impacts.</p>
Reduce the area of occupancy of an important population
<p>Within Australia, the extent of occurrence is estimated at >20,000 km², and the area of occupancy estimated at >18,000 km² (TSSC 2019).</p> <p>The Proposed Action may potentially result in increased avoidance of airspace within the Indicative Development Footprint – Wind Farm due to the presence of wind turbines.</p> <p>In total 463.2 ha of potential habitat that they may forage above and/or potentially roost in would be impacted by the Proposed Action, and approximately 1,885.3 ha (80 per cent) will not be impacted by the Proposed Action.</p>
Fragment an existing important population into two or more populations
<p>Operation of the wind farm may afford a barrier to movement however it is unlikely to fragment an existing important population of white-throated needletails into two or more populations given the species' mobility and the spatial extent of the wind farm.</p>
Adversely affect habitat critical to the survival of a species
<p>Habitat critical to the survival of the species has not been defined in the conservation advice. Australia provides non-breeding habitat, and the Proposed Action occurs in core non-breeding habitat.</p> <p>In total 463.2 ha of potential habitat that the species may forage above and/or potentially roost in would be impacted by the Proposed Action, and approximately 1,885.3 ha (80 per cent) will not be impacted by the Proposed Action.</p>

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

Due to the dispersed and aerial nature of white-throated needletails it is unlikely that there is any specific habitat critical for the survival of the species outside of their breeding range. Coolah Tops National Park to the north-east of the Indicative Development Footprint – Wind Farm is likely to be an important feature in a regional context for white-throated needletail given its location at the junction of the Liverpool Range and Great Dividing Range. The wind farm is located to the south and west of Coolah Tops National Park and is unlikely to support habitat critical to the species’ survival.

Disrupt the breeding cycle of an important population

The Proposed Action will not disrupt the breeding cycle of white-throated needletail given the location relative to the white-throated needletail’s breeding range (north-east Asia).

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

In total 463.2 ha of potential habitat that they may forage above and/or potentially roost in would be impacted by the Proposed Action, and approximately 1,885.3 ha (80 per cent) will not be impacted by the Proposed Action. However, the Proposed Action is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the white-throated needletail is likely to decline. Operation of the Proposed Action will however modify the airspace above and around the wind farm such that white-throated needletails may be at risk of mortality resulting from blade strike while foraging at, or dispersing through, this area.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species’ habitat

The conservation advice does not identify invasive species that are a known threat for the white-throated needletail. The Proposed Action will not result in invasive species that are harmful to white-throated needletail becoming established in white-throated needletail habitat.

Introduce disease that may cause the species to decline, or

The conservation advice does not identify disease that is a known threat for the white-throated needletail. The Proposed Action is unlikely to result in the introduction of disease that may cause the white-throated needletail to decline.

Interfere with the recovery of the species.

Direct and indirect impacts from wind farms are known threats to white-throated needletail (TSSC 2019) however the number of individuals that are likely to be impacted by the operation of turbines in the Indicative Development Footprint – Wind Farm is unlikely, in isolation, to substantially interfere with the recovery of white-throated needletail.

5.4.5.5 Discussion

Operation of the Proposed Action has the potential to have a significant impact on the white-throated needletail as there is a chance that there could be mortality of an ecologically significant proportion of its population.

5.4.6 Swift Parrot

5.4.6.1 Potential Construction Impacts

Construction of the Proposed Action proposes impacts to 302.5 ha of swift parrot potentially suitable habitat within the Indicative Development Footprints. Of the 1,653 ha of potential habitat identified within the Development Corridor, 1,350.4 ha or 82 per cent will not be impacted by the Proposed Action.

The Proposed Action may reduce the swift parrot's potential foraging habitat. However, clearance of such habitat is unlikely to have any adverse impact on the swift parrot's area of occupancy due to the presence of larger areas of equivalent habitat immediately adjacent to the impact area coupled with the lack of records of swift parrot in or near the Proposed Action Area.

In the event that the CWO REZ transmission line currently proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action the External Transmission Line component would no longer be required. Removal of the External Transmission Line component would result in the avoidance of impact to approximately 16.9 ha (or 6 per cent) of potentially suitable swift parrot habitat.

5.4.6.2 Potential Operational Impacts

Operation of the Proposed Action, including risk of blade strike, will not impact on known breeding habitat or important habitat as defined by NSW DPIE and/or identified in the recovery plan (Saunders and Tzaros 2011). Notwithstanding the absence of mortality records for the swift parrot, the impact assessment in Appendix G of the BDAR (Umwelt 2023a) in **Appendix D**, has identified that there is a moderate likelihood and overall high risk rating (refer to **Section 4.3.1**) of impacting individuals. Considering their current population size and short-term population projections, any occurrence of blade strike would be of considerable importance.

5.4.6.3 Potential Decommissioning Impacts

Decommissioning will not clear any potential terrestrial habitat for the swift parrot. Decommissioning will remove operational impact risks for the swift parrot.

5.4.6.4 Significant Impact Criteria Consideration

For the purposes of this assessment, criteria are assessed under the following assumptions:

- The full extent of occurrence is estimated to be 57000 km². The average area of occupancy for the swift parrot for nesting is estimated to be about 425 km² while the average area of occupancy for nesting and foraging for the species ranges from 18.5 km² to 355 km² between 2009 and 2014 (TSSC 2016a). In summary, the swift parrot has a restricted area of occupancy subject to extreme fluctuations (TSSC 2016a).
- There is only one single migratory population.
- The conservation advice identifies that the most recent population estimate as at 2011 was 2000 birds with moderate confidence in the estimate (TSSC 2016a). There is no recent estimate of number of swift parrots in the wild (National Environmental Science Program Threatened Species Research Hub 2019a) however the population is undergoing dramatic declines due to predation by sugar gliders in nesting habitat (CoA 2019).

- The recovery plan identifies that habitat critical to the survival of the swift parrot includes those areas of priority habitat for which the swift parrot has a level of site fidelity or possesses characteristics likely to be of importance to the swift parrot (Saunders and Tzaros 2011). The draft Recovery Plan defines habitat critical to the survival of the swift parrot as:
 - Any nesting sites or foraging areas where the species is known or likely to occur.
 - Any newly discovered breeding or important foraging areas (CoA 2019).
- In NSW, there are two key management sites identified for the swift parrot being the central coast management site including Lake Macquarie and Newcastle and the Riverina management site including Cootamundra-Gundagai, Greater Hume and Wagga Wagga LGAs. Other areas where management is underway include the coast south of Batemans Bay, area south of Rylstone through to Wallerawang including the western part of Wollemi National Park and an area south of Cowra through to Boorowa.

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:
lead to a long-term decrease in the size of a population
<p>The swift parrot is a single migratory population (Saunders and Tzaros 2011). The conservation advice identifies that in 2010 it was estimated that there were about 2,000 mature individuals and the population was declining and likely to undergo a future very severe reduction in population size over three generations (TSSC 2016a). The species is listed as critically endangered due to reduction in population size (TSSC 2016a). More recently Birdlife Australia Woodland Birds for Diversity website identify that less than 1000 swift parrots exist in the wild (https://birdlife.org.au/projects/woodland-birds-for-biodiversity/swift-parrot-search).</p> <p>The Proposed Action may impact on the population of the swift parrot:</p> <ul style="list-style-type: none"> • Through the removal of 302.5 ha of winter habitat including 205.4 ha (or 68 per cent) of marginal habitat (being Low condition woodlands). The Development Corridor occurs towards the western limit of the mainland range of the species and is not identified as an important habitat for the swift parrot. • Potential (Moderate likelihood, High consequence, overall High risk rating) for blade strike. Considering their current population size and short-term population projections, any occurrence of blade strike would be of considerable importance. Implementation of BBAMP will include triggers levels for further investigation and measures to minimise blade strike impacts. <p>Given the small size of the national population this may contribute further to a decrease in the swift parrot's population size.</p>
Reduce the area of occupancy of the species
<p>The average area of occupancy for the swift parrot for nesting is estimated to be about 425 km² while the average area of occupancy for nesting and foraging for the species ranges from 18.5 km² to 355 km² between 2009 and 2014 (TSSC 2016a). In summary, the swift parrot has a restricted area of occupancy subject to extreme fluctuations (TSSC 2016a). Non-breeding range of swift parrots includes much of the east coast of mainland Australia up to south-east Queensland and inland box gum ironbark woodlands in Victoria and NSW. The conservation advice for the swift parrot recognises that there is strong evidence to support a continuing decline in the area of occupancy and that the area of occupancy fluctuates between years (TSSC 2016a).</p> <p>The Proposed Action may reduce the swift parrot's potential foraging habitat. However, clearance of such habitat is unlikely to have any adverse impact on the swift parrot's area of occupancy due to the presence of larger areas of equivalent habitat immediately adjacent to the impact area coupled with the lack of records of swift parrot in or near the Proposed Action Area. Of the 1,653.0 ha of potential habitat identified within the Development Corridor, 1,350.5 ha or 82 per cent of the Development Corridor will not be impacted of which about half will be woodland habitat. The other half comprises marginal derived native grassland habitat.</p>

<p>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:</p>
<p>Fragment an existing population into two or more populations</p>
<p>There is one national population of the swift parrot. Due to the location and extent of the Proposed Action and the species' mobility it is unlikely that the swift parrot's population will be fragmented into two as a result of the construction and operation of the Proposed Action.</p>
<p>Adversely affect habitat critical to the survival of a species</p>
<p>The recovery plan identifies that habitat critical to the survival of the swift parrot includes those areas of priority habitat for which the swift parrot has a level of site fidelity or possesses characteristics likely to be of importance to the swift parrot (Saunders and Tzaros 2011, CoA 2019). At that time, priority sites were not listed for NSW. The NSW Save our Species Strategy has identified priority management areas for the swift parrot on the central coast from the lower Hunter to beyond Wollongong, the Riverina area and Tarcutta Hills near Wagga.</p> <p>The habitat to be removed by the indicative Development Footprints (302.5 ha) is not located within a priority management area for the swift parrot and given that swift parrot has not been recorded in or near the habitat to be removed it is unlikely that such habitat is critical to the swift parrot's survival.</p>
<p>Disrupt the breeding cycle of a population</p>
<p>The Proposed Action Area occurs in non-breeding habitat for the swift parrot. Major threats to survival of the species are ongoing loss of breeding and foraging habitat in Tasmania and predation by the introduced sugar glider. The Proposed Action is unlikely to disrupt the swift parrot's breeding cycle of the swift parrot.</p>
<p>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</p>
<p>The removal of up to 302.5 ha of potential winter habitat is unlikely to cause the swift parrot to decline given the species' status in the Development Corridor and the avoidance of important habitat to the south of the Proposed Action Area.</p> <p>The Proposed Action may have a cumulative impact on availability of winter habitat and may affect the survival of overwintering swift parrot utilising foraging resources in the region. However, location of the Proposed Action Area relative to important habitat may lessen cumulative impacts to the species.</p>
<p>Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat</p>
<p>The invasive large earth bumblebee (<i>Bombus terrestris</i>) may compete for foraging resources with the swift parrot in Tasmania and mainland Australia (Saunders and Tzaros 2011). The Proposed Action is unlikely to result in invasive species that are harmful to swift parrot becoming established in swift parrot habitat.</p> <p>While they are not invasive species, the native noisy miner (<i>Manorina melanocephala</i>) and rainbow lorikeet (<i>Trichoglossus haematodus</i>) are both aggressive nectar feeders and swift parrots are less likely to occur at known foraging sites when these species are present. The noisy miner is present in the Development Corridor and may have reduced habitat value for the swift parrot. The presence of these aggressive species may be promoted by further fragmentation of habitats.</p>
<p>Introduce disease that may cause the species to decline, or</p>
<p>Psittacine Circoviral Disease (Beak and Feather Disease) is a recognized threatening process for the swift parrot however the prevalence and pathogenicity of the disease in swift parrot is currently unknown (Saunders and Tzaros 2011). Stress and the release of infected birds into the wild increase susceptibility to the disease. The Proposed Action is unlikely to result in the introduction of disease that may cause the swift parrot to decline.</p>

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:

Interfere with the recovery of the species.

The National Recovery Plan for the swift parrot (Saunders and Tzaros 2011) identifies the overall objectives as:

- To prevent further decline of the swift parrot population.
- To achieve a demonstrable sustained improvement in the quality and quantity of swift parrot habitat to increase carrying capacity.

Recovery actions include:

- Action 1 – Identify the extent and quality of habitat. The Proposed Action will not interfere with annual monitoring undertaken by Birdlife Australia and data collected through monitoring under BBMP would add to knowledge.
- Action 2 – Manage and protect Swift Parrot habitat at the landscape scale. The clearing of winter habitat is contrary to this action however the avoidance of important habitat lessens potential impact on a landscape scale.
- Action 3 – Monitor and manage the impact of collisions, competition and disease. While there are no records of blade strike of swift parrot in available literature, the species has the potential to fly at RSA height especially during migration. Data collected under BBMP would add to knowledge.
- Action 4 – Monitor population and habitat. The Proposed Action will not interfere with annual monitoring undertaken by Birdlife Australia and data collected through monitoring under BBMP would add to knowledge.

While they are not invasive species, the native noisy miner (*Manorina melanocephala*) and rainbow lorikeet (*Trichoglossus haematodus*) are both aggressive nectar feeders and swift parrots are less likely to occur at known foraging sites when these species are present. The noisy miner is present in the Development Corridor and may have reduced habitat value for the swift parrot. The presence of these aggressive species may be promoted by further fragmentation of habitats, which in turn could discourage the swift parrot from utilising the Proposed Action Area.

5.4.6.5 Discussion

The Proposed Action would clear about 302.5 ha of potential winter habitat for the swift parrot. The Proposed Action avoids important habitat for the national population, as mapped by NSW DPE, however given the conservation status of the species there is potential that the Proposed Action may have an adverse effect on the local extent of potential foraging habitat for the swift parrot. If the CWO REZ transmission line proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action, the Development Corridor – External Transmission Line component would no longer be required. Removal of the Indicative Development Footprint – External Transmission Line component would result in the avoidance of impact to approximately 16.9 ha (or 6 per cent) of potential habitat for the swift parrot. This would decrease the impact area of the Proposed Action to 285.6 ha of potential habitat.

Operation of the Proposed Action has a Moderate likelihood and overall High risk rating (refer to **Section 4.3.1**) of impacting individuals from turbine collision. However, considering their current population size and short-term population projections, any occurrence of blade strike would be of considerable importance. Implementation of BBAMP will include triggers levels for further investigation and measures to minimise blade strike impacts.

5.4.7 Superb Parrot

5.4.7.1 Potential Construction Impacts

Based on the NSW TBDC, the only PCT which is predicted to provide foraging habitat for the superb parrot within the Development Corridor is PCT 84 and PCT 281. Construction of the Proposed Action may impact approximately 22.9 ha of potential habitat within the Indicative Development Footprint, with 124.2 ha of habitat occurring within the Development Corridor. About 101.2 ha or 82 per cent of potential habitat in the Development Corridor will not be impacted by the Proposed Action.

If the CWO REZ transmission line proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action, the Development Corridor – External Transmission Line component would no longer be required. Removal of the Indicative Development Footprint – External Transmission Line component would result in the avoidance of impact to approximately 12.0 ha (or 52 per cent) of potential habitat for the superb parrot.

The Proposed Action may reduce the superb parrot's potential foraging habitat. However, clearance of such habitat is unlikely to have any adverse impact on the species' area of occupancy due to the presence of larger areas of equivalent habitat immediately adjacent to the impact area coupled with the lack of records of superb parrot in or near the Proposed Action Area.

5.4.7.2 Potential Operational Impacts

Operation of the wind farm may impact birds direct (collision) for those birds flying in the RSA and/or indirect impacts (barrier and alienation). There are no records of blade strike of superb parrot in the available literature from Victoria (Moloney et al. 2019) which is not surprising given the lack of wind farms in the superb parrot's range in north-eastern Victoria. Furthermore, there are no records of blade strike of superb parrot in the available data collected in south-eastern New South Wales to date (BCD unpublished data, NGH 2022, Nature Advisory 2020, Nature Advisory 2021a, Nature Advisory 2021b, CWP 2021, CWP 2022 and Eco Logical 2022). In central-eastern NSW, there are two operational wind farms which may present a risk to superb parrot, namely Bodangora and Blayney. These wind farms are located at the current eastern edge of the superb parrot's range in the Southern Tablelands region. No superb parrot mortalities have been recorded at Bodangora wind farm following two years of monitoring surveys, however bird utilisation surveys recorded a total of 21 superb parrot observations, consisting of between 2 and 10 individuals (Nature Advisory 2021a). Further, no superb parrot mortality has been recorded at Bango Wind Farm following two years of monitoring surveys at Bango Wind Farm, despite the project being located in core superb parrot range (CWP Renewables 2021 and 2022).

Research to be conducted on the movement of superb parrots in New South Wales including at the under construction Bango Wind Farm is likely to improve understanding of the susceptibility of this species to blade strike and indirect impacts resulting from the operation of turbines (Rayner 2019).

Notwithstanding the absence of mortality records for the superb parrot, the impact assessment in Appendix G of the BDAR (Umwelt 2023a in **Appendix D**) has identified that the overall risk rating of blade strike for the superb parrot is Moderate based on a Moderate likelihood of blade strike and a Moderate consequence of collision (refer to **Section 4.3.1**).

5.4.7.3 Potential Decommissioning Impact

Decommissioning will not clear any potential terrestrial habitat for the superb parrot.

Decommissioning will remove operational impact risk of blade strike for the superb parrot.

5.4.7.4 Significant Impact Criteria Consideration

For the purposes of this assessment, criteria are assessed under the following assumptions:

- The extent of occurrence for superb parrots was estimated to be approximately 81,200 km² and the area of occupancy estimated to be 1000 km² in the Bird Action Plan 2000 (Garnett and Crowley 2000). More recent estimates (using the IUCN 2 x 2 km grid method) suggest the AOO is approximately 5,360 km² and the EOO (using the convex hull method) is approximately 317,104 km² (TSSC 2016b).
- The most recent population estimates in 2020 is 20,000 mature individuals with ongoing decline of the wild population across a substantial portion of their range but increasing numbers in the ACT region (CoA 2021b).
- The habitat critical to the survival of the superb parrot includes (CoA 2021b):
 - Breeding habitat in the riverine forests in the Riverina and box-gum woodlands on the inland slopes and tablelands of Victoria, NSW and ACT. These occur within the three KBAs as described in **Section 3.7.8.1**.
 - Any known breeding colony (aggregation of at least four adult pairs that attempt to nest in the same year within an 80 ha area where nest sites area separated by one kilometre) with a 10 km buffer area where contiguous habitat.
 - Any potential nest trees with suitable hollows within the buffer zone.
 - Preferred foraging habitat during breeding and non-breeding season
 - Habitat for the long-term maintenance of the species -being the three KBAs as described in **Section 3.7.8.1**.
- Key considerations in environmental impact assessments are that the superb parrot occurs across a large area of south-eastern Australia and is highly mobile however knowledge of their exact movements is not fully understood (CoA 2021b). Seasonal movement is linked to plant productivity, food supply and drought impacts (CoA 2021b).
- The conservation advice does not identify any important populations for the species (TSSC 2016b). Based on the definitions of an important population for a vulnerable species as provided in **Table 5.1**, it is unlikely that an important population of the superb parrot occurs in the Proposed Action Area as it is not at the limit of distribution and there is no evidence of individual or breeding such that it is important for maintaining genetic diversity, or dispersal.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
lead to a long-term decrease in the size of an important population of a species
<p>The most recent population estimates in 2020 is 20,000 mature individuals with ongoing decline of the wild population across a substantial portion of their range but increasing numbers in the ACT region (CoA 2021b). There is only record of the superb parrot within a 10 km vicinity of the Development Corridor. There is no evidence of an important population of the superb parrot in the Proposed Action Area. It is very unlikely that the Proposed Action would lead to a long-term decrease in the size of an important population of superb parrot.</p>
Reduce the area of occupancy of an important population
<p>The extent of occurrence for superb parrots was estimated to be approximately 81,200 km² and the area of occupancy estimated to be 1000 km² in the Bird Action Plan 2000 (Garnett and Crowley 2000). More recent estimates (using the IUCN 2 x 2 km grid method) suggest the AOO is approximately 5,360 km² and the EOO (using the convex hull method) is approximately 317,104 km² (TSSC 2016b).</p> <p>A total of approximately 22.9 ha of potentially suitable habitat is proposed to be impacted by the Proposed Action. The Development Corridor supports approximately 124.2 ha of potentially suitable habitat, therefore 101.2 ha of potential habitat for superb parrot will not be impacted by the Proposed Action. There is only one record of the superb parrot within a 10 km radius of the Development Corridor.</p> <p>If the CWO REZ transmission line proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action, the Development Corridor – External Transmission Line component would no longer be required. Removal of the Indicative Development Footprint – External Transmission Line component would result in the avoidance of impact to approximately 12.0 ha (or 52 per cent) of potential habitat for the superb parrot.</p> <p>The Development Corridor does not support an important population of the superb parrot and the proposed Action is considered unlikely to reduce the area of occupancy of an important population of the superb parrot.</p>
Fragment an existing important population into two or more populations
<p>There are no records of superb parrot within the Development Corridor.</p> <p>Given the lack of records of superb parrot within the Development Corridor and its surrounds, it is unlikely that the Proposed Action will fragment an existing important population of this species into two of more populations.</p>
Adversely affect habitat critical to the survival of a species
<p>Habitat critical to the survival of the Superb Parrot is defined in the recovery plan (CoA 2021b) as:</p> <ul style="list-style-type: none"> • Breeding habitat in the riverine forests in the Riverina and box-gum woodlands on the inland slopes and tablelands of Victoria, NSW and ACT. These occur within the three KBAs as described in Section 3.7.8.1. • Any known breeding colony (aggregation of at least four adult pairs that attempt to nest in the same year within an 80 ha area where nest sites area separated by one kilometre) with a 10 km buffer area where contiguous habitat. • Any potential nest trees with suitable hollows within the buffer zone. • Preferred foraging habitat during breeding and non-breeding season • Habitat for the long-term maintenance of the species -being the three KBAs as described in Section 3.7.8.1. <p>There are no records of the superb parrot in the Development Corridor and only one record by others within a 10 km radius of the Development Corridor. There is no evidence of breeding population. The Proposed Action Area does not support habitat critical to the survival of the superb parrot.</p> <p>The Proposed Action is unlikely to adversely affect habitat critical to the survival of the superb parrot.</p>

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
Disrupt the breeding cycle of an important population
<p>The superb parrot is known to breed in two distinct habitat types and there are three KBAs described in the recovery plan (CoA 2021b) where superb parrots area known to breed. The loss of tree hollows for nesting has been raised as a significant long-term concern for superb parrots and it has been speculated that the loss of nest trees will lock in future declines (Manning et al. 2013). While no studies have explicitly linked tree hollow abundance to superb parrot breeding success across their range, superb parrots are obligate hollow breeders and there has been extensive loss of hollow bearing trees from within their range, and that loss is ongoing (Manning et al. 2013).</p> <p>A total of approximately 22.9 ha of potentially suitable habitat is proposed to be impacted by the Proposed Action. There are no breeding records of the superb parrot within a 10 km radius of the Development Corridor. The Development Corridor is unlikely to support an important population of the superb parrot. The Proposed Action is unlikely to disrupt the breeding cycle of an important population of superb parrot.</p>
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
<p>A total of approximately 22.9 ha of potentially suitable habitat is proposed to be impacted by the Proposed Action. There are no breeding records and only record of the superb parrot, by others, within a 10 km radius of the Development Corridor. The Proposed Action is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the superb parrot is likely to decline.</p>
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
<p>The conservation advice does not identify any invasive species that area harmful to the superb parrot. Invasive and native species compete for potential nest sites including the common starling (<i>Sturnus vulgaris</i>), galah (<i>Eolophus roseicapilla</i>), the little corella (<i>Cacatua sanguinea</i>) and long-billed corella (<i>Cacatua tenuirostris</i>) may become a problem (TSSC 2016b). The Proposed Action is unlikely to result in invasive species that are harmful to superb parrot becoming established in superb parrot habitat.</p>
Introduce disease that may cause the species to decline, or
<p>Superb parrot is susceptible to Psittacine Circoviral Disease (Beak and Feather Disease). Stress and the release of infected birds into the wild increase susceptibility to the disease. The Proposed Action is unlikely to result in the introduction of disease that may cause the superb parrot to decline.</p>
Interfere with the recovery of the species.
<p>The overall objectives of the Recovery Plan are that by 2031:</p> <ul style="list-style-type: none"> • Habitat critical to the survival of the superb parrot has been identified, and the extent, condition and connectivity of this habitat has been improved. • Conservation action have been spatially prioritised to ensure the resilience of superb parrot populations under climate change. • The impacts from anthropogenic threats have been reduced. <p>Strategies to achieve the overall objectives are:</p> <ul style="list-style-type: none"> • Identify, protect, manage and strategically restore superb parrot breeding, foraging and movement habitats, at the local, regional and landscape scales. • Define, monitor, reduce and manage threats to the superb parrot at the local, regional and landscape scales. • Expand and sustain ecologically meaningful monitoring to track changes in superb parrot distribution, habitat use and population size, including developing and applying techniques to measure the success of recovery actions.

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

- Improve understanding of superb parrot movement ecology across multiple scales to better target protection and restoration measures.
- Engage local communities and stakeholders in superb parrot conservation.
- Coordinate, review and report on superb parrot recovery progress.

The Proposed Action is considered unlikely to interfere with the recovery of the superb parrot.

5.4.7.5 Discussion

A total of approximately 22.9 ha of potentially suitable habitat is proposed to be impacted by the Proposed Action. With 124.2 ha of potentially suitable habitat occurring in the Development Corridor, approximately 101.2 ha of potentially suitable habitat will be avoided by the Proposed Action. There are no evidence of breeding and only one record of the superb parrot by others within a 10 km radius of the Development Corridor. The Development Corridor is unlikely to support an important population of the superb parrot, The Proposed Action is considered unlikely to have a significant impact on the superb parrot.

5.5 Listed Threatened Mammals

5.5.1 Large-eared Pied bat

5.5.1.1 Potential Construction and Decommissioning Impacts

The population size within the Development Corridor and Indicative Development Footprints is not and cannot be known. A total of 572.0 ha of habitat was mapped in accordance with the BAM methodology as part of the biodiversity assessment within the Development Corridor, of which, 106.7 ha will be directly impacted by construction and decommissioning of the Proposed Action. This represents a reduction of 19 per cent of the area of potential habitat mapped in the Development Corridor as defined by the BAM (that is habitat within two kilometres of suitable rocky habitat). Approximately 465.3 ha of potential habitat for large-eared pied bat will not be impacted by the Proposed Action.

The large-eared pied bat is particularly vulnerable to threats that impact shelter and breeding sites. While the Proposed Action will clear about 19 per cent of potential habitat the Proposed Action will not impact on sandstone caves and overhangs and it is anticipated that no individuals will be directly impacted through habitat clearing. Habitat critical to the survival of the species located in nearby conservation areas will not be impacted. The Proposed Action is not expected to result in an adverse impact on a potentially occurring important population of the large-eared pied bat due to the very low density of the species (as evidenced by the lack of records since 2012), no breeding habitat being directly impacted, the retention of substantial areas of potential foraging habitat within the Development Corridor and the mitigation strategies that will be employed as part of the Proposed Action.

In the event that the CWO REZ transmission line currently proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action the External Transmission Line component would no longer be required. Removal of the External Transmission Line component would result in the avoidance of impact to approximately 14 ha (or 13 per cent) of impact to foraging habitat for large-eared pied bat.

5.5.1.2 Potential Operational Impacts

There are no records of blade strike of large-eared pied bat in the available literature from post-construction monitoring conducted and made publicly available (Moloney et al. 2019). Despite there being a substantial lack of information on the flying behaviour of this species, it is possible that the large-eared pied bat will involve flying activity at RSA height.

The Proposed Action has potential to impact on the large-eared pied bat through turbine strike and/or barotrauma, however it is considered that the Proposed Action will not impact on an important population of the species.

The potential risk the Proposed Action poses to the large-eared pied bat in relation to prescribed impacts of turbine strike is detailed in Appendix G of the BDAR (Umwelt 2023a) in **Appendix D**. NGH survey effort recorded the large-eared pied bat at five locations as part of the original assessment, primarily within and adjacent to the Durrigere State Conservation Area as well as one location in the wind farm component of the Proposed Action (NGH 2013a, 2013b and 2017). Umwelt survey effort did not record this species despite extensive surveys. In light of this, the large-eared pied bat received an overall risk rating of Moderate, based on Moderate Likelihood and Moderate Consequence Ratings. The number of individuals is not known and cannot be accurately predicted.

The Proposed Action will result in an increase of vehicle activity through construction of a network of internal access tracks, predominantly between turbine locations but also within the transmission line easement for servicing purposes. Such vehicle activity poses the potential of vehicle strikes to this species.

5.5.1.3 Potential Decommissioning Impact

Decommissioning will not clear any potential habitat for the large-eared pied bat. Decommissioning will remove operational impact risk of blade strike for the large-eared pied bat.

5.5.1.4 Significant Impact Criteria Consideration

For the purposes of this assessment, criteria are assessed under the following assumptions:

- The conservation advice for large-eared pied-bat does not identify any important populations for the species (DCCEEW 2023).
- The national population extent of occurrence is estimated to be 570 000 km² based on the distribution range in Hoyer and Dwyer (1995) (DCCEEW 2023). The area of occupancy is defined by the area supporting maternity roost sites. The area of occupancy is approximately 9120 km² (DCCEEW 2023).
- Any known roost site, or caves that could be roost sites, are considered habitat critical to the survival of the species. These features need to be within reasonable proximity of foraging habitat, which often occurs along water courses in relatively fertile valleys and plains (particularly in NSW) with moderately tall to taller trees. In especially fertile areas (particularly in Qld), foraging also appears to occur along ridge crests and upper slopes of escarpments (DCCEEW 2023b). The presence of such foraging and roosting habitat within close proximity (likely within a few kilometres, although this is an estimate that should not be relied on for management purposes) of each other should be considered habitat critical to the survival of the large-eared pied bat (DCCEEW 2023b).

- Based on the information provided above, particularly with regard to foraging habitat in buffered areas of roosting habitat being considered as habitat critical to the survival of the species, the Proposed Action is assumed to support an important population of the 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:
Lead to a long-term decrease in the size of an important population of a species
<p>The National Recovery Plan (DERM 2011) for the large-eared pied bat determined the species has a declining population. The degree to which this has occurred over the last decade, or three generations, is not published information (DERM 2011). The recent conservation advice identifies that the species total population size likely ranges between 10,000 individuals and 20,000 individuals, however of course not all individuals are mature (DCCEEW 2023b). There is some suggestion of subpopulation sizes for a number of sites, the largest known maternity colony which contains 20-40 females (DCCEEW 2023b). The previous conservation advice suggested up to 100 individuals may be present at maternity roosts (DAWE 2021c).</p> <p>The largest known populations of the large-eared pied bat occur in those areas dominated by sandstone escarpments where high-fertility forest or woodlands occur nearby. Within NSW, based on available records, the largest concentration of populations appears to be in the sandstone escarpments of the Sydney Basin and Northwest Slopes of NSW. Much of this habitat occurs within state reserves and should be the subject of recovery actions, the conservation advice identifies the species occurs specifically in Coolah Tops and Mt Kaputar National Parks. The species has also been recorded from a few locations in the sandstone escarpments of the Morton National Park at the southern end of its range (DERM 2011).</p> <p>In NSW maternity roosts are known in Ukerbarley State Conservation Area, near Coonabarabran, Woodsreef asbestos mine near Barraba, Pilliga National Park and Nature Reserve, Ophir reserve near Orange and potentially near Orange (DCCEEW 2023b).</p> <p>The 2019-2020 wildfires of eastern mainland Australia are considered to have burnt an estimated 27 per cent of habitat for the species, and 10 per cent of the range intersecting with severe fire (DCCEEW 2023b).</p> <p>The population size within the Development Corridor and Indicative Development Footprints is not and cannot be known. Habitat in the Development Corridor has been defined based on suitable PCTs occurring in the impact area within two km of suitable rocky habitat. This analysis identified 106.7 ha of potential habitat occurs in the Indicative Development Footprints. This represents a reduction of 19 per cent of the area of potential habitat mapped in the Development Corridor. No individuals will be directly impacted through habitat clearing. Approximately 465.3 ha of potential habitat for large-eared pied bat will not be impacted by the Proposed Action.</p> <p>The Proposed Action has potential to impact on the species through turbine strike and/or barotrauma, however it is considered that the Proposed Action will not impact on an important population of the species. The number of individuals is not known and cannot be accurately predicted. The Proposed Action will prepare and implement a BBAMP which will assess and monitor micro-bats being impacted by turbine strike and/or barotrauma. Trigger levels will be established as to corrective measures that would be required should the species be impacted by turbine strike and/or barotrauma.</p>
Reduce the area of occupancy of an important population
<p>The national population extent of occurrence is estimated to be 276,333 km² (DCCEEW 2023b). The area of occupancy is defined by the area supporting maternity roost sites. The area of occupancy is approximately <500 km² (DCCEEW 2023b).</p> <p>This species is typically found in areas with extensive cliffs and caves. The species distribution spans from Rockhampton in Queensland, south to Bungonia in the NSW Southern Highlands. The 2021 conservation advice for the large-eared pied bat has identified that much of the known distribution of the species is in NSW with main strongholds are the Sydney sandstone and Pilliga region (DCCEEW 2023b). The conservation advice identifies the species occurs specifically in Coolah Tops National Park and Mt Kaputar National Park. It is generally rare with a very patchy distribution in NSW.</p>

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

This species does have reproductive characteristics that severely limit its ability to increase in population size or occupy new habitat, as the species is reliant on specific habitat for breeding. In NSW maternity roosts are known in Ukerbarley State Conservation Area, near Coonabarabran, Woodsreef asbestos mine near Barraba, Pilliga National Park and Nature Reserve, Ophir reserve near Orange and potentially near Orange (DCCEEW 2023b).

The 2019-2020 wildfires of eastern mainland Australia are considered to have burnt an estimated 27 per cent of habitat for the species, and 10 per cent of the range intersecting with severe fire (DCCEEW 2023b).

Scattered records occur in the south of the Development Corridor – External Transmission Line, around Ulan Mine and to the east into Goulburn River National Park. The sandstone escarpments of the Sydney Basin are likely to support an important population of the large-eared pied bat. A total of 572.0 ha of habitat was mapped in accordance with the BAM methodology as part of the biodiversity assessment within the Development Corridor, of which, 106.7 ha will be directly impacted as part of the Proposed Action. This represents a reduction of 19 per cent of the area of potential habitat mapped in the Development Corridor.

The Proposed Action will alter the aerial space above the wind farm and may result in increased avoidance due to the presence of wind turbines. Implementation of BBAMP will include triggers levels for further investigation and measures to minimise blade strike impacts.

Fragment an existing important population into two or more populations

The removal of 106.7 ha of potential habitat is unlikely to impact upon the viability of any individuals that may occur within the Indicative Development Footprints. Genetic exchange is likely to remain unaffected due to the highly mobile nature of the species. Within the broader Development Corridor, a total of 572 ha of habitat has been mapped for the species. The reduction of 106.7 ha within the Indicative Development Footprints (excluding Indicative Development Footprints – Public Road Upgrades which occur outside of the Development Corridor) represents a 19 per cent reduction in availability of potential habitat in the Development Corridor with significant area of habitat conserved in the nearby Goulburn River National Park and Munghorn Gap. The Proposed Action will not fragment an existing important population of large-eared pied bat into two or more populations given the species' mobility and the spatial extent of the wind farm.

Adversely affect habitat critical to the survival of a species

Any known roost site, or caves that could be roost sites, are considered habitat critical to the survival of the species. These features need to be within reasonable proximity of foraging habitat, which often occurs along water courses in relatively fertile valleys and plains (particularly in NSW) with moderately tall to taller trees. In especially fertile areas (particularly in Qld), foraging also appears to occur along ridge crests and upper slopes of escarpments (DCCEEW 2023b). The presence of such foraging and roosting habitat within close proximity (likely within a few kilometres, although this is an estimate that should not be relied on for management purposes) of each other should be considered habitat critical to the survival of the large-eared pied bat (DCCEEW 2023b).

The large-eared pied bat is dependent on diurnal roosts (disused mine shaft, caves, overhangs, abandoned fairy martin nests) for shelter. This species is reliant on sandstone caves and overhangs for maternity roosts. Almost all records of the species are within several km of cliff lines or rocky terrain and fertile wooded valley habitat. Any maternity roost and nearby fertile valley habitat may be considered habitat critical to the survival of the species. Generally speaking, sandstones caves, cliff lines and overhangs are less susceptible to clearing and/or other impacts. The Proposed Action will not impact on sandstone caves and overhangs but will clear up to 106.7 ha or about 19 per cent of foraging habitat in the Development Corridor (excluding Indicative Development Footprints – Public Road Upgrades which occur outside of the Development Corridor). Habitat critical to the survival of the species located in nearby conservation areas will not be impacted.

<p>An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:</p>
<p>Disrupt the breeding cycle of an important population</p>
<p>Due to its dependence on roost sites for diurnal shelter (caves, overhangs, disused mine shafts and abandoned fairy martin nest) and very specific requirements for maternity roosts (arch caves with dome roofs deep enough to allow juvenile bats to learn to fly in) the large-eared pied bat is particularly vulnerable to threats to these sites. This species does have reproductive characteristics that severely limit its ability to increase in population size or occupy new habitat, as does the reliance on specific habitat for breeding. The Proposed Action does not include a known maternity roost site and is not anticipated to impact on breeding cycle of the population.</p>
<p>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</p>
<p>Up to 106.7 ha of foraging habitat will be cleared or by the Indicative Development Footprints. The habitat that will be removed in the northern portion of the Indicative Development Footprint – Wind Farm is already highly fragmented and disturbed in nature due to the current and historic agricultural use of the land. The removal or modification of foraging habitat along the Indicative Development Footprint – External Transmission Line is unlikely to isolate or decrease the availability of habitat given the mobility of the species. The Proposed Action will remove or modify about 19 per cent of mapped foraging habitat within the Development Corridor (excluding Indicative Development Footprints – Public Road Upgrades which occur outside of the Development Corridor) which will cause minor loss, fragmentation and decrease in quality of potential habitats at a local scale but this is not expected to modify habitat for the species to the point where it will be at risk of further decline.</p>
<p>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</p>
<p>The Proposed Action is not expected to result in invasive species that are harmful to the species becoming established in large-eared pied bat habitat.</p>
<p>Introduce disease that may cause the species to decline, or</p>
<p>The impact of diseases such as white-nose syndrome, caused by the fungus <i>Pseudogymnoascus destructans</i>, is a potential threat to the species however to date this fungus has not been detected in Australia, but is a threat to cave-dwelling bats in other parts of the world and could have a significant impact on the large-eared pied bat if introduced (DCCEEW 2023b). There are no diseases known to be a threat to the species in Australia.</p>
<p>Interfere with the recovery of the species.</p>
<p>The National Recovery Plan (DERM 2011) identifies impacts likely to substantially interfere with the recovery of the large-eared pied bat.</p> <p>The Proposed Action may:</p> <ul style="list-style-type: none"> • result in clearing of vegetation in proximity to potential roosts. <p>The Proposed Action is not expected to:</p> <ul style="list-style-type: none"> • Destroy or interfere with known maternity or other roosts. • Mine known roosts. • Cause subsidence of cliff lines. • Increase human recreational activities near known roosts. • Increase habitat disturbance by other animals (feral and agricultural). • Increase predation by introduced predators. • Increase the chance of fire in close proximity to known roosts. • Cause loss of genetic diversity.

5.5.1.5 Discussion

The Proposed Action is not expected to result in an adverse impact on a potentially occurring important population of the large-eared pied bat due to the very low population density of the species (as evidenced by the lack of records since 2012), no breeding habitat being directly impacted, the retention of substantial areas of potential foraging habitat within the Development Corridor and the mitigation strategies that will be employed as part of the Proposed Action.

In the event that the CWO REZ transmission line currently proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action, the Development Corridor – External Transmission Line component would no longer be required. Removal of the Development Corridor – External Transmission Line would result in the avoidance of impact to approximately 14.0 ha (or 13 per cent) of impact to foraging habitat for large-eared pied bat.

5.5.2 Spotted-tail Quoll (SE mainland population)

5.5.2.1 Potential Construction Impacts

A total of 941.4 ha of potentially suitable spotted-tail quoll habitat is present within the Development Corridor. The Proposed Action will impact approximately 193.9 ha of potentially suitable spotted-tail quoll habitat within the Indicative Development Footprint. There will be approximately 747.4 ha of potentially suitable habitat within the Development Corridor not impacted by the Proposed Action.

In the event that the CWO REZ transmission line currently proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action, the External Transmission Line component would no longer be required. Removal of the External Transmission Line component would result in the avoidance of impact to approximately 98.5 ha (or 51 per cent) of impact to potentially suitable habitat for the spotted-tail quoll.

5.5.2.2 Potential Operational Impacts

The Proposed Action will result in an increase of vehicle activity through construction of a network of internal access tracks, predominantly between turbine locations but also within the transmission line easement for servicing purposes. Such vehicle activity poses the potential of vehicle strikes to this species.

5.5.2.3 Potential Decommissioning Impacts

Decommissioning will not clear potential woodland or forest habitat for the spotted-tail quoll. Vehicle movements pose a potential risk of vehicle strikes to the species.

5.5.2.4 Significant Impact Criteria Consideration

For the purposes of this assessment, criteria are assessed under the following assumptions:

- The extent of occurrence (EOO) is estimated at 596,344 km² and the area of occupancy (AOO) at 2,512 km². These figures are based on the mapping of point records from 1997 to 2017, obtained from state governments, museums and CSIRO (TSSC 2020c).

- Habitat that is critical to the survival of the Spotted-tailed Quoll includes large patches of forest with adequate denning resources and relatively high densities of medium-sized mammalian prey. However, the threshold densities of these critical components required to support quoll populations are unknown. Consequently, it is currently not possible to define (or map) habitat critical to the survival of the Spotted-tail Quoll (TSSC 2020c).

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:
lead to a long-term decrease in the size of a population
<p>A total of 941.4 ha of potentially suitable spotted-tail quoll habitat is present within the Development Corridor. The Proposed Action will impact approximately 193.9 ha of potentially suitable spotted-tail quoll habitat within the Indicative Development Footprint. There will be approximately 747.4 ha of potentially suitable habitat within the Development Corridor not impacted by the Proposed Action.</p> <p>The spotted-tail quoll is a wide ranging species and it is likely that the stronghold of any territory would be in the large conservation reserves adjoining the Proposed Action Area and that individuals may move through and forage within the Development Corridor.</p> <p>This species has not been recorded within the Development Corridor. However, this species has been recorded five times within a 10 km vicinity of the Development Corridor to the south of the Development Corridor, surrounding the Goulburn River National Park.</p> <p>Thus, it is considered unlikely that the Proposed Action would lead to a long-term decrease in the size of a population of spotted-tail quoll.</p>
Reduce the area of occupancy of the species
<p>The extent of occurrence (EOO) is estimated at 596,344 km² and the area of occupancy (AOO) at 2,512 km². These figures are based on the mapping of point records from 1997 to 2017, obtained from state governments, museums and CSIRO (TSSC 2020c).</p> <p>A total of 941.4 ha of potentially suitable spotted-tail quoll habitat is present within the Development Corridor. The Proposed Action will remove approximately 193.9 ha of potential habitat within the Indicative Development Footprint. There will be approximately 747.4 ha (or 79 per cent) of potentially suitable habitat within the Development Corridor not impacted by the Proposed Action.</p> <p>This species has been recorded five times within a 10 km vicinity of the Development Corridor to the south of the Development Corridor, surrounding the Goulburn River National Park which provides higher quality habitat for the species.</p> <p>Thus, while a considerable area of suitable habitat is to be impacted by the Proposed Action, a large proportion of this is relatively low value.</p>
Fragment an existing population into two or more populations
<p>This species has been recorded five times within a 10 km vicinity of the Development Corridor to the south of the Development Corridor, surrounding the Goulburn River National Park. Spotted-tail quoll has not been recorded within the Development Corridor.</p> <p>Thus, it is considered that the Proposed Action is unlikely to fragment an existing population of spotted-tail quoll into two or more populations.</p>
Adversely affect habitat critical to the survival of a species
<p>Habitat that is critical to the survival of the spotted-tailed quoll includes large patches of forest with adequate denning resources and relatively high densities of medium-sized mammalian prey. However, the threshold densities of these critical components required to support quoll populations are unknown. Consequently, it is currently not possible to define (or map) habitat critical to the survival of the spotted-tailed quoll (TSSC 2020c).</p>

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:
<p>Given the threatened status of the spotted-tail quoll, all habitat within its current distribution that are known to be occupied are considered important. As the Development Corridor is not known to contain any spotted-tail quoll, it is considered the Development Corridor does not encompass important habitat for the species. Thus, the Proposed Action is unlikely to adversely affect habitat critical to the survival of the spotted-tail quoll.</p>
Disrupt the breeding cycle of a population
<p>This species has been recorded five times within a 10 km vicinity of the Development Corridor to the south of the Development Corridor, surrounding the Goulburn River National Park. Spotted-tail quoll has not been recorded within the Development Corridor.</p> <p>Thus, it is considered that the Proposed Action is unlikely to disrupt the breeding cycle of a population of spotted-tail quoll.</p>
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
<p>A total of 941.4 ha of potentially suitable spotted-tail quoll habitat is present within the Development Corridor. This species has been recorded five times within a 10 km vicinity of the Development Corridor to the south of the Development Corridor, surrounding the Goulburn River National Park which provides higher quality habitat for the species.</p> <p>Therefore, it is considered that the Proposed Action will impact a considerable area of suitable habitat is to be impacted by the Proposed Action, however, a large proportion of this is relatively low value and higher quality habitat is available within the vicinity.</p>
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
<p>Predation by feral cats (<i>Felis catus</i>), European Red Fox (<i>Vulpes vulpes</i>), Wild Dogs (<i>Canis lupus familiaris</i>), and Cane toads (<i>Rhinella marina</i>) are likely occurring and may be suppressing Spotted-tailed Quoll populations (TSSC 2020).</p>
Introduce disease that may cause the species to decline, or
<p>There are no known diseases which are specifically affecting the spotted-tail quoll. The Proposed Action is considered unlikely to introduce disease that may cause the spotted-tail quoll to decline.</p>
Interfere with the recovery of the species.
<p>Within the life span of this Recovery Plan, the Specific Objectives listed below have been identified as necessary to guide the recovery of the Spotted-tailed Quoll:</p> <ul style="list-style-type: none"> • Determine the distribution and status of Spotted-tailed Quoll populations throughout the range, and identify key threats and implement threat abatement management practices. • Investigate key aspects of the biology and ecology of the Spotted-tailed Quoll to acquire targeted information to aid recovery. • Reduce the rate of habitat loss and fragmentation on private land. • Evaluate and manage the risk posed by silvicultural practices. • Determine and manage the threat posed by introduced predators (foxes, cats, wild dogs) and of predator control practices on Spotted-tailed Quoll populations. • Determine and manage the impact of fire regimes on Spotted-tailed Quoll populations. • Reduce deliberate killings of Spotted-tailed Quolls. • Reduce the frequency of Spotted-tailed Quoll road mortality. • Assess the threat Cane Toads pose to Spotted-tailed Quolls and develop threat abatement actions if necessary.

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:

- Determine the likely impact of climate change on Spotted-tailed Quoll populations.
- Increase community awareness of the Spotted-tailed Quoll and involvement in the Recovery Program.

The Proposed Action is considered unlikely to interfere with the recovery of the spotted-tail quoll.

5.5.2.5 Discussion

Approximately 193.9 ha of potentially suitable habitat is to be impacted by the Proposed Action within the Indicative Development Footprint. There will be approximately 747.4 ha or 79 per cent of potentially suitable habitat within the Development Corridor not impacted by the Proposed Action.

The Proposed Action is not considered likely to result in a significant impact on this species despite the impacts to 193.9 ha of potentially suitable habitat as there will be no direct impacts to the species as these impacts are not considered likely to result in any isolation or fragmentation for the species.

5.5.3 Corben's Long-eared bat

5.5.3.1 Potential Construction Impacts

The Development Corridor supports up to 721.5 ha of potential roosting and foraging habitat. In addition, there are large areas of remnant vegetation at the south of the Development Corridor – External Transmission Line that are known to provide habitat for the species including Goulburn River National Park. It is likely that habitat in the south of the Development Corridor – External Transmission Line is part of an important population of Corben's long-eared bat.

The Indicative Development Footprints will remove or modify up to 156.8 ha of potential foraging and roosting habitat. Approximately 564.7 ha of potential foraging and roosting habitat will not be impacted by the Proposed Action in the Development Corridor. Due to the surrounding areas of protected remnant vegetation, it is unlikely that the Proposed Action will result in a reduction of the area of occupancy for the species.

In the event that the CWO REZ transmission line currently proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action, the Development Corridor – External Transmission Line would no longer be required. Removal of the Development Corridor – External Transmission Line would result in the avoidance of impact to approximately 86.5 ha (or 55 per cent) of impact to potential roosting and foraging habitat for Corben's long-eared bat.

5.5.3.2 Potential Operational Impacts

There are no published records of blade strike of Corben's long-eared bats in the available literature in Victoria (Moloney et al. 2019) or south-east New South Wales (BCD unpublished data) however it should be noted that the majority of wind farms monitored to-date in Victoria are located outside of this species' distribution. Despite there being a substantial lack of information on the flying behaviour of this species, it is possible that the large-eared pied bat will involve flying activity at RSA height.

There are published records of blade strike of the closely related lesser long-eared bat (six strikes) and Gould’s long-eared bat (one strike) in the available literature in Victoria (Moloney et al. 2019). A mortality model for the lesser long-eared bat generated a mortality rate estimate of 0.1 individuals per turbine per year (95 per cent CI 0-0.5) for one particular wind farm (Moloney et al. 2019).

The Proposed Action will alter the aerial space above the wind farm and may result in increased avoidance due to the presence of wind turbines. The Proposed Action has potential to impact on the species through turbine strike and/or barotrauma.

5.5.3.3 Potential Decommissioning Impacts

Decommissioning will not clear any potential habitat for Corben’s long-eared bat.

Decommissioning will remove operational impact risk of blade strike for the Corben’s long-eared bat.

5.5.3.4 Significant Impact Criteria Consideration

For the purposes of this assessment, criteria are assessed under the following assumptions:

- The conservation advice for Corben’s long-eared bat does not identify any important populations for the species (TSSC 2015).
- The area of occupancy for Corben’s long-eared bat is undefined in the conservation advice for this species (TSSC 2015).
- The conservation advice does not identify habitat that is critical for the survival of the species however the majority of records are associated with extensive stands of vegetation and large remnants are likely critical for Corben’s long-eared bat (TSSC 2015).

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

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

The national population of Corben’s long-eared bat is not fully quantified but is likely to be between 5,000 and 20,000 individuals (Pennay et al. 2011). The Conservation Advice (TSSC 2015c) for the species state that there is little information on the current population size and structure and determined that it has a declining population. The species roosts solitarily with maternity colonies of 10 to 20 individuals (TSSC 2015c). Known records indicate that while this species has been recorded near Durrigere State Conservation Area other records occur predominately to the east of the southern end of the external transmission line within the nearby Goulburn River National Park.

The Proposed Action has potential to impact on the species through clearance of up to 156.8 ha of potential roosting and foraging habitat and turbine strike and/or barotrauma associated with the wind farm in the north of the Proposed Action Area. The Development Corridor supports 721.5 ha of potential roosting and foraging habitat, therefore 564.7 ha or 78 per cent of the habitat will not be impacted by the Proposed Action.

The Conservation Advice (2015) states that there is currently little information available to accurately estimate current population numbers. Therefore, this assessment cannot adequately determine if the Proposed Action will have a significant impact on an important population. From known records it appears that the Proposed Action Area is within their known distribution, but outside the area with a high density of records. As this species is highly data deficient the Proposed Action has potential to have a significant impact on the species.

<p>An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:</p>
<p>The Proposed Action will prepare and implement a BBAMP which will assess and monitor micro-bats being impacted by turbine strike and/or barotrauma. Trigger levels will be established as to corrective measures that would be required should the species be impacts by turbine strike and/or barotrauma.</p>
<p>Reduce the area of occupancy of an important population</p>
<p>The area of occupancy for Corben’s long-eared bat is undefined in the conservation advice for this species (TSSC 2015).</p> <p>Corben’s long-eared bat has a patchy distribution across its range which extends from southern central Queensland, through central western NSW, north-west Victoria to eastern South Australia (TSSC 2015c). Most of its range is in the Murray Darling Basin (TSSC 2015c). About 50 per cent of known distribution is in NSW and the Pillaga scrub region is a distinct stronghold for the species (TSSC 2015c). Pennay et al (2011) considered the species relatively uncommon, occurring mostly west of the Great Dividing Range and crossing into the Upper Hunter Valley (Pennay et al 2011). In the locality of the Proposed Action, it is known from Goulburn River National Park (TSSC 2015c). The conservation advice does not provide an area of occupancy.</p> <p>The Development Corridor supports up to 721.5 ha of potential roosting and foraging habitat, of which 156.8 ha will be impacted by the Proposed Action. In addition, there are large areas of remnant vegetation at the south of the Development Corridor – External Transmission Line that are known to provide habitat for the species including Goulburn River National Park. It is likely that habitat in the south of the Development Corridor – External Transmission Line is part of an important population of Corben’s long-eared bat. The Indicative Development Footprint – External Transmission Line will clear or modify up to 86.5 ha or 55 per cent of potential roosting and foraging habitat in the area of occupancy of the important population.</p> <p>The Indicative Development Footprints will remove or modify up to 156.8 ha of potential foraging and roosting habitat. Approximately 564.7 ha or 78 per cent of potential foraging and roosting habitat will not be impacted by the Proposed Action in the Development Corridor. Due to the surrounding areas of protected remnant vegetation, it is unlikely that the Proposed Action will result in a reduction of the area of occupancy for the species.</p> <p>The Proposed Action will alter the aerial space above the wind farm and may result in increased avoidance due to the presence of wind turbines. Implementation of BBAMP will include triggers levels for further investigation and measures to minimise blade strike impacts.</p>
<p>Fragment an existing important population into two or more populations</p>
<p>The removal of up to 156.8 ha of potential roosting and foraging habitat is unlikely to impact upon the viability of any individuals that may occur within the Indicative Development Footprints. Genetic exchange is likely to remain unaffected due to the highly mobile nature of the species.</p> <p>Within the Development Corridor, a total of 721.5 ha of potential roosting and foraging habitat has been mapped. The majority of records of this species are in the south of the Development Corridor – External Transmission Line and in contiguous habitats. The Proposed Action would clear up to 156.8 ha of potential roosting and foraging habitat for the species within the Indicative Development Footprints. While it is noted that Corben’s long-eared bat appears to be highly sensitive to fragmentation from wide-scale clearing for agriculture (Pennay et al 2011), clearance and modification of potential habitat in the Indicative Development Footprint – External Transmission Line, up to 60 m wide, is unlikely to fragment a population. The Proposed Action will not fragment an existing important population of Corben’s long-eared bat into two or more populations given the species’ mobility and the spatial extent of the Proposed Action.</p>
<p>Adversely affect habitat critical to the survival of a species</p>
<p>The conservation advice does not identify habitat that is critical for the survival of the species however the majority of records are associated with extensive stands of vegetation and large remnants are likely critical for Corben’s long-eared bat.</p>

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
Up to 156.8 ha of potential roosting and foraging habitat will be cleared or in the Indicative Development Footprints. Habitat in the south of the Development Corridor – External Transmission Line is continuous with large remnants of potential habitat through to Goulburn River National Park which is known to provide habitat for the species. It is unlikely that the Proposed Action will adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population
There is little available information of Corben’s long-eared bat reproductive biology, breeding is likely to be seasonal with maternity colonies of 10 to 20 individuals in dead trees (TSSC 2015c). Up to 156.8 ha of potential roosting and foraging habitat will be cleared in the Indicative Development Footprints. Goulburn River National Park and other reserves are located within 20 km of the Proposed Action Area and support potential breeding habitat. It is unlikely that the Proposed Action will adversely affect the breeding cycle of an important population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
Up to 156.8 ha of potential roosting and foraging habitat will be cleared in the Indicative Development Footprints. The habitat that will be removed in the north of the Development Corridor – Wind Farm is already highly fragmented and disturbed in nature due to the current and historic agricultural use of the land. The removal or modification of habitat in the Indicative Development Footprint – External Transmission Line, where there are large tracts of contiguous habitat, is unlikely to isolate or decrease the availability of habitat given the mobility of the species. The Proposed Action will remove or modify approximately 156.8 ha of potential roosting and foraging habitat within the Indicative Development Footprints which will cause minor loss, fragmentation and decrease in quality of potential habitats at a local scale but this is not expected to modify habitat for the species to the point where it will be at risk of further decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species’ habitat
The Proposed Action is not expected to result in invasive species that are harmful to the species becoming established in Corben’s long-eared bat habitat.
Introduce disease that may cause the species to decline, or
There are no diseases known to be a threat to the species.
Interfere with the recovery of the species.
There is no adopted recovery plan for this species. Conservation Advice (TSSC 2015) identifies threats likely to substantially interfere with the survival of the species: The Proposed Action may: <ul style="list-style-type: none"> • result in habitat loss and fragmentation • result in a reduction in hollow availability. The Proposed Action is not expected to: <ul style="list-style-type: none"> • increase the likelihood of bushfires in and around the Development Corridor • increase the likelihood of exposure to agrochemicals • increase grazing activities in the Development Corridor • increase predation by feral animals.

5.5.3.5 Discussion

Construction of the Proposed Action would impact approximately 156.8 ha of potential roosting and foraging habitat for the species from within the Indicative Development Footprint.

This assessment has concluded that the Proposed Action is not expected to result in an adverse impact on an important population of Corben's long-eared bat due to the very low population density of the species, the retention of substantial areas of potential breeding and foraging habitat within the Development Corridor and the mitigation strategies that will be employed as part of the Proposed Action. Approximately 564.7 ha of potential roosting and foraging habitat for the species in the Development Corridor will not be impacted by the Proposed Action.

In the event that the CWO REZ transmission line currently proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action the Development Corridor – External Transmission Line would no longer be required. Removal of the Development Corridor – External Transmission Line would result in the avoidance of impact to approximately 86.5 ha of potential roosting and foraging habitat for Corben's long-eared bat.

The Proposed Action will alter the aerial space above the wind farm and may result in increased avoidance due to the presence of wind turbines. The Proposed Action has potential to impact on the species through turbine strike and/or barotrauma.

5.5.4 Greater Glider

5.5.4.1 Potential Construction Impacts

The Indicative Development Footprints will clear up to 19.3 ha of potential habitat within the Development Corridor. In total, there is approximately 111.3 ha of potential habitat for greater glider in the Development Corridor, therefore the Proposed Action will not impact 92.0 ha of potential habitat. The estimate of impacts to 19.3 ha is likely an overestimate of potential habitat for the greater glider which is likely to prefer those areas of potential habitat closer to and contiguous to its stronghold in the Coolah Tops National Park.

Clearing of potential habitat may impact on individuals however implementation of pre-clearing surveys and clearing supervision reduces the risk of injury or mortality of individuals.

Greater gliders are particularly sensitive to fragmentation as they disperse poorly across vegetation that is not native forest. Their low reproductive rate, sensitivity to disturbance and bushfire means that they tend to become locally extinct in small and fragmented habitat patches (DCCEE 2022a). Movement of the greater glider is primarily restricted to gliding between trees and they avoid walking on the ground. When gliding they tend not to glide further than 30 m and have a steeper trajectory than other glider species, likely due to their larger size and mass compared with the other species'.

Within the Development Corridor – Wind Farm the species occurs mainly in habitats on steep slopes contiguous to the Coolah Tops National Park. The Indicative Development Footprint – Wind Farm has avoided large areas of potential habitat for the species in the Development Corridor, contiguous to Coolah Tops National Park, reducing the likelihood of the Proposed Action decreasing the size of a population of the greater glider in the locality as connectivity will be maintained to provide for gene flow and movement of individuals. However, as shown in Figure 3.22, there will be removal of areas of potential habitat for access tracks along ridgelines and some turbine locations 2 – 3 kilometres to the west of Coolah Tops National Park.

Adoption of the CWO REZ transmission line will not change the area of potential habitat cleared by the Proposed Action given that all of the potential habitat for the greater glider occurs in the Development Corridor – Wind Farm.

5.5.4.2 Potential Operational Impacts

The Proposed Action will result in an increase of vehicle activity through construction of a network of internal access tracks, predominantly between turbine locations but also within the transmission line easement for servicing purposes. Such vehicle activity poses the potential of vehicle strikes to this species.

5.5.4.3 Potential Decommissioning Impacts

Decommissioning will not clear any potential habitat for the greater glider.

5.5.4.4 Significant Impact Criteria Consideration

For the purposes of this assessment, criteria are assessed under the following assumptions:

- The extent of occurrence of the greater glider is estimated at 1,066,146 km² and area of occupancy is estimated at 15,316 m² (DCCEEW 2022a).
- Habitat critical to the survival of the greater glider include:
 - Large contiguous areas of eucalypt forest which contain mature hollow-bearing trees and a diverse range of preferred food species. And,
 - Smaller or fragmented habitat patches connected to larger patches of habitat, that can facilitate dispersal of the species and/or that enable recolonization. And,
 - Cool microclimate forest/woodland areas (protected gullies, sheltered high elevation areas, coastal lowland area, southern slopes). And,
 - Areas identified as refuges under future climate changes scenarios. And,
 - Short-term or long-term post fire refuges that allow the species to persist, recover and recolonise burnt areas.
- Habitat in the Development Corridor – Wind Farm that is connected to Coolah Tops National Park is likely to be critical to the survival of the greater glider.

<p>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:</p>
<p>lead to a long-term decrease in the size of a population</p>
<p>There is no robust estimate of the population size of the greater glider with estimates in 2014 of over 100,000 mature individuals and it is highly unlikely that the number of mature individuals is less than 1,000 (DCCEEW 2022a). The species is not listed as endangered due to a low population size.</p> <p>There is a declining trend in population particularly following the 2019-2020 bushfires with estimates of overall population decline of greater than 20 per cent (DCCEEW 2022a). The nearby Coolah Tops National Park is likely to be a significant climate change refuge for this species as it at higher altitude and has not been affected by extensive bushfires with fires recorded being mainly prescribed burns (refer to Figure 3.7). Recent drone surveys by NPWS have recorded a population of at least 1,358 greater gliders in Coolah Tops National Park (pers. Comm. Tilt Renewables 2023). The greater glider was listed under the EPBC Act as vulnerable in 2016 and has been recently assessed to have undergone a severe reduction in numbers of at least 50 per cent over the past three generations (21 years) (DCCEEW 2022a).</p> <p>The Indicative Development Footprints will clear up to 19.3 ha of potential habitat within the Development Corridor, of which supports a total of 111.3 ha. The greater glider which is likely to prefer those areas of potential habitat, external to the Development Corridor, closer to and contiguous to its stronghold in the Coolah Tops National Park. Clearing of potential habitat may impact on individuals however implementation of pre-clearing surveys and clearing supervision reduces the risk of injury or mortality of individuals. These surveys will include the use of nocturnal surveys to detect individuals and drone surveys to identify suitable den hollows in limbs as such hollows may not be detected from the ground.</p> <p>The avoidance of large areas of potential habitat in the Development Corridor, contiguous to Coolah Tops National Park, reduces the likelihood of the Proposed Action decreasing the size of a population of the greater glider in the locality as connectivity will be maintained on the steep slopes to provide for gene flow and movement of individuals. Existing fragmented habitats on the ridgelines may be impacted by construction of the access tracks and wind turbines. Pre-clearance surveys to identify potential locations where clearance for access tracks may be narrowed where possible to reduce the gap between canopies while providing safe access during construction will minimise fragmentation impacts along the ridgelines.</p>
<p>Reduce the area of occupancy of the species</p>
<p>The extent of occurrence of the greater glider is estimated at 1,066,146 km² and area of occupancy is estimated at 15,316 m² (DCCEEW 2022a). In the locality, the greater glider is largely restricted to the Coolah Tops National Park with records in the north-east of the Proposed Action Area.</p> <p>The Indicative Development Footprints will clear up to 19.3 ha of potential habitat within the Development Corridor, of which supports a total of 111.3 ha. The greater glider is likely to prefer those areas of potential habitat closer to and contiguous to its stronghold in the Coolah Tops National Park.</p> <p>The Proposed Action will result in a negligible reduction of the potential area of occupancy for the greater glider in the wider locality or region.</p>
<p>Fragment an existing population into two or more populations</p>
<p>Greater gliders are sensitive to fragmentation and tend to become locally extinct in small and fragmented habitat patches (DCCEEW 2022a). Movement of the greater glider is primarily restricted to gliding between trees and avoid walking on the ground. When gliding they tend not to glide further than 30 m and have a steeper trajectory than other glider species. Within the Development Corridor – Wind Farm the species occurs mainly in habitats on steep slopes contiguous to the Coolah Tops National Park.</p>

<p>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:</p>
<p>The habitats within the north-east of the Development Corridor – Wind Farm currently contain fragmented forest along the ridgelines with connectivity of tree cover on the steep slopes (Figure 3.22). The Proposed Action has avoided large areas of potential habitat in the Development Corridor, contiguous to Coolah Tops National Park, thereby reducing the likelihood of the Proposed Action removing habitat contiguous with the national park that is likely to be more important for the species survival. While connectivity will be maintained on the steep slopes adjoining the Development Corridor, providing for movement of individuals, the existing fragmented tree canopy on the ridgelines may be impacted by construction of the access tracks and wind turbines.</p> <p>Pre-clearance surveys to identify potential locations where clearance for access tracks may be narrowed where possible to reduce the gap between canopies while providing safe access during construction will minimise fragmentation impacts along the ridgelines. The majority of records of the greater glider are in Coolah Tops National Park. Clearing for the Indicative Development Footprint – Wind Farm is unlikely to fragment the existing population.</p>
<p>Adversely affect habitat critical to the survival of a species</p>
<p>Habitat critical to the survival of the greater glider include:</p> <ul style="list-style-type: none"> • Large contiguous areas of eucalypt forest which contain mature hollow-bearing trees and a diverse range of preferred food species. • Smaller or fragmented habitat patches connected to larger patches of habitat, that can facilitate dispersal of the species and/or that enable recolonization. • Cool microclimate forest/woodland areas (protected gullies, sheltered high elevation areas, coastal lowland area, southern slopes). And • Areas identified as refuges under future climate changes scenarios. And • Short-term or long-term post fire refuges that allow the species to persist, recover and recolonise burnt areas. Habitat in the Development Corridor – Wind Farm that is connected to Coolah Tops National Park is likely to be critical to the survival of the greater glider. <p>The Indicative Development Footprint – Wind Farm supports about 19.3 ha of potential critical habitat for the greater glider and will be impacted by the Proposed Action. The majority of potential habitat critical to the survival of the greater glider in the Development Corridor – Wind Farm would not be adversely affected. The Proposed Action avoids habitat critical to the survival of the greater glider within the Coolah Tops National Park.</p>
<p>Disrupt the breeding cycle of a population</p>
<p>The greater glider has a relatively low reproductive rate with a generation length estimated to be six to eight years. No breeding populations of this species been recorded in the Development Corridor – Wind Farm. However, the presence of records of the species within the last 21 years in Coolah Tops National Park is indicative of a breeding population.</p> <p>Clearing of suitable live hollow-bearing trees, foraging resources and fragmentation of habitats may disrupt breeding cycle of the greater glider. However, a large area of potential habitat will be retained in the Development Corridor, in the Proposed Action Area and adjoining Coolah Tops National Park such that the Proposed Action is unlikely to disrupt the breeding cycle of the species.</p>
<p>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</p>
<p>The removal of up to 19.3 ha of potential greater glider habitat within the Indicative Development Footprint will contribute to fragmentation of habitat connected to Coolah Tops National Park. Given the low number of records in the Indicative Development Footprint – Wind Farm it is unlikely that the Proposed Action will modify, destroy, remove, isolate, or decrease the availability or quality of habitat for this species to the extent that the greater glider population in Coolah Tops National Park would be likely to decline.</p>

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:
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 species that are harmful to the greater glider include introduced predators (European red fox and feral cat). The Proposed Action is not expected to result in invasive species that are harmful to the greater glider becoming established.
Introduce disease that may cause the species to decline, or
The conservation advice for the greater glider does not identify any disease that may cause the species to decline.
Interfere with the recovery of the species.
<p>The Development Corridor – Wind Farm and particularly habitat connected to Coolah Tops National Park is likely to be important for achieving recovery objectives for the greater glider.</p> <p>The Proposed Action may:</p> <ul style="list-style-type: none"> • Result in negligible reduction in potential habitat including denning and foraging resources and habitat connectivity. Mitigation standards including pre-clearance surveys and avoidance of felling of trees with large hollows will reduce impacts. <p>The Proposed Action is not expected to:</p> <ul style="list-style-type: none"> • introduce or increase predators • result in further fragmentation of habitats such that Coolah Tops National Park is isolated • result in hydrological changes to the surrounding environment such that the function and integrity of the existing habitat is jeopardised. <p>Based on the above, it is unlikely that the Proposed Action will interfere with the recovery of the greater glider throughout its distribution.</p>

5.5.4.5 Discussion

The Proposed Action will clear up to 19.3 ha of potential habitat within the Development Corridor, of which supports a total of 111.3 ha.

Coolah Tops National Park is a stronghold for the species and likely an important refuge given its higher-altitude forests and managed bushfire history. There are few recordings of greater gliders in the Development Corridor of the Proposed Action with the majority of records in Coolah Tops National Park. In the NSW BAM none of the PCTs recorded in the Development Corridor are associated with the species however, we have identified potential habitat associated with the vegetation zones where NGH (2013a) recorded the species directly adjacent to Coolah Tops National Park.

Clearing of potential habitat may impact on individuals however implementation of pre-clearing surveys and clearing supervision reduces the risk of injury or mortality of individuals. These surveys will include the use of nocturnal surveys to detect individuals and drone surveys to identify suitable den hollows in limbs as such hollows may not be detected from the ground.

While connectivity will be maintained on the steep slopes adjoining the Development Corridor, the existing fragmented tree canopy on the ridgelines (where the Indicative Development Corridor is located) may be impacted by construction of the access tracks and wind turbines. Pre-clearance surveys to identify potential locations where clearance for access tracks may be narrowed, where possible, to reduce the gap between canopies to facilitate gliding while providing safe access during construction will minimise fragmentation impacts along the ridgelines. The avoidance of large areas of potential habitat between the Development Corridor and Coolah Tops National Park, including areas known to support individuals reduces likelihood the Proposed Action will have a significant impact on the greater glider. It is unlikely that the Proposed Action will have a significant impact on the greater glider or its habitat.

5.5.5 Yellow-bellied Glider

5.5.5.1 Potential Construction Impacts

The Proposed Action would clear up to 15.2 ha of potential habitat within the Indicative Development Corridor. With the Development Corridor supporting approximately 87.4 ha of potential habitat for yellow-bellied glider, approximately 72.2 ha will not be impacted by the Proposed Action. No potential habitat for the yellow-bellied glider is predicted to occur in the Development Corridor – External Transmission Line or Development Corridor – Public Road Upgrades.

Adoption of the CWO REZ transmission line will not change the area of potential habitat cleared by the Proposed Action given that all of the potential habitat for the yellow-bellied glider occurs in the Development Corridor – Wind Farm.

5.5.5.2 Potential Operational Impacts

The Proposed Action will result in an increase of vehicle activity through construction of a network of internal access tracks, predominantly between turbine locations but also within the transmission line easement for servicing purposes. Such vehicle activity poses the potential of vehicle strikes to this species.

5.5.5.3 Potential Decommissioning Impacts

Decommissioning will not clear any potential habitat for the yellow-bellied glider.

5.5.5.4 Significant Impact Criteria Consideration

For the purposes of this assessment, criteria are assessed under the following assumptions:

- There is no definition of an important population of the yellow-bellied glider in the conservation advice for this species (DAWE 2022b). However given the abundance of records of the species in the adjacent Coolah Tops National Park, it is possible the population of yellow-bellied glider that resides in that reserve would represent an important population of the species.
- The area of occupancy of the yellow-bellied glider is estimated at 12,724 km² and likely to be contracting due to habitat loss, bushfires and timber harvesting (DAWE 2022b).
- Habitat critical to the survival of the yellow-bellied glider includes (DAWE 2022b):
 - large contiguous areas of floristically diverse eucalypt forest which are dominated by winter-flowering and smooth-barked eucalypts, including mature living hollow-bearing trees and sap trees

- areas identified as refuges under future climate change scenarios
- short-term or long-term post fire refuges that allow the species to persist, recover and recolonize burnt areas
- habitat corridors between fragmented habitat patches to facilitate dispersal or recolonization
- cool microclimate forest/woodland areas (protected gullies, sheltered high elevation areas, coastal lowland area, southern slopes)
- areas in which some trees have evidence of use for sap extraction.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
Lead to a long-term decrease in the size of an important population of a species
<p>There is no reliable estimate of the national population size of the yellow-bellied glider (south-eastern). It was suggested that there are over 100,000 mature individuals in 2014 however modelling of the impact of the 2019–2020 bushfires on the population, have estimated that there has been a decline in the population by 21 to 29 per cent, further the per cent decline is expected to increase in the next three generations (that is about 12 to 15 years) since the fires (DAWE 2022b). Umwelt recorded the yellow-bellied glider in fragmented remnants of PCT 490 in steep slopes above Coolaburragundy River in the north-east of the Development Corridor – Wind Farm and in nearby forested habitats in the Coolah Tops National Park.</p> <p>The species is social and lives in family groups of two to six individuals with exclusive home range of about 56 to 65 ha. The conservation advice suggest that 150 family units is the minimum to ensure a population remains viable with a minimum habitat area to 180 to 350 km² (DAWE 2022b).</p> <p>The Proposed Action would clear up to 15.2 ha of potential habitat within the Indicative Development Corridor. With the Development Corridor supporting approximately 87.4 ha of potential habitat for yellow-bellied glider, approximately 72.2 ha will not be impacted by the Proposed Action. Clearing of potential habitat may impact individuals however implementation of pre-clearing surveys and clearing supervision reduces the risk of injury or mortality of individuals. With implementation of these management measures the Proposed Action may not lead to a long-term decrease in the size of an important population.</p>
Reduce the area of occupancy of an important population
<p>The area of occupancy of the yellow-bellied glider is estimated at 12,724 km² and likely to be contracting due to habitat loss, bushfires and timber harvesting (DAWE 2022b). Modelling suggests that to maintain a viable population of the yellow-bellied glider 180 to 350 km² of suitable forest habitat is required (DAWE 2022b). In the area that the species was recorded known habitats are largely in private rural landholdings and have been fragmented however there is still some connectivity to other remnants in the steep gullies above the Coolaburragundy River and through to habitat in the Coolah Tops National Park.</p> <p>The Indicative Development Footprints will clear up to 15.2 ha of potential habitat within the Development Corridor. This represents about 20 per cent of the territory requirement of one social group. With the Development Corridor supporting approximately 87.4 ha of potential habitat for yellow-bellied glider, approximately 72.2 ha will not be impacted by the Proposed Action and connection to the population in the Coolah Tops National Park will be maintained.</p>
Fragment an existing important population into two or more populations
<p>The yellow-bellied glider is vulnerable to impacts of clearing and fragmentation due to its large home range, requirement for large areas of forest and inability to cross even small areas of cleared land (DAWE 2022b). The yellow-bellied glider has very low dispersal capabilities over spaces larger than its glide ratio (horizontal distance/height dropped) of about 2.0 (DAWE 2022b). The maximum gliding distance is unknown but in taller forests it may be up to 120 to 140 m while in low-canopy forest it is only about 25 m (DAWE 2022b).</p>

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

The conservation advice states that a precautionary approach should be taken to maximise dispersal by considering all habitat corridors to be habitat critical to the survival (DAWE 2022b).

Yellow-bellied gliders were recorded in fragmented habitat on the steep slopes associated with Liverpool Range in the north-east corner of the Proposed Action, to the west of and connected to large areas of forest in Coolah Tops National Park. While up to 15.2 ha of potential habitat would be cleared by the Proposed Action in the Indicative Development Footprint, clearing largely avoids the area with the highest number of records, avoids potential habitat in the steep gullies in the Proposed Action Area and connection to known habitat in the Coolah Tops National Park would be retained such that an important population is not fragmented. With the Development Corridor supporting approximately 87.4 ha of potential habitat for yellow-bellied glider, approximately 72.2 ha will not be impacted by the Proposed Action.

Adversely affect habitat critical to the survival of a species

Habitat critical to the survival of the yellow-bellied glider include:

- large contiguous areas of floristically diverse eucalypt forest which are dominated by winter-flowering and smooth-barked eucalypts, including mature living hollow-bearing trees and sap trees
- areas identified as refuges under future climate change scenarios
- short-term or long-term post fire refuges that allow the species to persist, recover and recolonize burnt areas
- habitat corridors between fragmented habitat patches to facilitate dispersal or recolonization
- cool microclimate forest/woodland areas (protected gullies, sheltered high elevation areas, coastal lowland area, southern slopes), and
- areas in which some trees have evidence of use for sap extraction (DAWE 2022b).

Habitat in the north-east of the Proposed Action Area on steep slopes of the Liverpool Range and in the Coolah Tops National Park is likely to be critical to the survival of the population of yellow-bellied glider in the Proposed Action Area. While up to 15.2 ha of potential habitat would be cleared in the Indicative Development Footprint, clearing largely avoids the area with the highest number of records and also avoids potential habitat in the steep gullies in the Proposed Action Area.

Disrupt the breeding cycle of an important population

The yellow-bellied glider has a generation length estimated to be four to five years, reaching sexual maturity at around two years of age (DAWE 2022b). While no evidence of a breeding population of this species was recorded in the Development Corridor – Wind Farm it is assumed that the north-east of the Proposed Action Area and adjoining Coolah Tops National Park support a viable breeding population, based on the number of individuals recorded.

Clearing of suitable live hollow-bearing trees, sap trees (i.e., feeding) and fragmentation of habitat may disrupt breeding cycle of the yellow-bellied glider. However, a large area of potential habitat will be retained in the Development Corridor – Wind Farm and in the Proposed Action Area such that the Proposed Action is unlikely to disrupt the breeding cycle of an important population of this species. Furthermore, connection of habitat to the adjoining Coolah Tops National Park will be maintained despite impacts of the Proposed Action such that a viable breeding population is considered to be sustainable.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
The removal of up to 15.2 ha of potential yellow-bellied glider habitat by the Proposed Action in the Indicative Development Footprints will contribute to fragmentation of habitat on the steep slopes of the Liverpool Range in the Proposed Action Area. Given the low number of records in the Indicative Development Footprint – Wind Farm and the avoidance of habitat in the north-east of the Development Corridor – Wind Farm and Proposed Action Area, it is unlikely that the Proposed Action will modify, destroy, remove, isolate, or decrease the availability or quality of habitat for this species to the extent that an important population of the yellow-bellied glider would be likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
Invasive species considered a threat to the yellow-bellied glider include the European fox (predation), feral cats (potential predation) and habitat degradation by feral deer (DAWE 2022b). Dieback due to <i>Phytophthora cinnamomi</i> may be impacting the specie through habitat degradation (DAWE 2002b). The Proposed Action is not expected to result in invasive species that are harmful to the species becoming established in yellow-bellied glider habitat.
Introduce disease that may cause the species to decline, or
The conservation advice for the yellow-bellied glider does not identify any disease that may cause the species to decline.
Interfere with the recovery of the species
<p>There is no adopted recovery plan for this species. The Proposed Action may:</p> <ul style="list-style-type: none"> • Result in negligible reduction in potential habitat including den trees and sap resources and habitat connectivity. Mitigation standards including pre-clearance surveys and avoidance of felling of trees with large hollows will reduce impacts. <p>The Proposed Action is not expected to:</p> <ul style="list-style-type: none"> • introduce or increase predators • result in further fragmentation of habitats such that habitat in the north-east of the Proposed Action Area is isolated • result in hydrological changes to the surrounding environment such that the function and integrity of the existing habitat is jeopardised. <p>Based on the above, it is unlikely that the Proposed Action will interfere with the recovery of an important population of the yellow-bellied glider.</p>

5.5.5.5 Discussion

The yellow-bellied glider was not listed as threatened under the EPBC Act at the time of original referral of the Approved Action. This assessment has identified that the Proposed Action will clear up to 15.2 ha of potential habitat within the Development Corridor. With the Development Corridor supporting approximately 87.4 ha of potential habitat for yellow-bellied glider, approximately 72.2 ha will not be impacted by the Proposed Action.

Clearing of potential habitat may impact on individuals however implementation of pre-clearing surveys and clearing supervision reduces the risk of injury or mortality of individuals. The avoidance of large areas of potential habitat, including areas known to support individuals reduces likelihood the Proposed Action will have a significant impact on an important population of the yellow-bellied glider.

Maintaining connection between known habitat in the Proposed Action Area and nearby Coolah Tops National Park reduces likelihood of an impact on an important population as it allows the species to persist, recover and recolonise in the fragmented habitats on the steep slopes to the west of Coolah Tops. The Proposed Action is not anticipated to have a significant impact on an important population of the yellow-bellied glider or its habitat.

5.5.6 Koala

5.5.6.1 Potential Construction Impacts

The Proposed Action will clear up to 720.6 ha of potential habitat within the Indicative Development Footprints of which about 472.2 ha or 66 per cent of potential habitat is low condition or thinned woodland vegetation zones with scattered trees. With the Development Corridor supporting approximately 3,725.7 ha of potential habitat for koala, approximately 3,005.1 ha will not be impacted by the Proposed Action.

Clearing of potential habitat may impact on individuals however implementation of pre-clearing surveys and clearing supervision reduces the risk of injury or mortality of individuals. The avoidance of large areas of potential habitat in the Development Corridor (about 3,005.1 ha or 81 per cent), contiguous to areas known to support individuals based on NSW BioNet Atlas records from 2014 and 2015 (DPIE 2021a), reduces likelihood of the Proposed Action decreasing the size of a population of the koala in the locality as connectivity will be maintained to provide for gene flow and movement of individuals.

The Proposed Action is not expected to result in an adverse impact on a potentially occurring population of the koala due to the very low potential density of the species (as evidenced by the lack of records since 2012), the retention of substantial areas of potential habitat within the Development Corridor and the mitigation strategies that will be employed as part of the Proposed Action. Particular mitigation measures that will facilitate reducing impacts of the Proposed Action on potential koala habitat are the pre-clearance and tree-felling procedures and identification of clearance boundaries to avoid inadvertent impacts. Furthermore, the Indicative Development Footprints are realistic estimates, particularly when compared to the Approved Project (SSD 6696), and opportunities to further reduce impacts will be explored during detailed design. Furthermore, all impacts will be managed through the various management plans that will be required as part of the development consent.

In the event that the CWO REZ transmission line currently proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action, the External Transmission Line component would no longer be required. Removal of the External Transmission Line component would result in the avoidance of impact to approximately 192.3 ha (or 27 per cent) of impact to potential foraging and breeding habitat for the koala. In the event that this situation occurs, the Proposed Action impacts on highly suitable koala habitat would be reduced to 528.3 ha.

5.5.6.2 Potential Operational Impacts

The Proposed Action will result in an increase of vehicle activity through construction of a network of internal access tracks, predominantly between turbine locations but also within the transmission line easement for servicing purposes. Such vehicle activity poses the potential of vehicle strikes to this species.

5.5.6.3 Potential Decommissioning Impacts

Decommissioning will not clear any potential habitat for the koala. Vehicle movements pose a potential risk of vehicle strikes to the species.

5.5.6.4 Significant Impact Criteria Consideration

For the purposes of this assessment, criteria are assessed under the following assumptions:

- The listed population of the koala in Queensland, NSW and the ACT extent of occurrence is estimated at 1,665,850 km² and area of occupancy at 19,428 km² (DAWE 2022d).
- As defined by the EPBC Act, habitat critical to the survival of the koala is the area that the species relies on to avoid or halt decline and promote the recovery of the species. The conservation advice (DAWE 2022d) does not provide a definition of habitat critical to the survival of the koala.

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:
lead to a long-term decrease in the size of a population
<p>The number of mature individuals is estimated in the conservation advice as 92,184 (DAWE 2022d). The koala population in NSW has declined by over 26 per cent in the last three generations (20 years) (DAWE 2022d). In the Brigalow Belt South IBRA Bioregion, it is estimated that the koala population has reduced over the last three generations from 18,821 individuals in 2001 to 8,281 individuals in 2021 (DAWE 2022d). In the Sydney Basin IBRA Bioregion, it is estimated that the koala population has reduced from 5,797 individuals in 2001 to 5,565 individuals in 2021 (DAWE 2022d).</p> <p>The Proposed Action will clear up to 720.6 ha of potential habitat of which about 66 per cent is thinned woodland with scattered trees. With the Development Corridor supporting approximately 3,725.7 ha of potential habitat for koala, approximately 3,005.1 ha will not be impacted by the Proposed Action.</p> <p>Despite the lack of records of koala within the Development Corridor and the scarcity of recent (in the last 20 years) records in the nearby locality, the Development Corridor – External Transmission Line may provide habitat for a low-density population of the koala particularly towards the southern end.</p> <p>A population of 42 koala have been recently detected in Coolah Tops National Park as part of state wide surveys (pers. Comm. Tilt Renewables 2023). With extrapolation of these results, considering extent of the survey effort, it is estimated that approximately 100 koala individuals reside in the Coolah Tops National Park.</p> <p>Clearing of potential habitat may impact on individuals however implementation of pre-clearing surveys and clearing supervision reduces the risk of injury or mortality of individuals.</p> <p>The avoidance of large areas of potential habitat in the Development Corridor (about 3,005.1 ha or 81 per cent), contiguous to areas known to support individuals based on NSW BioNet Atlas records from 2014 and 2015 (DPIE 2021a) and recent surveys in Coolah Tops, reduces the likelihood of the Proposed Action decreasing the size of a population of the koala in the locality as connectivity will be maintained to provide for gene flow and movement of individuals.</p>

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:

Reduce the area of occupancy of the species

The listed population of the koala in Queensland, NSW and the ACT extent of occurrence is estimated at 19,428 km² (DAWE 2022a). The majority of koalas in NSW are found in forests and subhumid woodlands on the central and north coast, and to the west across the Western Plains and slopes, within Pilliga Forest. Areas of koala significance near the Proposed Action Area are focused on Pilliga forest area near Gunnedah and Narrabri to the north-west of the Proposed Action Area.

The Proposed Action will clear up to 720.6 ha of potential habitat which includes vegetation with occurrences of regionally relevant feed trees for the koala. With the Development Corridor supporting approximately 3,725.7 ha of potential habitat for koala, approximately 3,005.1 ha will not be impacted by the Proposed Action. The majority of the potential habitat loss occurs in the Indicative Development Footprint – Wind Farm (510.5 ha) where koala records are fewer. Within the Indicative Development Footprint – External Transmission Line up to 192.3 ha of highly suitable koala habitat will be impacted and 17.8 ha of highly suitable koala habitat will be impacted in the Indicative Development Footprint – Public Road Upgrades, in the area of potential occupancy of the koala.

The Proposed Action will result in a reduction of the potential area of occupancy for the koala in the Proposed Action Area, however this is unlikely to substantially reduce the area of occupancy of the species in the wider locality or region.

Fragment an existing population into two or more populations

The habitats within the north of the Proposed Action Area currently contain fragmented woodlands surrounded by tracts of derived native grasslands and agricultural land. There are records of the koala in Coolah Tops National Park and within 20 km of the north-west of the Development Corridor – Wind Farm. Clearing for the Indicative Development Footprint – Wind Farm is unlikely to fragment an existing population. Habitats in the south of the Development Corridor, south of the Durrigere State Conservation Area (SCA) are continuous with large tracts of habitat around Ulan Mine to the west of Ulan Road and through to Goulburn River National Park, Munghorn Gap and Wollemi National Park. This area is where the majority of koala records are, and this area is more likely to support a population. Clearing and modification of habitat in the Indicative Development Footprint – External Transmission Line is unlikely to present a barrier to movement as individuals are still likely to move across the cleared land.

A population of 42 koala have been recently detected in Coolah Tops National Park as part of state wide surveys (pers. Comm. Tilt Renewables 2023). With extrapolation of these results, considering extent of the survey effort, it is estimated that approximately 100 koala individuals reside in the Coolah Tops National Park. Despite removal of up to 720.6 ha of highly suitable habitat for koala by the Proposed Action in the Indicative Development Footprints, this impact will not fragment the Coolah Tops National Park population.

Adversely affect habitat critical to the survival of a species

As defined by the EPBC Act, habitat critical to the survival of the koala is the area that the species relies on to avoid or halt decline and promote the recovery of the species. The conservation advice (DAWE 2022d) does not provide a definition of or spatially delineates habitat critical to the survival of the koala.

The Development Corridor – External Transmission Line is likely to comprise habitat critical to the survival of the species as the area supports resources necessary for survival and has connectivity with large remnants of habitat, allowing for gene flow and refuges during drought and fire.

Use of habitats within the Proposed Action Area by the koala has not been recorded despite targeted surveys but there are records of the koala within the last 20 years that may indicate generational persistence of the koala, albeit in low numbers. Recently identified population in Coolah Tops National Park confirms generational persistence in habitats adjacent to the Indicative Development Footprint – Wind Farm.

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:
<p>While the Proposed Action will clear and/or modify about 720.6 ha of potential koala habitat in the Indicative Development Footprints, connectivity from Coolah Tops National Park will be retained. Also about 192.3 ha of this habitat occurs in the Indicative Development Footprint – External Transmission Line and the Proposed Action will reduce resource availability however connectivity may still be provided across the 60 m wide transmission line easement.</p>
<p>Disrupt the breeding cycle of a population</p>
<p>The conservation advice identified that nationally there are four spatially distinct genetic koala management units including: Queensland and NSW populations north of the Clarence River Valley; in NSW south of the Clarence River Valley to north of the Sydney Basin; in NSW south of the Sydney Basin to about the border with Victoria; and the Victoria and South Australia population.</p> <p>The Proposed Action occurs at the western edge of the third koala management unit (NSW south of the Sydney Basin to about the border with Victoria). No breeding populations of this species been recorded in the Development Corridor, however the presence of historical records of the koala within the last 20 years is indicative of breeding population particularly in the wider locality in the area of the Development Corridor – External Transmission Line, south of Durrigere State Conservation Area.</p> <p>Impacts in this area will include modification of habitat for a width of up to 60 m wide for the transmission line. This is unlikely to present a barrier to breeding. A large area of potential koala habitat will be retained in the Development Corridor, Proposed Action Area and broader locality. The Proposed Action is therefore unlikely to disrupt the breeding cycle of an important population of this species.</p>
<p>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</p>
<p>The removal or modification of up to 720.6 ha of potential koala habitat will contribute to fragmentation of habitat within the landscape but will leave movement corridors allowing for the species to move across the landscape and access other areas of similar potential habitat in the wider region. Given the low number of records in the Proposed Action Area it is unlikely that the Proposed Action will modify, destroy, remove, isolate, or decrease the availability or quality of habitat for this species to the extent that the koala would be likely to decline.</p> <p>A population of 42 koala have been recently detected in Coolah Tops National Park as part of state wide surveys (pers. Comm. Tilt Renewables 2023). With extrapolation of these results, considering extent of the survey effort, it is estimated that approximately 100 koala individuals reside in the Coolah Tops National Park. Despite removal of 720.6 ha of habitat for koala by the Proposed Action in the Indicative Development Footprints, this impact will not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species or the Coolah Tops National Park population is likely to decline.</p>
<p>Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat</p>
<p>The Proposed Action is not expected to result in invasive species that are harmful to the koala becoming established in koala habitat.</p>
<p>Introduce disease that may cause the species to decline, or</p>
<p>The koala is known to contract strains of Chlamydia and the koala retrovirus. Chlamydia infections are known to cause blindness, pneumonia and reduced female fertility and is almost ubiquitous among koala populations (DAWE 2021b). The koala retrovirus is a gamma retrovirus that has integrated into the koala germ line of northern koala populations (DAWE 2021b). It is implicated in immunodeficiency including leukemia and lymphoma increasing susceptibility to infectious diseases such as Chlamydia (DAWE 2021b).</p>

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:

An emerging disease that affects koala habitat is myrtle rust (*Austropuccinia psidii*) impacting on availability of foraging resources. There are a number of interacting factors involved in susceptibility to disease correlated to population decline. Chronic stress from poor nutrition, reduced habitat quality, exposure to unnatural stressors (dogs, traffic), heat stress, bushfires likely increase susceptibility of the koala to disease and loss of fertility. This is more likely to occur in urban and peri-urban landscapes or in areas of marginal habitat (DAWE 2021b).

The Proposed Action will involve loss of habitat and during construction there will be increase in traffic however this unnatural stress can be managed such that the Proposed Action does not involve any processes that are likely to introduce a disease for the koala that may cause this species to decline.

Interfere with the recovery of the species.

The Proposed Action Area and particularly the contiguous habitat in the southern half of the Development Corridor – External Transmission Line, are likely to be important for achieving recovery objectives for the koala as large tracts are protected as national park estate and there is a diversity of habitat to provide refuge during drought and extreme heat.

The Proposed Action may:

- Result in an increase to vehicle movements, however this will be largely confined to the construction phase and will be negligible during the operational phase. Mitigation standards including speed limits and signage will be employed. Given that vehicles movements in the construction area can be managed is unlikely to subject the koala to increased mortality levels.

The Proposed Action is not expected to:

- introduce or increase dogs to the local area and therefore is unlikely to increase the threat of dog attacks to any local koala population
- result in the creation of substantial additional barriers to koala movement in the local area
- facilitate the introduction or spread of pathogens as *Phytophthora cinnamomic*, myrtle rust (*Austropuccinia psidii*) or *Chlamydia* or
- result in hydrological changes to the surrounding environment such that the function and integrity of the existing habitat for the koala is jeopardised.

Based on the above, it is considered unlikely that the Proposed Action will interfere with the recovery of the koala throughout its range in Qld, NSW and the ACT.

5.5.6.5 Discussion

The Proposed Action will clear up to 720.6 ha of potential habitat within the Indicative Development Footprints. The Proposed Action will clear up to 720.6 ha of potential habitat which includes vegetation with occurrences of regionally relevant feed trees for the koala however about 472.2 ha or 66 per cent of this habitat is thinned woodland with scattered feed trees. With the Development Corridor supporting approximately 3,725.7 ha of potential habitat for koala, approximately 3,005.1 ha will not be impacted by the Proposed Action. Despite the lack of records of koala within the Development Corridor during field surveys and the scarcity of recent (in the last 20 years) records in the nearby locality, the Development Corridor may provide habitat for a population of the koala, particularly towards the southern end of the Development Corridor – External Transmission Line.

If the CWO REZ transmission line proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action, the Development Corridor – External Transmission Line component would no longer be required. Removal of the Indicative Development Footprint – External Transmission Line would result in the avoidance of impact to approximately 192.3 ha of potential habitat for the koala in the area that is more likely to support the koala.

Clearing of potential habitat may impact on individuals however implementation of pre-clearing surveys and clearing supervision reduces the risk of injury or mortality of individuals. The avoidance of large areas of potential habitat, including areas known to support individuals reduces likelihood the Proposed Action will have a significant impact on the koala. It is unlikely that the Proposed Action will have a significant impact on the koala or its habitat.

5.5.7 Grey-headed Flying-fox

5.5.7.1 Potential Construction Impacts

Of the 1,731.4 ha of potential habitat within the Development Corridor, the Proposed Action will clear up to 312.0 ha of potential habitat within the Indicative Development Footprints. Therefore, the Proposed Action will not impact approximately 1,419.4 ha or 82 per cent of potential habitat within the Development Corridor.

In the event that the CWO REZ transmission line currently proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action the External Transmission Line component would no longer be required. Removal of the External Transmission Line component would result in the avoidance of impact to approximately 16.9 ha (or five per cent) of impact to potentially suitable foraging habitat for the grey-headed flying-fox.

5.5.7.2 Potential Operational Impacts

The Proposed Action will result in an increase of vehicle activity through construction of a network of internal access tracks, predominantly between turbine locations but also within the transmission line easement for servicing purposes. Such vehicle activity poses the potential of vehicle strikes to this species.

The grey-headed flying-fox has only been recorded once in the Proposed Action Area over all the years of surveys. As discussed in **Section 3.8.7**, the Proposed Action Area is further from any camps identified in the national flying-fox viewer than the species would routinely fly to forage in a night. The Proposed Action Area is also more than 100 km from any nationally important camp. In summary, any occurrence of the grey-headed flying-fox in the operational area of the wind farm is likely to be very rare and therefore assessment of collision risk from the wind turbines is not considered warranted.

5.5.7.3 Potential Decommissioning Impacts

Decommissioning will not clear any potential foraging habitat for the grey-headed flying fox. Vehicle movements pose a potential risk of vehicle strikes to the species.

5.5.7.4 Significant Impact Criteria Consideration

For the purposes of this assessment, criteria are assessed under the following assumptions:

- An area of occupancy for the grey-headed flying fox has not been defined within the conservation advice for this species (TSSC 2001, DAWE 2021).

- As defined in the recovery plan (DAWE 2021), critical habitat for this species includes:
 - Important winter and spring vegetation communities are those that contain *Eucalyptus tereticornis*, *E. albens*, *E. crebra*, *E. fibrosa*, *E. melliodora*, *E. paniculata*, *E. pilularis*, *E. robusta*, *E. seeana*, *E. sideroxylon*, *E. siderophloia*, *Banksia integrifolia*, *Castanospermum australe*, *Corymbia citriodora citriodora*, *C. eximia*, *C. maculata*, *Grevillea robusta*, *Melaleuca quinquenervia* or *Syncarpia glomulifera*.
 - Where the existence of these important winter and spring flowering vegetation communities is verified in the field, they are considered habitat critical to the survival of the Grey-headed Flying-fox. Back yard fruit trees, orchards or non-native trees that may be used for foraging are not considered to be habitat critical to the survival of the Grey-Headed Flying-Fox.
- Habitat critical to the survival of the Grey-headed Flying-fox may also be vegetation communities not containing the above tree species but which (DAWE 2021):
 - contain native species that are known to be productive as foraging habitat during the final weeks of gestation, and during the weeks of birth, lactation and conception (August to May)
 - contain native species used for foraging and occur within 20 km of a nationally important camp as identified on the Department’s interactive flying-fox web viewer, or
 - contain native and or exotic species used for roosting at the site of a nationally important Grey-Headed Flying-Fox camp as identified on the Department’s interactive flying-fox web viewer (DCCEEW 2023c).
- Two grey-headed flying fox individuals were observed overhead during a bird and bat utilisation survey by Umwelt in January 2023 in the north of the Proposed Action Area, in proximity to the Coolah Tops National Park. The species had not been recorded on any previous survey prior to this.
- Based on the extent of surveys completed for the Project, for the Approved Action, Referred Action and Proposed Action, the record of these two individuals is not considered to represent an important population of the grey-headed flying-fox within the Development Corridor.
 - Instead, the two individuals recorded is considered to represent individuals moving through the landscape.
- The closest known current camp for grey-headed flying-fox is 42 km south-west from the Proposed Action Area in Mudgee NSW. Individuals may forage in the Referral Area from the camp at Mudgee however this camp is over 40 km from the southern end of the Proposed Action, it is likely to be infrequent.
 - The two individuals recorded by Umwelt in January 2023 are more than 90 km to the north of where the known Mudgee camp.
- The closest nationally important flying fox camp is at Muswellbrook, over 100 km to the south-east of the southern end of the Proposed Action Area.

<p>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:</p>
<p>lead to a long-term decrease in the size of a population</p>
<p>According to the numerous national counts conducted between 1998 and 2005, the accepted estimate of the grey-headed flying-fox national population is between 320,000 to 435,000 individuals (DAWE 2021).</p> <p>Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. The nationally significant camp at Muswellbrook (more than 100 km south-east of the southern end of the Proposed Action Area), is more than double the maximum foraging distance for the species. While the closest known camp for the species is about 42 km south-west of the Proposed Action Area, which is within the maximum foraging distance for the species but is approximately double the 'normal' foraging distance for the species. Further, the Mudgee camp is more than 90 km to the south-west of the two individuals recorded in January 2023.</p> <p>Due to the distances of the Proposed Action from known camps for the species, the 1,731.4 ha of potential habitat within the Development Corridor and adjacent habitat in Coolah Tops National Park is not considered likely to be frequently foraged by the species. Instead, roaming individuals through the landscape could occasionally occur as foraging habitat refuge.</p> <p>The Proposed Action will clear up to 312.0 ha the of potential habitat within the Indicative Development Footprints which contains 1,731.4 ha of potential habitat in total. The Proposed Action may also have impacts to individuals through operational activities (i.e. turbine strike), however this is likely to be very uncommon given the scarcity of records and distance from known camps. These impacts are unlikely to result in any long-term decrease in the size of the population.</p>
<p>Reduce the area of occupancy of the species</p>
<p>Grey-headed flying-foxes are highly mobile and appear to be a highly adaptable species in response to changes in their habitat and surrounding environment. A number of 'urban' roost sites that are occupied year-round (Sydney suburbs, Botanic Gardens in Sydney and Melbourne) have become established due to consistently available food resources and suitable roosting habitat. At other 'non-permanent' roost sites, grey-headed flying-foxes have shown themselves to be able to respond rapidly to the presence/absence of food availability.</p> <p>Grey-headed flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. Based on the extent of surveys completed for the Project (including the Approved Action, Referred Action and Proposed Action), the record of two individuals flying overhead in a January 2023 survey is not considered to represent an important population of the grey-headed flying-fox within the Development Corridor. This is supported by the fact that the closest known current camp for the species is some 110 km south-west of the Proposed Action Area in Wellington, NSW. A distance which the species is highly unlikely to commonly travel for foraging activities. It is considered more likely that these two individuals recorded were merely travelling through the landscape.</p> <p>Of the 1,731.4 ha of potential habitat within the Development Corridor, the Proposed Action will clear up to 312.0 ha the of potential habitat within the Indicative Development Footprint, therefore the Proposed Action will not impact approximately 1,419.4 ha or 82 per cent of potential foraging habitat within the Development Corridor. Given the high mobility of the species, the Proposed Action is unlikely to reduce the area of occupancy of the grey-headed flying-fox.</p>
<p>Fragment an existing population into two or more populations</p>
<p>The closest nationally significant grey-headed flying-fox camp is located more than 100 km south-east of the Proposed Action Area in Muswellbrook (DCCEEW 2023c). This is approximately double the maximum foraging distance for the species and five times the 'normal' foraging distance for the species. While the closest camp at Mudgee, is about 42 km to the south-west of the Development Corridor. Individuals may forage in the Proposed Action Area from the camp at Mudgee, however this camp is over 40 km from the southern end of the Proposed Action Area and more than 90 km to the south-west of where the two individuals were observed in January 2023.</p>

<p>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:</p>
<p>The grey-headed flying-fox therefore is unlikely to forage in the 1,731.4 ha of potential habitat identified within the Development Corridor or the adjacent Coolah Tops National Park.</p> <p>Instead, roaming individuals such as the two individuals recorded by Umwelt in January 2023, may infrequently stop in the Coolah Tops National Park or in the Proposed Action Area for foraging refuge as they move through the landscape.</p> <p>As the Proposed Action Area does not support an existing population of the grey-headed flying-fox, nor to any known camps occur within active foraging distance to the Proposed Action Area, the Proposed Action is unlikely to fragment any existing populations of the species. That is despite the Proposed Action clearing up to 312.0 ha of potential habitat within the Indicative Development Footprints, and potential operational impacts that may occur to roaming individuals.</p>
<p>Adversely affect habitat critical to the survival of a species</p>
<p>The grey-headed flying-fox can travel up to 50 km from the camp to forage; commuting distances are more often <20 km. With the closest nationally significant grey-headed flying-fox camp is located approximately 110 km south-east of the Development Corridor (DCCEEW 2023c), in Wellington, NSW. The Proposed Action Area is therefore more than double the maximum foraging distance from a known camp, and more than five times the 'normal' foraging distance from a known camp.</p> <p>The 1,731.4 ha of potential habitat within the Development Corridor, of which the Proposed Action will clear up to 312.0 ha of is not considered to be habitat critical to the survival of the species, given the scarcity of records and distance from known camps, nationally significant or otherwise. The Proposed Action is therefore unlikely to adversely affect habitat critical to the survival of a species.</p>
<p>Disrupt the breeding cycle of a population</p>
<p>The Proposed Action Area occurs more than five times the 'normal' foraging distance for the grey-headed flying-fox (being <20 km) from the nearest camp in Mudgee and double the maximum foraging distance from the nearest nationally significant camp in Muswellbrook. Despite two individuals being recorded in January 2023, the species is unlikely to frequently occur in the Proposed Action Area, and less likely to forage in the 1,731.4 ha of potential habitat within the Development Corridor.</p> <p>The Proposed Action is therefore unlikely to disrupt the breeding cycle of a population.</p>
<p>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</p>
<p>Grey-headed flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. Of the 1,731.4 ha of potential habitat within the Development Corridor, the Proposed Action will clear up to 312.0 ha of potential habitat within the Development Corridor. The Proposed Action will therefore not impact 1,419.4 ha of potential habitat within the Development Corridor.</p> <p>Given the high mobility of the species, extent of potential habitat in the adjacent Coolah Tops National Park and also extent of potential habitat closer to the known population in Mudgee, NSW, the Proposed Action is unlikely to reduce the area of occupancy of the grey-headed flying-fox.</p>
<p>Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat</p>
<p>Invasive species that are harmful to the grey-headed flying-fox include introduced predators such as the European red fox and feral cat.</p> <p>The Proposed Action is not expected to result in invasive species that are harmful to the grey-headed flying-fox becoming established. The European red fox is highly likely to occur in the Proposed Action Area already, as to may the feral cat. Assuming they do, the Proposed Action is not considered likely to lead to or facilitate an increase in population of these two species in the Proposed Action Area.</p>

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:
Introduce disease that may cause the species to decline, or
<p>Australian flying-foxes, including the grey-headed flying-fox, are natural reservoirs for at least three zoonotic diseases, meaning that they carry a disease agent that can affect humans: Australian Bat Lyssavirus, a rabies-like disease, and two paramyxoviruses – Hendra virus and Menangle virus (DAWE 2021).</p> <p>Research suggests that Australian flying-foxes may also be carriers for pathogenic <i>Leptospira</i> species, although they are not considered to pose a significant risk to humans of leptospirosis (DAWE 2021).</p> <p>The Proposed Action is considered unlikely to introduce a disease that may cause the species to decline.</p>
Interfere with the recovery of the species.
<p>The national recovery plan for the grey-headed flying-fox (DAWE 2021) lists the following threats to the species which are likely to occur to an extent of the Proposed Action:</p> <ul style="list-style-type: none"> • Habitat loss, particularly clearing of winter foraging species. <p>Of the 1,731.4 ha of potential habitat within the Development Corridor, the Proposed Action will clear up to 312.0 ha of potential habitat within the Development Corridor. The potential habitat impacted by the Proposed Action will include the clearing of winter foraging species. However, given the distance of the Proposed Action Area from the nearest nationally significant camp (>100 km south-east in Muswellbrook) and known camp (>40 km in Mudgee), the species is unlikely to forage in the Proposed Action Area. Therefore, the Proposed Action is unlikely to significantly interfere with the recovery of the grey-headed flying-fox.</p>

5.5.7.5 Discussion

The Proposed Action is considered unlikely to significantly impact on the grey-headed flying-fox. Despite the Proposed Action impacting 312.0 ha of the total 1,731.4 ha of potential foraging habitat within the Development Corridor, the sheer distances from the nearest known national camp and nearest camp make the species unlikely to frequently forage within the Proposed Action Area.

5.6 Migratory Species

5.6.1 International Obligations Relating to Migratory Birds

5.6.1.1 Bilateral Agreements

Australia entered into bilateral agreement to conserve migratory birds in the East Asian – Australasian Flyway with Japan (Japan-Australia Migratory Bird Agreement (JAMBA)), China (China-Australia Migratory Bird Agreement (CAMBA)) and the Republic of Korea (Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)). The agreements for:

- Protection and conservation of migratory birds and their important habitats.
- Protection from take or trade.
- The exchange of information and building cooperative relationships.

The EPBC Act gives effect to Australia’s obligations to pursuing conservation outcomes for migratory birds of these agreements through the protection of migratory bird species listed under the Act and under these agreements.

Of the MNES relevant to the Proposed action that are listed as migratory species, only the white-throated needletail is listed under the bilateral agreements being listed under all three agreements. Assessments of the impact of the Proposed Action on the white-throated needletail has been provided in **Section 5.4.5**. As a largely aerial species the assessment is focused on risks associated with the wind turbine collision.

5.6.1.2 The Bonn Convention

Australia is signatory to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). The Bonn Convention provides a global platform for the conservation and sustainable use of migratory species and their habitats and migration routes.

The convention definition of migratory species is ‘the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries’. This definition has been adopted in the EPBC Act.

The Bonn Convention prioritises protection of migratory species listed in Appendix I of the Convention as threatened with extinction, protecting these animals, conserving or restoring their habitats and mitigating obstacles to migration. Migratory species that need or would significantly benefit from international cooperation are listed in Appendix II of the Bonn Convention.

The white-throated needle-tail is not listed under either Appendix I or II of the Bonn Convention. MNES assessed in Section 3.10 relevant to the Proposed Action that are listed as a migratory species under Bonn Convention include the black-faced monarch, satin flycatcher and rufous fantail. None of these species are listed individually in Appendix I of the Bonn Convention but are listed as A2H that is as a member of a family listed in Appendix II of the Bonn Convention as species that are native to Australia and are known to be cyclical and predicable migrants into and out of Australia. The Development Corridor provides habitat that may be used by the satin flycatcher during migration but does not provide habitat suitable for any of the species.

5.6.2 Satin Flycatcher

5.6.2.1 Potential Construction Impacts

Construction of the Proposed Action would clear up to 101.8 ha of the 542.3 ha of potential marginal habitat identified in the Development Corridor. The potential habitat identified within the Proposed Action Area is considered seasonal migratory habitat in that the species may only occupy the potential habitat when migrating.

In the event that the CWO REZ transmission line currently proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action the External Transmission Line component would no longer be required. Removal of the External Transmission Line component would result in the avoidance of impact to approximately 30.4 ha (or 30 per cent) of impact to potentially suitable habitat for the satin flycatcher.

Clearance of habitat is unlikely to substantially impact the area of occupancy at the landscape scale due to the presence of an additional 440.5 ha (or 81 per cent) of potential seasonal migratory habitat that will not be impacted in the Development Corridor of the Proposed Action.

5.6.2.2 Potential Operational Impacts

There are no predicted direct or indirect impacts from operation of the Proposed Action on habitat for the satin flycatcher. While there are no known record of the species having been impacted directly by wind farms, it is also considered unlikely to occur given the nature and habit of the species in which it will most likely utilise gullies and water courses (Birdlife Australia 2023b) habitats.

5.6.2.3 Potential Decommissioning Impacts

Decommissioning will not clear any potential foraging habitat for the satin flycatcher and would not affect migration.

5.6.2.4 Significant Impact Criteria Consideration

The satin flycatcher is listed as a migratory species under the Bonn Convention and as a listed marine species under Section 248 of the EPBC Act. The satin flycatcher is widespread in eastern Australia and vagrant to New Zealand. In NSW, they are widespread on and east of the Great Dividing Range and sparsely scattered on the western slopes, with very occasional records on the western plains (Birdlife Australia 2023b).

The satin flycatcher shows a north-south migration throughout its range. In NSW, they depart in February and March, and around Sydney they are mainly recorded on passage moving north between February and April. Satin flycatchers arrive in NSW, or are recorded on passage, between September and October.

While most birds migrate north through the eastern coastal region, a small number consistently deviate from the coast and migrate inland through South Australia, generally recorded between December–June.

While there are no records of the satin flycatcher in the Development Corridor and only a few publicly available records of the satin flycatcher in Coolah Tops National Park between 1998 and 2003 (refer to Section 3.9.2) the paucity of records may be an artefact of recording of sightings given the species is not listed as threatened. Given the presence of habitats within the inland migratory route for the species it has been assumed that the satin flycatcher may use habitats in the Development Corridor during migration.

The global population size has not been quantified, but the species is reported to be commonest in the south of its range in Australia (especially Tasmania) and scarce in the north. The range of the population and the extent of the habitat used suggest that the population is at least tens of thousands.

For the purposes of this assessment, an area of ‘important habitat’ for a migratory species is:

- a. 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
- b. habitat that is of critical importance to the species at particular life-cycle stages, and/or
- c. habitat utilised by a migratory species which is at the limit of the species range, and/or
- d. habitat within an area where the species is declining.
- e. It is unlikely that the Development Corridor is an area of important habitat for the satin flycatcher.

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
<p>While migrating, the satin flycatcher may occur in wooded habitats including dry eucalypt forests and woodlands dominated by Blakely's red gum (<i>Eucalyptus blakelyi</i>), mugga ironbark (<i>Eucalyptus sideroxylon</i>), Yellow Box (<i>Eucalyptus melliodora</i>), white box (<i>Eucalyptus albens</i>), manna gum (<i>Eucalyptus viminalis</i>) or stringybarks (Birdlife Australia 2023b). There is 542.3 ha of potential marginal migratory habitat identified in the Development Corridor, of which the Proposed Action will impact 101.8 ha.</p> <p>The potential habitat is considered marginal migratory potential habitat and not considered to represent important habitat for the satin flycatcher. The adjoining habitat in Coolah Tops National Park is far more likely to support important habitat for the species given the scattered records within the national park.</p> <p>The Proposed Action is unlikely to substantially destroy or isolate important habitat of satin flycatcher habitat although it may modify the airspace above the Indicative Development Footprint – Wind Farm such that the migratory species may be at risk of mortality resulting from blade strike while foraging at or dispersing through this location.</p>
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 Proposed Action will not result in an invasive species that is harmful to the migratory species becoming established in an area of important for the migratory species.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.
While the Proposed Action may not form a barrier to the migratory species during migration, or feeding during migration, it is possible that it will increase mortality of these species during the migratory period. There is insufficient data to determine whether annual mortality of the migratory species is likely to exceed the thresholds for an ecologically significant proportion of the migratory species' populations. The Proposed Action may seriously disrupt the lifecycle of an ecologically significant proportion of the migratory species' population.

5.6.2.5 Discussion

The Development Corridor is unlikely to be an area of important habitat and is considered marginal potential seasonal migratory habitat for the satin flycatcher. Given the low number of records of the satin flycatcher in adjacent habitats in Coolah Top and no records in the Development Corridor the Proposed Action is unlikely to significantly impact on the migratory satin flycatcher.

5.7 Impacts to Listed Threatened and Migratory Bird and Bat Species Associated with Wind Turbines

Section 4.3.1 provides preliminary consideration of collision risk (including barotrauma), a potential operational impact of the Proposed Action and wind industry more broadly. In response to the PER Guidelines, further information is provided below in relation to site characteristics and utilisation of the Development Corridor by listed threatened and migratory bird and bat species that may fly in the RSA and therefore are at potential risk of turbine strike and barotrauma from the Proposed Action during its operational phase.

The following assessment has been prepared based on desktop assessment and site-specific assessment including but not limited to recorded flight data collected during bird and bat utilisation surveys (BBUS) between 2012 and 2015 by NGH and between 2020 and 2023 by Umwelt at the Proposed Action Area. This assessment has relied upon the detailed prescribed impact assessment prepared for the BDAR (Umwelt 2023a) in accordance with Sections 6.1.5 and 8.3.5 of the BAM (DPIE 2020a). The prescribed impact assessment is provided in full in Appendix G (Umwelt 2023a) of **Appendix D** outlining the assessment approach based on Umwelt's experience and consultation with NSW BCS.

5.7.1 Bird and Bat Utilisation Surveys

Umwelt has completed BBUS in August 2020 and January 2023 to contribute to previous extensive BBUS programs undertaken by NGH.

NGH bird utilisation surveys recorded (by sight and vocalisations) within the search area, flying overhead and outside the search area. The following variables were also recorded:

- number of individuals
- distance from observer
- flight height AGL (0–20 metres, 21–40 metres, 41–165 metres and >165 metres)
- bird behaviour.

Each survey was 30 minutes in length. Surveys completed included 24 bird utilisation surveys undertaken between October 2012 and October 2013 and four bird utilisation surveys in March 2015.

In 2017 NGH completed 34 bat utilisation sites. Each site included the deployment of an Anabat recorder at or near ground level. Each site was surveyed overnight (NGH 2017).

Umwelt completed a single comprehensive BBUS program in May 2020, as well as an additional Bird Utilisation programs in August 2020 and January 2023. Umwelt used vantage point surveys to assess bird and bat site utilisation and characterise flight behaviour of birds in the Proposed Action Area, but the surveys were specifically undertaken within the Development Corridor. Vantage points were selected to provide suitable spatial coverage, generally at elevated locations with high visibility over the surrounding area (including turbine locations).

The purpose of the BBUS was to:

- Identify 'At Risk' species, being those that are susceptible to collision-based impacts due to observed flight behaviours.
- Be undertaken in accordance with the Best Practice Guidelines for Implementation of Wind Energy projects in Australia (Clean Energy Council 2018).
- Align with industry guidelines for the assessment of impacts from wind farms on birds and bats (AusWEA, 2005).

Bird utilisation was determined by recording all observed bird species and observed abundances at each vantage point. A total of seven bird utilisation sites were surveyed in May 2020, each site was surveyed over three survey periods (morning, noon and evening), twice. In addition to bird species and abundances being recorded, the following bird behaviour was also collected where applicable:

- observation type (visual or aural)
- the distance and direction of the bird from the observer (to the nearest 10 metres and 10 degrees respectively)
- estimated height of flight AGL (to the nearest 5 metres below 30 metres and to the nearest 10 metres at and above 30 metres)
- direction of travel (to the nearest 10 degrees)
- flight pattern (not flying, local movement, directional flight, circling, stooping, varied, other)
- for birds observed not in flight, behaviour would be noted (perched, foraging, aggressive behaviour, mating etc.).

A total of 16 bird utilisation surveys were completed across the seven sites in May 2020. Two bird utilisation sites were surveyed in August 2020, each site was surveyed twice, totalling four bird utilisation surveys. Bird utilisation surveys were completed over a one (1) hour period. A further 18 bird utilisation surveys were completed in January 2023, across three additional BBUS sites, in the north-east of the Proposed Action Area near the boundary of Coolah Tops National Park. Each BBUS site was surveyed twice in each of the morning, midday and afternoon time periods. An additional four opportunistic bird utilisation surveys were also undertaken during the survey.

During the May 2020 survey, six bat utilisation sites were surveyed. At each site, an Anabat microbat echolocation recorder was deployed for the duration of the field survey. Four bat utilisation sites involved the Anabat recorder being installed at or near ground height. The remaining two bat utilisation sites had the Anabat recorder deployed at height on existing meteorological masts for the duration of the field survey. Umwelt deployed these Anabat recorder as high as possible, with the meteorological masts used, this height was approximately 35 metres agl. Umwelt surveyed an additional three bat utilisation sites in the north-east area of the Proposed Action Area in 2023 near the boundary of Coolah Tops National Park. A single Anabat microbat echolocation recorder was deployed (at or near ground height) at each of the three sites, for three nights each.

While the full suite of BBUS programs undertaken for the Proposed Action have not been completed in a uniform approach as per current agency guidance material or even current project expectations, it is important to acknowledge that across all completed BBUS programs undertaken for the Proposed Action, they are considered to satisfy the 24 months of BBUS assessment. These completed surveys are considered sufficient and appropriate to facilitate the detailed prescribed impact assessment of turbine strike risk prepared for the Proposed Action.

Notwithstanding this, the Proponent has committed to preparing and commencing implementation of the BBUS program in early 2024 that will support the BBAMP that will be prepared for the Proposed Action. This will include development of a detailed methodology, inclusive of the number of and location of BBUS sites, as well as consideration of targeted surveys for regent honeyeater and swift parrot. This BBUS program will be prepared in consultation with BCS and DCCEEW.

For clarity, this additional BBUS program preparation and implementation is not to facilitate an update to the current prescribed impact assessment of the Proposed Action, nor does it reflect any doubt in the outcome of that assessment. It is purely a commitment by the Proponent to ensure there is a BBUS program consistent with what will be monitored as part of the implementation of the BBAMP. Of course, should the implementation of this additional BBUS program identify an MNES species not currently assessed, DCCEEW will be consulted.

5.7.2 Site Characteristics with the Potential to Influence Bird and Bat Interaction with Wind Turbines

Site characteristics with the potential to influence bird and bat interaction with wind turbines include: focal habitat features, topography, prevailing wind and weather patterns, presence of wetland in and or adjacent to the Proposed Action Area that may attract waterfowl or migratory species, and distance to potential nesting, roosting and foraging areas. As described in **Section 3.1**, the Proposed Action Area is largely dominated by agricultural land however there are a number of conservation areas and tracts or remnant vegetation that provide habitat for threatened and migratory bird and bat species that may be at risk of impact from operation of the wind turbines.

The dominant topographical feature defining the site characteristics of the Development Corridor – Wind Farm is the ridgeline along the northern boundary which follows the junction of the Liverpool Range and the Warrumbungle Range. Elevation along the northern boundary varies from over 1000 metres in Coolah Tops National Park on the Liverpool Range to 788 metres at Pandora’s Pass.

The landform of the Development Corridor – Wind Farm falls gently from the north to the south across a series of ridgelines sloping from the Liverpool Range towards the localities of Coolah and Cassilis. The wind turbines are proposed along the north to south ridgelines below the ranges. Slopes from these ridgelines are moderate to very steep trending to low inclination slopes bordering the Coolaburragundy and Talbragar Rivers.

The dominant habitat feature defining the site characteristics of the Development Corridor – Wind Farm is Coolah Tops National Park, to the north-east, and remnant vegetation on the steep slopes and watercourses in the valleys between the ridgelines. There are no proposed direct impacts of the Proposed Action within Coolah Tops National Park; and impacts proposed to remnant vegetation on steep slopes and watercourses of the valleys is restricted in extent and nature. The national park lies on a basalt plateau protecting extensive tall open forest including areas of old growth (NPWS 2002). It is an isolated basaltic plateau in an otherwise lower and largely cleared landscape (NPWS 2002). Coolah Tops National Park provides habitat for threatened and migratory birds and bats that may be at risk of turbine collision including the following species (recorded on NSW BioNet database: gang-gang cockatoo, glossy black-cockatoo and white-throated needletail), as well as records noted in the Plan of Management from the 1990s for the regent honeyeater and large-eared pied bat (NPWS 2002). To the south of the Development Corridor – Wind Farm and Cassilis, the land is typically flatter, with a combination of undulating topography generally at lower elevations and bordered by less steep slopes. The Development Corridor – External Transmission Line intersects with large tracts of native vegetation in and around Durrigere State Conservation Area and Community Conservation Area Zone 3 in the locality of Turill, and through remnant vegetation in private land holdings to the north of Ulan.

Durrigere State Conservation Area comprises six disconnected portions of land, extending about 6,172 ha of mostly dry sclerophyll forest with undisturbed rocky rises and a patch of rainforest vine thicket (NPWS 2014). It was previously used for hardwood timber harvesting (Curryall State Forest and Durrigere State Forest) and was reserved in December 2005. Durrigere State Conservation Area provides habitat for a number of listed threatened birds and mammals including the EPBC Act listed painted honeyeater, Corben's long-eared bat and the large-eared pied bat (NPWS 2014).

Towards the southern end of the Modified Development Corridor – External Transmission Line, there is remnant vegetation that provides habitat connectivity with the Goulburn River State Conservation Area (The Drip Gorge) and adjoining Goulburn River National Park located to the east of Ulan Road. Goulburn River National Park conserves woodlands and forests associated with sandstone plateau and is known to provide habitat for the large-eared pied bat, swift parrot and regent honeyeater (NPWS 2003).

The Proposed Action Area is located in a setting that has been extensively modified and disturbed as a result of a long history of agricultural land uses with remnant vegetation associated with road reserves and upper slopes and ridgetops of the Liverpool and Great Dividing Range. Fauna habitats include open pasture and native grassland with scattered remnant trees, open woodland, dry forest and riparian/aquatic zones. The woodland and forest habitats support hollow-bearing trees, fallen timber and rocky outcrops. Habitat condition is variable due to disturbance history and present land management.

Habitat corridors within the Proposed Action Area have been previously compromised by agricultural land use including long term grazing of cattle and goats, logging and clearing. Connectivity from the Development Corridor – Wind Farm to remnant vegetation, in Coolah Tops National Park, to the north and east is along the ridgelines however even these patches have been degraded to varying degrees due to long history of agriculture. The Proposed Action will remove habitat within some of these corridors.

As noted in **Section 3.1.5**, there are no wetland areas in the Proposed Action Area and or immediate environs. The closest nationally important wetland is Lake Goran on the Liverpool Plains about 50 km to the north of the Proposed Action Area and the Macquarie Marshes are more than 200 km to the north-west of the Proposed Action Area.

Background wind speed measurements for the noise assessment measured an average wind speed of 0.9 to 1.2 m/s at 1.2 metres above the ground. Onsite measurements of wind have been conducted since 2009 at met masts in the Proposed Action Area. The wind rose in **Figure 5.1** shows data collected from LVP03 mast located on ridges to the south-west of Coolah Tops National Park over a seven year period from 2016 to 2023. This shows that the predominant wind direction is from the south-east (120–150°). Winds at hub height are typically in the 5–10 m/s range, with rare occurrences of very high winds (above 25 m/s). That is the prevailing winds affecting site characteristics in the RSA of the wind farm are from the south-east, being south of Coolah Tops National Park.

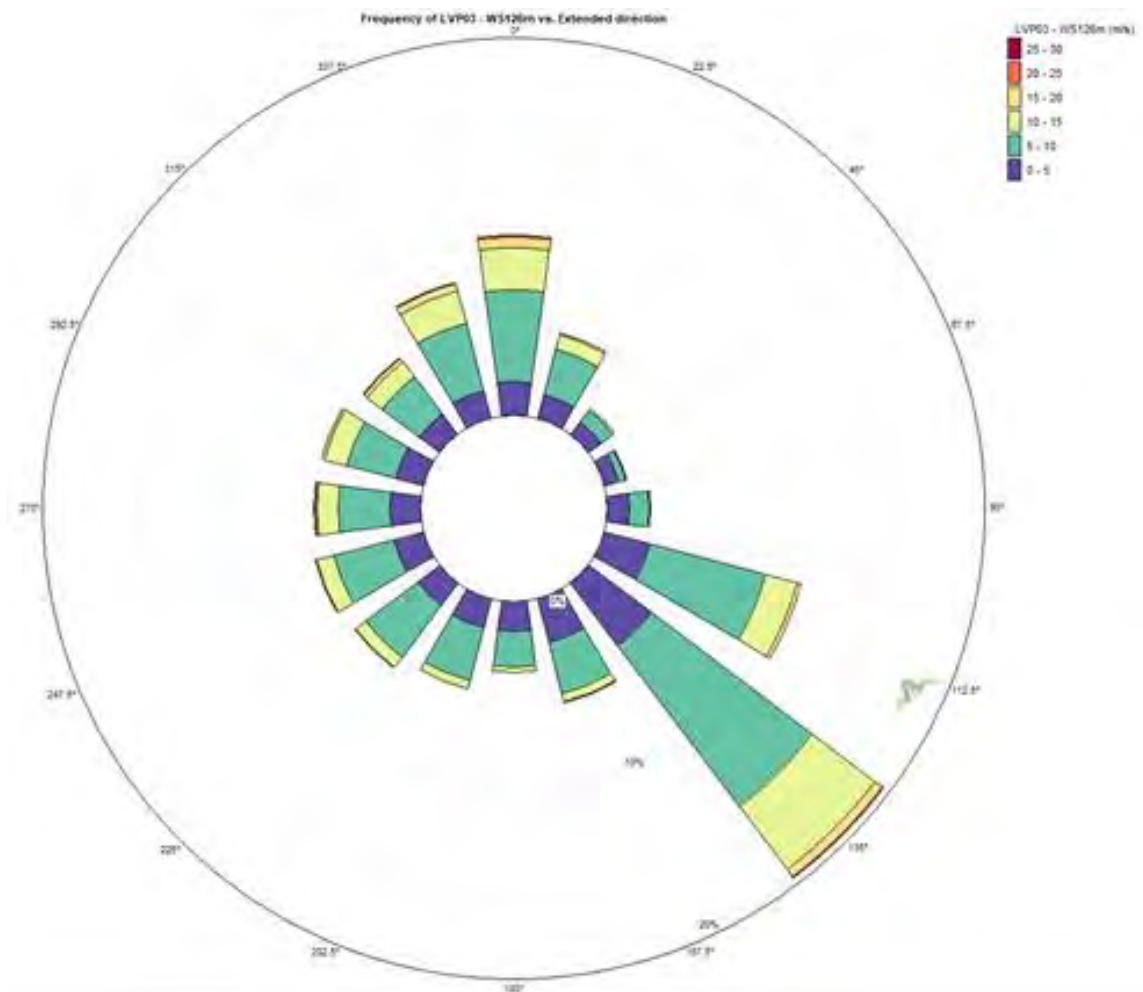


Figure 5.1 Wind Rose from data collected at LVP03 met mast

5.7.3 Species Characteristics and Proposed Action Risk Assessment

Another consideration in the prediction of risk of impacts of wind turbines to threatened and migratory birds and bats is the species characteristics; specifically behaviour, flight or demographic factors, site use, flight paths, flight heights, flight behaviour and population numbers.

Umwelt have undertaken a comprehensive literature review of all operational wind farms within NSW to compile a list of bird and bat species that have been recorded as being impacted by turbine strike (i.e. mortality events). The literature review searched for and considered wind farm monitoring reports from BBAMPs that have been made publicly available through publishing on project websites, or alternative means. In addition to these public monitoring reports, Umwelt also considered unpublished data provided by two NSW BCS offices (being Dubbo and Queanbeyan), which merely identified species known to have been impacted. This unpublished data did not identify the particular project, number of individuals, frequency of impact, year of impact...etc. This assessment does not mean that a species without known mortalities is not susceptible to such impacts, however it does assist with considering the potential likelihood of a species.

An assessment of the risk of blade strike and consequence of blade strike, based on species characteristics is provided in full in Section 8 of Appendix G of the BDAR (Umwelt 2023a in **Appendix D**) including descriptors of each criterion. The species characteristics of the MNES assessed as at risk of blade strike are summarised in **Table 5.4**. Where:

- **Flight height** was assessed by identifying not only the frequency of flights observed between 40 m and 215 m AGL but also observations in the literature and from other wind farm operations and mortalities recorded from other wind farms as this indicates a susceptibility of the species to occur in the RSA.
- **Status or frequency of occurrence in the Proposed Action Area** based on field surveys and likelihood of occurrence predicted from historical and local observations, known ranges and/or presence of suitable foraging or nesting habitat.
- **Geographic population concentration** was assessed by estimating the degree to which a species' population may be concentrated due to site related factors such as geographic location, habitat type, proximity to important habitat or roost locations (i.e., significant wetlands, roost caves) and how this relates to the specific landscape in which the Proposed Action is located.
- **Demographic resilience** was assessed through consideration of known aspects of each assessed species breeding biology and, most specifically, the nature of species' life-history traits.
- **Population size** to account for the variation in the significance of mortality of a given number of individuals between species as a result of the large variation in assessed species' national or global populations. Population size and demographic resilience provide a measure through which the relative vulnerability of a species to loss of individuals can be estimated.
- **Conservation status** under the EPBC Act and/or BC Act.

The likelihood/consequence score of each of the above criterion are described in detail in Table 8.3 of Appendix G of the BDAR (Umwelt 2023a) in **Appendix D**. The overall risk rating based on the species characteristics and site characteristics are summarised in **Table 5.4**.

A knowledge gap exists regarding the susceptibility of the species to turbine strike and/or barotrauma in Australia. This includes a lack of quantitative information on the likelihood of individuals flying at RSA height at a location with turbines. As such, there is a high level of uncertainty when predicting the number of individuals that may be impacted by the Proposed Action.

Table 5.4 Species and site characteristics and overall risk rating

Species	Likelihood of risk		Consequence of risk				Overall Risk Rating		
	Flight Height	Status on site	Geographic population concentration	Demographic resilience	Population Size	Conservation Status (EPBC Act)	Likelihood	Consequence	Rating
regent honeyeater	Moderate. Insufficient data on flight behaviour. Potential to fly at RSA height during migration.	Low. Not recorded however possible (albeit rare) to occur during heavy flowering events.	High. Congregate in and are primarily observed in foraging habitat, that is highly fragmented.	High. Low numbers and fidelity to breeding sites.	High. Total population estimated at 100 breeding pairs (Crates et al 2018).	High. Critically endangered.	Moderate	High	High
painted honeyeater	Moderate. Based on observations elsewhere, likely to regularly fly below RSA, occasionally at RSA height.	Low. Uncommon/rare visitor most likely when mistletoe flowering. Suitable habitat largely restricted to External Transmission Line.	Low. Widely distributed within areas of suitable habitat across its range. In Proposed Area occur away from wind farm.	Low. Not long-lived, have relatively high fecundity and a high capacity to replace individuals lost.	High. Population estimated to be <10,000 individuals in 2015, suspected to have declined by 20 to 29 per cent over last three generations.	Moderate. Vulnerable.	Moderate	Moderate	Moderate
white-throated needletail	High. High proportion of flight activity is at RSA height.	Moderate. Not recorded by NGH or Umwelt but database records and known occurrence of foraging habitat.	Moderate. Very large range, large proportion of population may occur at specific preferred foraging area or use particular migratory path. High degree of variability in likelihood of collisions.	Moderate.	Moderate. Population approximately 10,000 individuals (DoE 2015)	Moderate. Vulnerable and migratory	High	Moderate	High

Species	Likelihood of risk		Consequence of risk				Overall Risk Rating		
	Flight Height	Status on site	Geographic population concentration	Demographic resilience	Population Size	Conservation Status (EPBC Act)	Likelihood	Consequence	Rating
swift parrot	Moderate. Smales (2005) assigned 25% of a flight within 30–120 m agl. Potential to fly at RSA during migration.	Low. Not recorded however possible (albeit rare) to occur during heavy flowering events.	High. One population with restricted range, may move through any given area during winter migration.	Moderate. Low numbers. On mainland attracted to heavy flowering events.	High. Total population is estimated to be below 2,000 individuals (Garnett, et al 2011) and as low as 500 (Olah et al. 2020).	High. Critically endangered.	Moderate	High	High
superb parrot	Moderate. Records in literature that they regularly fly below RSA height and occasionally fly at RSA height.	Low. Has not been recorded and few records by others in the Proposed Action Area and adjacent areas. May transit through area.	Moderate. Relatively restricted distribution known from three main breeding areas. Proposed Action Area not in any of these areas.	Moderate. Known from three main breeding areas. Using same nest sites in successive years. Non-breeding moves in response to plant productivity.	Moderate. Most recent population estimates in 2020 is 20,000 mature individuals with ongoing decline of the wild population.	Moderate. Vulnerable	Moderate	Moderate	Moderate

Species	Likelihood of risk		Consequence of risk				Overall Risk Rating		
	Flight Height	Status on site	Geographic population concentration	Demographic resilience	Population Size	Conservation Status (EPBC Act)	Likelihood	Consequence	Rating
large-eared pied bat	Moderate. Lack of information on flying behaviour. Possible fly at RSA height.	Low. Positively identified in 2012. Calls from 2020 and 2023 not able to be confidently identified.	Moderate. Distribution discontinuous. Main strongholds are present in the Sydney sandstone region, Pilliga region and Central Queensland Sandstone Belt where maternity roost sites.	Moderate. Little known of traits	High. Estimated between 10,000 and 20,000 individuals.	Moderate. Vulnerable.	Moderate	Moderate	Moderate
Corben's long-eared bat	Moderate. May occasionally fly at RSA height (based on mortality of similar species)	Moderate. Positively identified in 2012. Calls from 2020 and 2023 not able to be confidently identified.	Moderate. Wide but sparse distribution and are highly concentrated where they do occur.	Moderate. Utilises a range of habitats, roosting in trees.	Moderate. Population is not quantified.	Moderate. Vulnerable	Moderate	Moderate	Moderate

Avoidance behaviour is considered as a behavioural change by a particular species whereby either specific habitat, locality or wider region is avoided. The potential indirect impacts associated with such avoidance behaviour may have on migratory or partly migratory species is difficult to predict given the lack of relevant information available. Assessment against such criterion will be only possible through the preparation (i.e., completion of baseline monitoring) and subsequent implementation (i.e., ongoing monitoring) of the Bird and Bat Adaptive Management Plan for the Project.

Species for which a high proportion of their population exhibits migratory behaviour (such as white-throated needletail, superb parrot, regent honeyeater and swift parrot) may be more likely to be affected by impacts (direct and indirect) than sedentary species though the magnitude and nature of such impacts on each is unknown. Mitigation measures prepared as part of the Bird and Bat Adaptive Management Plan will aim to consider potential impacts of avoidance behaviour.

5.7.4 Collision Risk Assessment and Proposed Additional BBUS Surveys

There is currently no information on the degree to which wind turbines disturb aerial species in Australia. For this reason, the likely zone of disturbance around wind turbines is unknown. In the absence of such information being published or formally recognised, Umwelt has buffered each of the proposed 185 wind turbines by 170 metres to indicate a potential likely zone of disturbance (refer to Figure 10.1 in Appendix G of the BDAR (Umwelt 2023a) in **Appendix D**). This 170 m buffer considers the proposed blade length of 85 metres, plus an additional 85 metres and has been applied following consideration of BCSs submission on the exhibited BDAR. This represents a total 'likely zone of disturbance' of 96,211 m² per turbine or approximately 1,780 ha across the Proposed Action. This area represents the area of aerial indirect impact zone. It is acknowledged that this represents a potential likely zone of disturbance in plain view, i.e., view of the impact area as projected on a horizontal plane.

A comprehensive bird and bat utilisation survey program has been completed for the Proposed Action, spanning more than two years of surveys. Bird and bat utilisation surveys commenced for the Proposed Action in 2012 (as part of the Approved Action), since then, surveys have been completed in 2013, 2015, in 2020 and 2023 (refer to **Section 5.7.1**).

In addition to this, as the Proposed Action progresses through state and commonwealth assessments the Proponent is committing to commence further BBUS programs in the lead up to commencement of construction. This will ensure that a survey program is designed with consideration of current state and commonwealth guidelines that can be implemented as the Proposed Action works toward construction. The proposed program will be prepared through consultation with the relevant agencies to ensure adequacy against those guidelines. These additional BBUS programs are not being proposed to update the current impact assessments relating to bird and bat turbine strike impacts, as these impacts are considered accurate based on the extensive surveys undertaken to date. Rather, the additional surveys are proposed to ensure the Proposed Action has a current and up to date BBUS program with pre-construction and pre-operational data. It is the intention that the proposed program for additional surveys will be adopted as part of the future BBAMP for the Proposed Action.

A detailed prescribed impact assessment has been prepared in accordance with the BAM to consider the potential impacts associated with turbine strike and barotrauma on protected bird and bat species. This is provided in Appendix G of the BDAR (Umwelt 2023a) in **Appendix D**. The assessment considered 29 species, comprising 18 threatened species (13 bird and five bat species) and 11 non-threatened species (nine bird and two bat species). Of the 29 species considered, 22 species (16 birds and six bat species) were assessed for risk of blade strike/barotrauma based on them being recorded within the Proposed Action Area, and the known susceptibility of the species to turbine strike and barotrauma in Australia.

Of the 22 species recorded within the Proposed Action Area, four (4) species were considered to be at High risk, 15 species were considered to be at Moderate risk and the remaining three (3) species were considered at Minor risk of being impacted by turbine strike and barotrauma. No bird or bat species were considered to result in an Extreme risk rating as a result for the Proposed Action. The resultant risk rating for these species is primarily due to their relative abundance in the Proposed Action Area, their predicted or observed flight behaviour in the Proposed Action Area and/or their known susceptibility to blade strike at wind farms in south-east Australia. For each of the four (4) species assigned an overall risk rating of High, two (2) species were considered to have a High likelihood of collision. The two species that were considered to have a Moderate likelihood of collision were considered to have a High consequence from a potential collision.

Three of the four species considered to have a High Risk rating of turbine strike are MNES, being white-throated needletail, regent honeyeater and swift parrot. For white-throated needletail, this species is considered to have a high likelihood of impact from turbine strike due to the flight behaviour of the species, likelihood of occurring in the Proposed Action Area in any given year and the known susceptibility of the species to these impacts. The overall risk rating of High for swift parrot and regent honeyeater reflects the very small remaining population sizes, listing status, coupled with each species' migratory nature and habitat fragmentation.

Of the 15 species considered to have a Moderate Risk rating of turbine strike, four are MNES, being large-eared pied bat, Corben's long-eared bat, painted honeyeater and superb parrot. All four species are considered to have a moderate likelihood of turbine strike as well as a moderate consequence should turbine strike occur. The likelihood assessment considers the known utilisation of the Proposed Action Area by the species including utilisation behaviours recorded during surveys, as well as existing known susceptibility of the species to turbine strike. While the consequence assessment considers the current listing status and known population dynamics of each species.

The High and Moderate Risk Ratings for MNES species will be a key focus of the BBAMP (refer to **Section 6.3.3**) which will be required for the Proposed Action. This plan will be developed to monitor and mitigate impacts to birds and bats attributable to the operation of the proposed action. While it won't be limited to MNES, they will be a focus. The overall objective of the BBAMP will be to ensure the Proposed Action does not result in a significant impact on birds and bats by retaining viable local populations of threatened species. The plan will identify and detail the impact triggers for MNES as well as present mitigation measures that will be considered in the event that MNES are impacted by turbine strike and associated triggers occur.

5.8 Summary of Assessments of Significance on MNES

Assessment of the significance of potential impacts of the Proposed Action on listed MNES has been prepared and has found that the Proposed Action may have a significant impact on the following MNES:

- Commonwealth Box Gum Woodland CEEC. All patches of the Commonwealth Box Gum Woodland CEEC are considered to be locally important. The Proposed Action is likely to adversely modify or reduce the composition and quality of retained adjoining vegetation through edge effects.
- Swift parrot (*Lathamus discolor*). While the Proposed Action avoids important habitat for the national population, given the status of the species there is potential that the loss of about 302.5 ha of potential winter habitat may have an adverse effect on the local extent and long term viability of the swift parrot.
- Regent honeyeater (*Anthochaera phrygia*). While the Proposed Action avoids critical habitat for the national population, and the absence of records, despite extensive surveys for the species, given the status of the species there is potential that the loss of about 604.3 ha of potential foraging habitat may have an adverse effect on the local extent and long term viability of the regent honeyeater.
- White-throated needletail (*Hirundapus caudacutus*). The Proposed Action has the potential to have a significant impact as there is a chance that there could be mortality of an ecologically significant proportion of its population.

The Proposed Action is not considered to have a significant impact on the following MNES:

- Gang-gang cockatoo (*Callocephalon fimbriatum*). The Proposed Action is considered to have a likely negligible impact on potential habitat for the gang-gang cockatoo given the minimal proposed habitat impacts, lack of records of the species within the Development Corridor, and a greater quality habitat for the species within the nearby Goulburn River National Park.
- South-eastern glossy black-cockatoo (*Calyptorhynchus lathami lathami*) as the Proposed Action would clear a negligible amount of potential foraging habitat and breeding habitat, nor impact on an important population of the species.
- Superb parrot (*Polytelis swainsonii*) as there is no evidence of breeding and only one record of the superb parrot by others within a 10 km radius of the Development Corridor and just 22.9 ha of potential habitat will be impacted by the Proposed Action.
- Greater glider (southern and central) (*Petauroides volans*), as potential habitat largely avoided and connectivity to known records in Coolah Tops National Park can be maintained through detail design.
- Koala (*Phascolarctos cinereus*) (combined populations of Qld, NSW and the ACT), as not recorded in the Development Corridor, no evidence of breeding population in the Development Corridor. Breeding population may occur in forest/woodland habitat adjacent to the Indicative Development Footprint— External Transmission Line. In this area the impact will be linear and narrow and is unlikely to fragment or isolate the koala.
- Painted honeyeater (*Grantiella picta*) as potential habitat most likely to be associated with the Indicative Development Footprint— External Transmission Line where impacts are linear and narrow and unlikely to fragment habitat for a mobile species.

- Large-eared pied bat (*Chalinolobus dwyeri*) as the Proposed Action will not impact roosting and breeding habitat. The Proposed Action is not expected to result in an adverse impact on a potentially occurring important population of the large-eared pied bat due to the very low population density of the species (as evidenced by the lack of records since 2012), no breeding habitat being directly impacted, the retention of substantial areas of potential foraging habitat within the Development Corridor and the mitigation strategies that will be employed as part of the Proposed Action.
- Corben's long-eared bat (*Nyctophilus corbeni*) due to the very low population density of the species, the retention of substantial areas of potential breeding and foraging habitat within the Development Corridor and the mitigation strategies that will be employed as part of the Proposed Action.
- Yellow-bellied glider (south-eastern) (*Petaurus australis australis*) as habitat largely avoided and connectivity to known records in Coolah Tops National Park can be maintained through detail design.
- Spotted-tail quoll (*Dasyurus maculatus*) despite the impacts to 193.9 ha of potentially suitable habitat as there will be no direct impacts to the species as these impacts are not considered likely to result in any isolation or fragmentation for the species.
- Grey-headed flying fox (*Pteropus poliocephalus*) despite the Proposed Action impacting 312.1 ha of potential foraging habitat given the sheer distances from the nearest known nationally important camp and nearest known camp make the species unlikely to frequently forage within the Proposed Action Area.
- Satin flycatcher (*Myiagra cyanoleuca*) a migratory species that may occupy terrestrial habitat during migration but has been recorded rarely with no publicly known records in the Proposed Action Area or adjacent areas since 2003. The Proposed Action may impact up to 101.8 ha of marginal habitat but is unlikely to substantially destroy or isolate important habitat.

Avoidance, management and mitigation measures are discussed in Section 6, and offsetting measures are discussed in **Section 8.0**.

6.0 Avoidance, Mitigation and Management Measures

6.1 Avoidance

The Proposed Action has undergone substantial design changes since project feasibility began in 2012, many of which have been the result of specific biodiversity avoidance measures. A range of design amendments occurred as part of the original assessment for the Approved Action including amendment to the external transmission line to avoid areas of NSW Box Gum Woodland CEEC (NGH 2013b) and relocation of at least five turbines to avoid areas of NSW Box Gum Woodland CEEC (NGH 2017). It is also possible, if not likely, that further avoidance and minimisation measures occurred during the assessment phase of the Approved Action, that were not documented in the relevant assessments (NGH 2013a, 2013b, 2017).

Since the Proponent took ownership of the Approved Action in 2019, additional changes to the design have been made with a focus on avoiding impacts to native vegetation, habitats and heritage values where possible and respecting landholder imposed no-go zones. A description of changes of the Approved Action to the Referred Action and now the Proposed Action is provided in **Section 2.2**. A comparative analysis of changes in impact to habitat of MNES by the Approved Action, the Referred Action and the Proposed Action for MNES is provided in **Table 2.6** identifying the quantification of how design refinement has avoided impacts for biodiversity and habitat for MNES.

The avoidance measures between the Approved Action and the Referred Action are provided in Table 4.1 of the BDAR (Umwelt 2023a) in **Appendix D**. These measures are considered initial avoidance measures as they have occurred through early assessment of the proposal to modify the Approved Action.

In summary, the Approved Action allowed for the construction of up to 267 wind turbines while the Referred Action sought approval for 220 turbines. Turbine spacing in the Approved Action was maximised in the Referred Action to a minimum of 500 m apart, most between 550 to 600 m apart, to accommodate larger turbines. The minimum ground clearance to the blade tip has been increased from 35 m agl in the Approved Action to 40 m agl in the Proposed Action. Maximising space between turbines and increasing minimum ground clearance provides greater opportunity for birds and bats to move through the landscape between the wind turbines and potentially reduce bird and bat strike risk. Redesign of the Approved Action to the Referred Action include relocation of turbines within the north-east turbine cluster to avoid impacts to not only Commonwealth Box Gum Woodland CEEC but also fauna habitat, a habitat corridor and increase the separation distance from Coolah Tops National Park.

As summarised in **Section 2.5.2**, following feedback received from community and agency stakeholders during the NSW public exhibition process for the NSW Mod-1 Application, held in September/October 2022, the Proponent has undertaken substantial design changes in a conscious effort to further avoid and minimise impacts of the Proposed Action on biodiversity values, relative to the Referred Action. This is demonstrated by the reduction of the area of potential habitat for MNES in the Development Corridor in the Proposed Action relative to the Referred Action as listed in **Table 2.6**. Of note, the area of habitat for the Commonwealth Box Gum Woodland, glossy black-cockatoo, swift parrot, large-eared pied bat, Corben's long-eared bat and greater glider in the Development Corridor of the Proposed Action relative to the Referred Action has been more than halved. Within the Development Corridor, the Indicative Development Footprint of the Proposed Action relative to the Referred Action has decreased the impact to Commonwealth Box Gum Woodland CEEC, swift parrot, large-eared pied bat and Corben's long-eared bat (refer to **Table 2.6**).

The Proponent has applied several design strategies to avoid/minimise ground disturbance including prioritising the use of spur lines along the ridges to locate access tracks. The refined Indicative Development Footprints have been developed using 3D terrain modelling and civil engineering design software. The process is explained in **Section 2.1.2.1** and modelling outputs shown in **Figure 2.2**. Through the introduction of static synchronous compensators (STATCOMs) that allow larger underground reticulation cabling to be used the need for additional underground reticulation cabling adjacent to access tracks can be minimised. Ground disturbance has been further minimised through steepening the cut/fill batter design in specific locations where geotechnical conditions allow.

Another example of where design has resulted in reduced impacts to NSW Box Gum Woodland CEEC is the changes made to the location, size, and orientation of collector stations which reduced the length of the internal transmission line by approximately 2.2 km. This change to the substation and internal transmission line infrastructure layout was carried out to avoid/minimise impacts to the NSW Box Gum Woodland CEEC and respond to landholder concerns.

Assessment of the Referred Action Indicative Development Footprint – Public Road Upgrades was a key focus during the NSW Mod-1 Application response to submissions stage. The Proponent worked closely with Umwelt to understand the constraints that NSW Box Gum Woodland CEEC presented in relation to the public road upgrades.

Many of the public road corridors support patches of NSW Box Gum Woodland CEEC and Commonwealth Box Gum Woodland. The Proponent will work with the councils throughout the detailed design phase to optimise the public road upgrades to avoid/minimise impacts to roadside vegetation, particularly patches of Commonwealth Box Gum Woodland.

A summary of the additional avoidance measures in the Proposed Action relative to the Referred Action are provided in **Table 6.1**. Notably this included reducing number of turbines by 35 when compared to the Referred Action, to assist in avoiding and minimising impacts on native vegetation and other biodiversity values. The Proposed Action has also reduced the RSA by 33 per cent compared to the Referred Action, lowering the potential for prescribed impacts to bird and bat species.

Table 6.1 Summary of Initial Avoidance Measures from the Referred Action and the Proposed Action through design

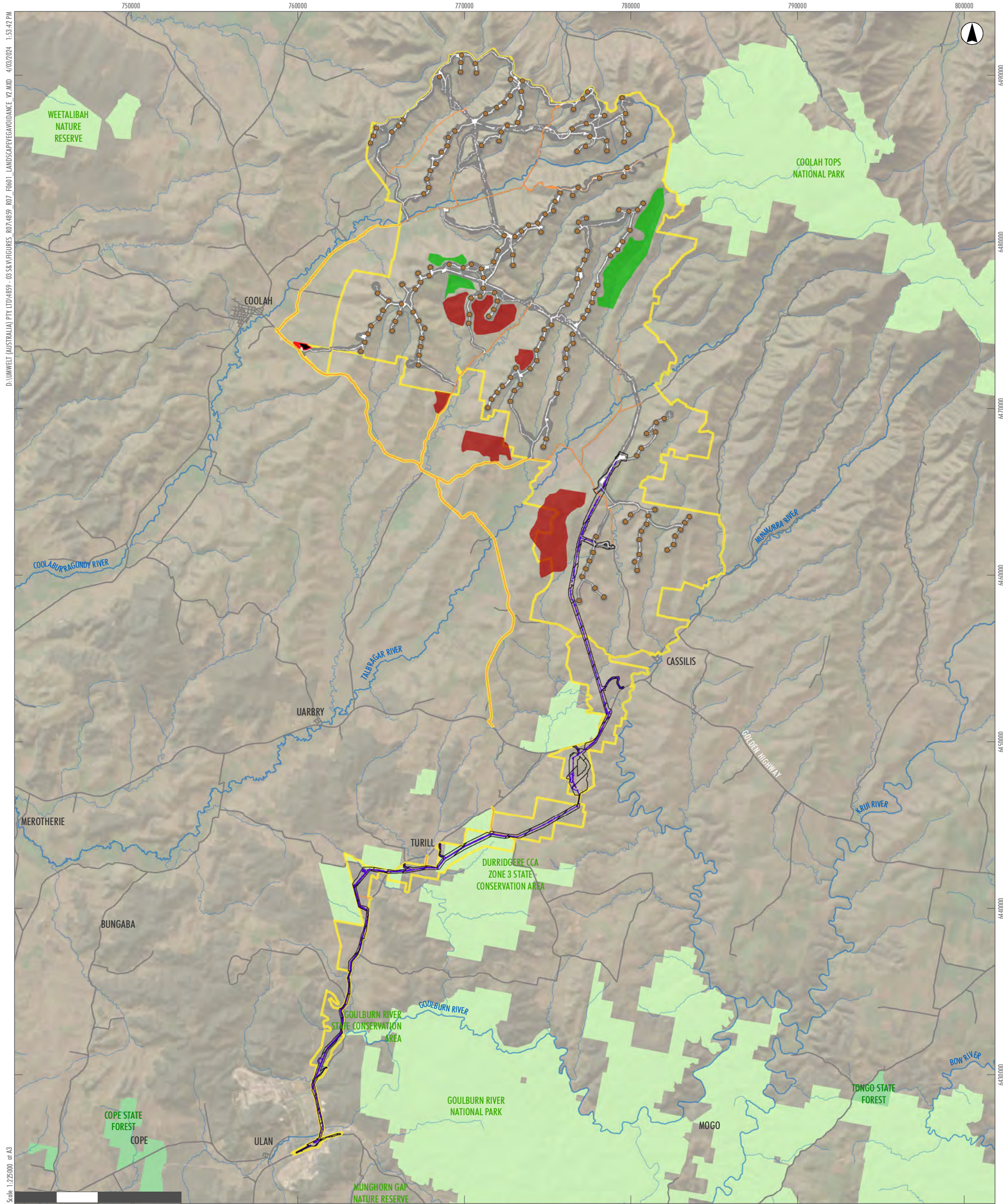
Measure	Outcome
Reduction in the number of wind turbines	<ul style="list-style-type: none"> • The Proposed Action includes an application to construct and operate up to 185 wind turbines, a reduction of 35 wind turbines compared with the Referred Action (as referred in 2022). • Removal of 1 x wind turbine (C10) and associated infrastructure to avoid impacts to intact patch of treed vegetation: <ul style="list-style-type: none"> ○ Minimising impacts to Vegetation Zones 8 and 12. • Removal of 1 x wind turbine (D56) and associated infrastructure: <ul style="list-style-type: none"> ○ Minimising impacts to Vegetation Zones 12. • Removal of 2 x wind turbines (D60 and D61) to minimise visibility from Pinnacle Lookout and potential turbine noise encroachment into Coolah Tops National Park: <ul style="list-style-type: none"> ○ Also minimising impacts to Vegetation Zones 11, 12 and 13. ○ Also minimising impacts to the Southern Greater Glider species polygon. ○ Minimising potential prescribed impacts of turbine strike and barotrauma to forest owl species residing in the adjacent Coolah Tops National Park, particularly the barking owl, powerful owl and masked owl. • Removal of 3 x wind turbines (A11, A12 & A13) and associated infrastructure: <ul style="list-style-type: none"> ○ Minimising impacts to Vegetation Zones 11, 12 and 14. ○ Minimising impacts to the large-eared pied-bat polygon. • Removal of 6 x wind turbines (B12, B15, B17, B22, B23 & B28) and associated infrastructure: <ul style="list-style-type: none"> ○ Substantial minimisation of impacts to Vegetation Zones 1, 8, 11, 12 and 14. ○ Minimisation of impacts to Vegetation Zones 7, associated with NSW Box Gum Woodland CEEC. • Removal of 3 x wind turbines (C19, C20 & C21) and associated infrastructure to reduce visibility from Pinnacle Lookout and reduce potential turbine noise impacts within Coolah Tops National Park: <ul style="list-style-type: none"> ○ Substantial minimisation of impacts to Vegetation Zones 11, 12 and 14. ○ Minimisation of impacts to Southern Greater Glider species polygon. ○ Minimising impacts to the large-eared pied-bat. ○ Minimising potential prescribed impacts of turbine strike and barotrauma to forest owl species residing in the adjacent Coolah Tops National Park, particularly the barking owl, powerful owl and masked owl.

Measure	Outcome
	<ul style="list-style-type: none"> • Removal of 3 x wind turbines (A7, A8 & A9) and associated infrastructure: <ul style="list-style-type: none"> ○ Minimisation of impacts to Vegetation Zones 9 and 12. ○ Minimising impacts to the large-eared pied-bat and eastern cave-bat species. • Removal of 2 x wind turbines (E41 and E42) and associated infrastructure: <ul style="list-style-type: none"> ○ Minimising impacts to Vegetation Zone 12. ○ Minimising impacts to Vegetation Zone 11, associated with NSW Box Gum Woodland CEEC. ○ Minimising potential prescribed impacts of turbine strike and barotrauma to forest owl species residing in the adjacent Coolah Tops National Park, particularly the barking owl, powerful owl and masked owl.
Reduction in the turbine blade tip heights	<ul style="list-style-type: none"> • The Referred Action proposed the construction of wind turbines with a maximum blade tip height of up to 250 m. • The Proposed Action proposes the construction of wind turbine with a maximum blade tip height of 215 m, a reduction of 35 m compared with the Referred Action.
Reduction in blade length	<ul style="list-style-type: none"> • The Referred Action proposed the construction of wind turbines with indicative blade lengths of 105 m. • The Proposed Action proposes the construction of wind turbines with a blade length of 85 m (based on the preferred Vestas V172 7.2 MW turbine), a reduction of 20 m compared with the Referred Action. • Reducing the aerial impact area of the Proposed Action, therefore reducing the potential for prescribed impacts to bird and bat species.
Reduction in Rotor Swept Area	<ul style="list-style-type: none"> • The Referred Action proposed the construction of wind turbines within an indicative RSA of 34,636 m² of aerial habitat per turbine OR 762 ha in total. • The Proposed Action proposes the construction of wind turbines with an 23,235 m² of aerial habitat per turbine OR 430 ha in total based on 185 turbines, representing: <ul style="list-style-type: none"> ○ a reduction of 11,401 m² OR 332 ha compared with the Referred Action. • Reducing the potential for prescribed impacts to bird and bat species.
General infrastructure avoidance and minimisation measures	<ul style="list-style-type: none"> • No over-size/over-mass (OSOM) vehicles are proposed along the access track between A06 and A10 to minimise ground disturbance. Light and heavy vehicles are proposed to use this access track only: <ul style="list-style-type: none"> ○ Minimising impacts to Vegetation Zones 11, 12 and 14. ○ Minimising impacts to the large-eared pied-bat and eastern cave-bat species polygons.

Measure	Outcome
	<ul style="list-style-type: none"> • No OSOM vehicles are proposed to use the first 2.9 km of State Forest Road. OSOM vehicles proposed to access State Forest Road near turbine D53. Use of first 2.9 km of State Forest Road by Light and Heavy vehicles only is proposed: <ul style="list-style-type: none"> ○ Minimising impacts to Vegetation Zones 11 and 12. • No OSOM vehicles, or Heavy or Light vehicles are proposed along Coolah Road to remove duplicate site access points. Access will be provided from Rotherwood Road: <ul style="list-style-type: none"> ○ Minimising impacts on NSW Box Gum Woodland CEEC. • Realignment of 330 kV overhead transmission line between C Cluster and B Cluster (generally follows approved 33 kV overhead alignment, which is no longer proposed): <ul style="list-style-type: none"> ○ Minimising impacts to Vegetation Zones 1, 9, 11 and 12. • Realignment of access track from Rotherwood Road to utilise existing access track and minimise ground disturbance: <ul style="list-style-type: none"> ○ Minimising impacts on NSW Box Gum Woodland CEEC. • Realignment of optional and proposed overhead 330 kV transmission line to minimise impact to intact treed vegetation and increase separation distance from nearby residence: <ul style="list-style-type: none"> ○ Minimising impacts to multiple Moderate/Good Vegetation Zones. • Realignment of underground 33 kV reticulation cabling from turbine F07 in a more direct alignment towards Substation F: <ul style="list-style-type: none"> ○ Minimising impacts on Vegetation Zones 7 and 17, aligning with NSW Box Gum Woodland CEEC. • Removal of 330 kV overhead transmission line between C Cluster and D Cluster (reduces visibility of transmission line infrastructure along State Forest Road): <ul style="list-style-type: none"> ○ Minimising impacts to Vegetation Zones 1, 9, 11 and 12. • Removal of duplicate access track off Turee Vale Road: <ul style="list-style-type: none"> ○ Minimising impacts to Vegetation Zones 1, 8, 11 and 12. • Removal of Coolah Road and duplicate site access point and access track from Coolah Road: <ul style="list-style-type: none"> ○ Minimising impacts to Vegetation Zones 1, 8 and 12. • Removal of optional external 330 kV transmission line alignment to avoid impacts to Durridgere State Conservation Area in this location: <ul style="list-style-type: none"> ○ Minimising impacts to Vegetation Zones 4 and 15.

Measure	Outcome
Avoidance of Commonwealth Box Gum Woodland CEEC	<ul style="list-style-type: none"> • The targeted design modification undertaken by the Proponent has minimised the impact to Moderate/Good Condition woodlands that conform with the NSW Box Gum Woodland CEEC and Commonwealth Box Gum Woodland CEEC by 7.6 ha. The Proposed Action will impact up to 31.6 ha of Commonwealth Box Gum Woodland CEEC down from 42.1 ha identified as being impacted by the Referred Action. This is a substantial reduction of impacts to the Box Gum Woodland CEEC, given the extensive constraint it presents throughout the Proposed Action Area. • The Proponent consulted with and sought feedback from Umwelt following completion of extensive field surveys to understand the Commonwealth Box Gum Woodland CEEC constraints for the Proposed Action. Through this effort, the Proposed Action has avoided better quality and larger patches of BC Act and EPBC Act listed Box Gum Woodland CEECs. • Umwelt have identified a number of very large patches of Moderate/Good vegetation that would conform with the Commonwealth Box Gum Woodland CEEC within the Proposed Action Area that have been avoided. These are presented in Figure 6.1 and highlighted below: <ul style="list-style-type: none"> ○ Approximately 79 ha patch on the western side of Turee Vale Road. ○ Approximately 350 ha on the north side of Rotherwood Road, near the intersection with Vinegaroy Road. ○ Approximately 960 ha patch between Vinegaroy Road and Rotherwood Road. ○ Approximately 98 ha patch on the western facing slope of a ridgeline east of Turee Vale Road. • The Proponent has considered the NSW BCS submission relating to the request to consider removing proposed wind turbines within the E and F clusters to reduce impacts to the NSW Box Gum Woodland CEEC. In total 13 wind turbines have been removed (and associated infrastructure) from these two clusters, six of which in the F cluster (F36, F37, F38, F39, F40 and F41) have reduced impacts to the Commonwealth Box Gum Woodland CEEC based on mapping in Umwelt (2022). Detailed images of the avoidance locations are provided in Table 2.1 of Appendix G. • A substantial Commonwealth Box Gum Woodland CEEC avoidance measure of the Proposed Action occurs to the west of the proposed F cluster of wind turbines, specifically F5 and F7. In this location, the Referred Action proposed approximately 4 km of internal access tracks to service multiple locations of the External Transmission Line. The Proposed Action has removed this lengthy internal access track that largely occurred within Commonwealth Box Gum Woodland CEEC. The Proposed Action design instead includes a shorter internal access track of Rotherwood Road. While this alternative design does include impacts to Commonwealth Box Gum Woodland CEEC, it is substantially shorter (approximately 2 km) than that proposed by the Referred Action, the majority of which utilises an existing internal track. • Removal of larger areas of mapped Commonwealth Box Gum Woodland CEEC from the Development Corridor within the Wind Farm and along External Transmission Line wherever practicable to avoid potential impacts, based on mapping in Umwelt (2022).

Measure	Outcome
	<ul style="list-style-type: none"> The Proposed Action has been deliberately designed to utilise existing property entries and internal tracks (for the most part, aside from necessary allowance of oversized and heavy vehicles) access points and associated access tracks. Just one of these site entry points and access tracks is not located at an existing entry point, being on the south side of Coolah Creek Road. This deliberate design parameter for the Proposed Action avoids impacts to Commonwealth Box Gum Woodland CEEC, with the community being common across the valley floors of the Proposed Action Area where entry points are located.
Avoidance of MNES habitat and connectivity	<ul style="list-style-type: none"> The Proposed Action has avoided proposed impacts to the majority of gullies adjoining the ridgelines where wind turbines are proposed, these locations generally support intact Moderate/Good vegetation that supports MNES habitat. The Proponent has considered feedback from the NSW BCS and NPWS and removed nine proposed wind turbines (C10, C19, C20, C21, D60, D61, E41, E42 and E49) that were located in proximity to the Coolah Tops National Park. These design changes reduce proposed impacts to yellow-bellied glider habitat. The removal of the nine proposed wind turbines (C10, C19, C20, C21, D60, D61, E41, E42 and E49) from the lands adjoining Coolah Tops National Park reduces the proposed impacts to the southern greater glider species polygon. Detailed refinement of the proposed wind turbines and associated infrastructure along the northern ridgeline of the Proposed Action (west and east of Pandora's Pass on Coolah Creek Road) has substantially reduced the proposed impacts to the large-eared pied-bat species polygons.



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Scale: 1:25000 at A3

GDA2020 MGA Zone 55

Legend

- | | | |
|---|------------------------------|--|
| Proposed Action Area | Road | Broad landscape vegetation avoidance by the Proposed Action |
| Development Corridor | Drainage Line | Commonwealth Box Gum Woodland CEEC |
| Development Corridor - Wind Farm | National Parks (NPWS Estate) | Moderate Good Vegetation |
| Development Corridor - TWA Facility | State Forest | |
| Development Corridor - External Transmission Line | Wind Turbines | |
| Indicative Development Footprints | | |
| Indicative Development Footprint - Wind Farm | | |
| Indicative Development Footprint - TWA Facility | | |
| Indicative Development Footprint - External Transmission Line | | |
| Indicative Development Footprint - Public Road Upgrades | | |

Image Source: ESRI Basemap (2022) Data source: NSW DSEI (2022)

FIGURE 6.1

Broad landscape vegetation avoidance by the Proposed Action

A primary focus of the recent design changes relates to avoiding and minimising serious and irreversible impacts to Box Gum Woodland CEEC as listed under the BC Act (NSW Box Gum Woodland CEEC) and EPBC Act (Commonwealth Box Gum Woodland CEEC). Despite these avoidance and minimisation efforts, additional surveys targeting both Box Gum Woodland CEECs completed after public exhibition concluded in October 2022, identified that different environmental conditions had resulted in increased areas of Low Condition and Derived Native Grassland Condition vegetation zones which conform with the NSW Box Gum Woodland CEEC. This has meant that larger areas within the Development Corridor have now been mapped as NSW Box Gum Woodland CEEC and therefore despite the avoidance and minimisation measures adopted by the Proponent, this hasn't resulted in a reduction in the extent of impacts to the NSW Box Gum Woodland CEEC. As these two vegetation zones do not conform with the Commonwealth Box Gum Woodland CEEC, this mapping update did not affect the proposed impacts to this CEEC.

The avoidance and minimisation efforts of the Proposed Action did however reduce proposed impacts to Commonwealth Box Gum Woodland CEEC by 10.5 ha when the exhibited BDAR for the Proposed Action (Umwelt 2022a) is compared against the amended BDAR (Umwelt 2023a). This 10.5 ha of impact avoidance relates to vegetation that is in Moderate/Good condition.

As the Commonwealth Box Gum Woodland CEEC is relatively common within and surrounding the Proposed Action Development Corridor, any avoidance of impacts to the CEEC is important. Further to this direct impact avoidance, the total potential impacts from the Proposed Action on Commonwealth Box Gum Woodland CEEC includes 17.3 ha of partial direct impacts. These impacts are proposed within balance of easements sections of the internal and external sections of the proposed transmission lines. Where treed vegetation occurs in these locations, the vegetation will be cleared in a particular manner to ensure that biodiversity values remain. The full description of this process is provided in Section 5.1.2 of the BDAR (Umwelt 2023a) in **Appendix D**. Essentially, the canopy structure will be removed, the shrub layer will be substantially reduced, while the ground stratum will be largely un-impacted. Partial direct impacts are only assessed in the balance of easements and excludes direct impacts entirely. Specific construction and post-construction management actions and monitoring programs will be implemented to ensure the Commonwealth Box Gum Woodland CEEC persists in those areas of partial direct impacts.

The process of constructing a transmission line easement in the manner proposed by the Proposed Action (i.e., allowing biodiversity values to remain) is substantially more time consuming, complex to manage, requires ongoing monitoring and management and is ultimately more costly to construct. This demonstrates the level to which the Proponent is committed to minimising the impact of the Proposed Action on biodiversity values, particularly in relation to Commonwealth Box Gum Woodland CEEC and large intact patches of remnant vegetation which occur along the majority of the External Transmission Line. The alternative approach to the Proponent applying partial direct impacts, permissible within Section 8.1.1.2 of the BAM (DPIE 2020a), would result in the entire removal of all biodiversity values from the implicated vegetation zones, where the vegetation integrity scores would be reduced to 0. This would be considered a perverse outcome for the Proposed Action and the proposal to apply partial direct impacts is a significant minimisation measure for the Proposed Action.

In addition, it is worthy to note that in the event that the CWO REZ transmission line currently proposed by EnergyCo becomes a viable connection option and is adopted by the Proposed Action, the External Transmission Line component would no longer be required and all impacts on biodiversity values associated with the External Transmission Line would no longer apply. Removal of the External Transmission Line component would result in the avoidance of impact to approximately 17.7 ha of Commonwealth Box Gum Woodland CEEC.

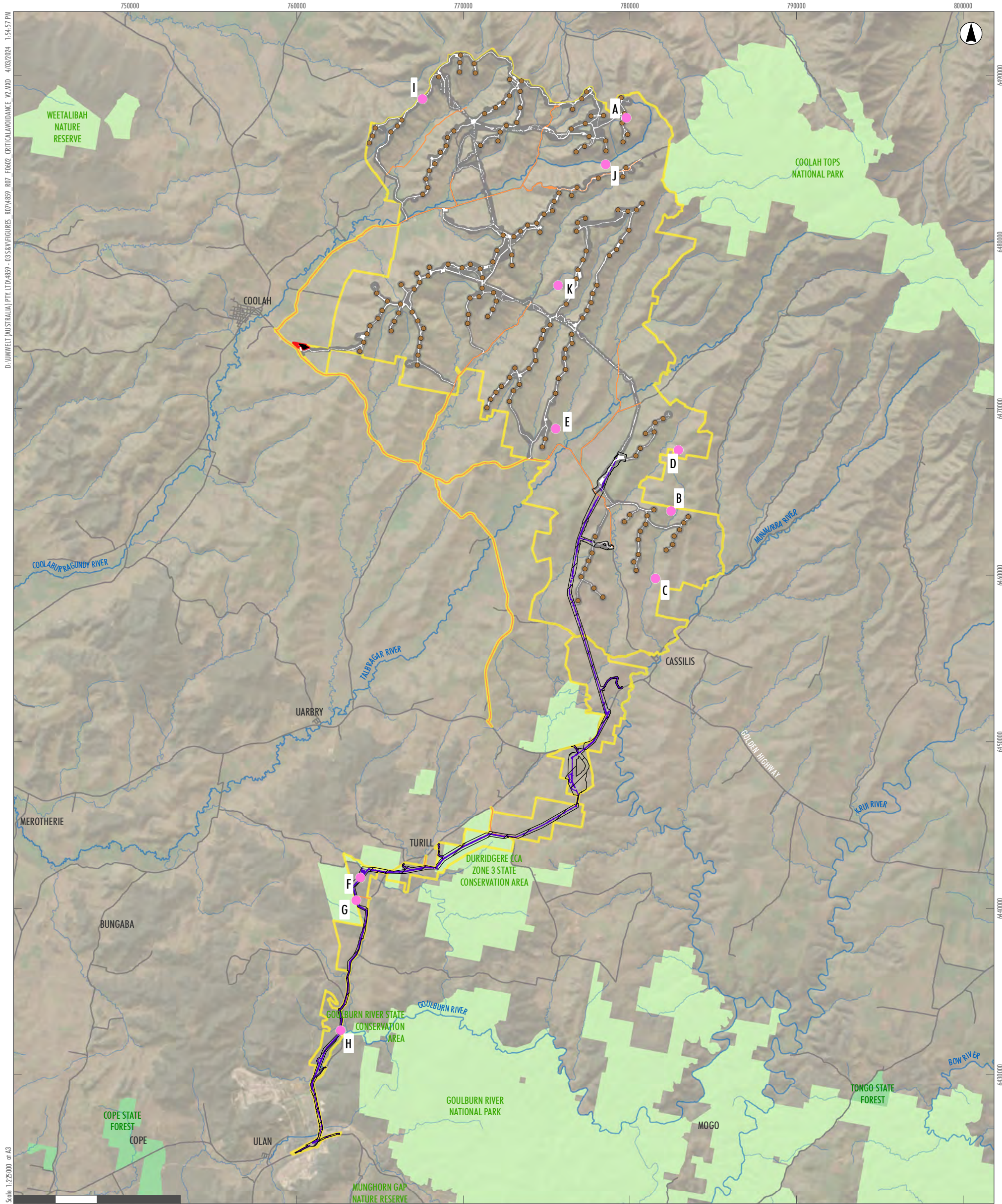
Key areas of Commonwealth Box Gum Woodland CEEC, key threatened species habitat and habitat connectivity for glider, microbat and bird MNES have all been minimised by the Proposed Action. Furthermore, the Proponent will continue to seek additional avoidance of these biodiversity values through finalisation of the detailed design once a preferred contractor(s) are selected. As highlighted in **Section 2.5.2**, layout review and design optimisation process to the Referred Action have resulted in a number of additional changes to infrastructure layout (refer to **Table 2.4**). For the main part, the infrastructure layout including turbine locations, access track alignments and External Transmission Line alignment is generally consistent with the Approved Action. Through these efforts, the Proposed Action has reduced (-10.5 ha) the extent of proposed impacts to Commonwealth Box Gum Woodland CEEC compared to the Referred Action, from 42.1 ha to 31.6 ha.

The key changes to the Referred Action infrastructure layout, in particular those proposed changes that result in reduced impacts to MNES, are listed in **Table 6.2**. The location of each key change is broadly shown in the overview plan in **Figure 6.2**.

Table 6.2 Summary of additional avoidance measures relating to MNES between Referred Action and Proposed Action

Reference ID (see Figure 6.2)	Design Change/Avoidance/Minimisation Measure	Outcome
n/a	Reduction of 35 turbines to accommodate larger turbines, from 220 in the Referred Action to the proposed 185 of the Proposed Action.	Despite, reduced turbines there is an increased ground disturbance based on extensive 3D terrain modelling and more realistic assumptions based on recent construction experience. The reduced number of proposed turbines reduces the RSA of the Proposed Action by 11,401 m ² per turbine OR 332 ha across all turbines compared with the Referred Action
A	Removal of 5 x turbines (Turbines C19, C20, C21, D60, and D61) from the north-east portion of the Proposed Action Area.	<ul style="list-style-type: none"> The removal of 5 x turbines in the north-east adjacent to the Coolah Tops National Park, reduces impacts on greater glider and yellow-bellied glider. See detailed map on Sheet A5 and B5 of Figure 3.4 in Appendix A of the BDAR (Appendix D).
B	Removal of 33 kV overhead cabling in F Cluster east of Rotherwood Road. Removal of wind turbines and associated infrastructure F37 and F38.	<ul style="list-style-type: none"> Avoids impact to ~3.0 ha of Commonwealth Box Gum Woodland CEEC. See detailed map on Sheets D5, D6, E4–6 and F4–6 of Figure 3.4 in Appendix A of the BDAR (Appendix D).
C	Removal of access track off Rotherwood Road to F Cluster, specifically F5 and F7	<ul style="list-style-type: none"> Avoids impact to ~6 ha of Commonwealth Box Gum Woodland CEEC. See detailed map on Sheets D5, D6, E4–6 and F4–6 of Figure 3.4 in Appendix A of the BDAR (Appendix D).

Reference ID (see Figure 6.2)	Design Change/Avoidance/Minimisation Measure	Outcome
D	<p>Removal of section of access track in F Cluster east of Yarrawonga Road.</p> <p>Removal of wind turbines and associated infrastructure of F36, F39, F40 and F41.</p>	<ul style="list-style-type: none"> • Avoids impact to ~1.5 ha of Commonwealth Box Gum Woodland CEEC. • See detailed map on Sheets C5, D5 and D6 of Figure 3.4 in Appendix A of the BDAR (Appendix D).
E	<p>Removal of section of access track off Norfolk Road to E Cluster and upgrades to Norfolk Road.</p>	<ul style="list-style-type: none"> • Avoids ground disturbance and vegetation/habitat impacts associated with ~1.3 km of wind farm access track and ~500 m of public road upgrades. • See detailed map on Sheets C4–5, D3–4, E3–4 of Figure 3.3 in Appendix A of the BDAR (Appendix D).
F	<p>Shift section of External Transmission Line west to minimise potential visual impact and minimise impact to Durridgere State Conservation Area further south, and inclusion of potential concrete batch plant/construction compound/laydown area.</p>	<ul style="list-style-type: none"> • Negligible change in ground disturbance and native vegetation/habitat impacts likely to support MNES. • See detailed map on Sheets H4, I2, I3 and J2 of Figure 3.3 in Appendix A of the BDAR (Appendix D).
G	<p>Potential to shift section of External Transmission Line east to avoid impacts to Durridgere State Conservation Area in this location.</p>	<ul style="list-style-type: none"> • Avoid impacts to Durridgere State Conservation Area in this location. • See detailed map on Sheets H4, I2, I3 and J2 of Figure 3.3 in Appendix A of the BDAR (Appendix D).
H	<p>Shift External Transmission Line east to avoid impacts to the land parcel (Lot 751 / DP 1270886) within which Hands on Rock cultural heritage site is located.</p>	<ul style="list-style-type: none"> • Minimise impacts to the land upon which 'Hands on Rock' is located. • See detailed map on Sheet J1 of Figure 3.3 in Appendix A of the BDAR (Appendix D).
I	<p>Removal of 3 x wind turbines (A7, A8 and A9).</p>	<ul style="list-style-type: none"> • Minimising impacts to native vegetation and adjoining large intact areas of habitat.
J	<p>Removal of internal transmission line between wind turbines C13 and D57.</p>	<ul style="list-style-type: none"> • Avoids impact to ~5 ha intact vegetation and habitats with potential to support MNES species.
K	<p>Removal of access track from Turee Vale Road to wind turbine cluster E.</p>	<ul style="list-style-type: none"> • Minimising impacts to native vegetation.



- Legend**
- Proposed Action Area
 - Development Corridor**
 - Development Corridor - Wind Farm
 - Development Corridor - TWA Facility
 - Development Corridor - External Transmission Line
 - Indicative Development Footprints**
 - Indicative Development Footprint - Wind Farm
 - Indicative Development Footprint - TWA Facility
 - Indicative Development Footprint - External Transmission Line
 - Indicative Development Footprint - Public Road Upgrades

- Reference IDs
- Wind Turbines
- Road
- Drainage Line
- National Parks (NPWS Estate)
- State Forest

FIGURE 6.2

Key design changes, critical avoidance and minimisation measures for MNS

Image Source: ESRI Basemap (2022) Data source: NSW DSFI (2022)

6.2 Mitigation Measures

Proposed safeguards and mitigation measures of the Proposed Action on visual impacts, shadow flicker, noise, Aboriginal heritage, historic heritage, traffic and transport, electromagnetic interference, aviation, social and economic impacts have been described in Section 6 of the Liverpool Range Wind Farm Amendment Report (Umwelt 2023c) prepared for Amendment 1 of the NSW Mod-1 Application.

This discussion has focused on mitigation measures for any likely impact of the Proposed Action on the EPBC Act listed threatened species.

6.2.1 Mitigation Measures – Biodiversity

The final impact area associated with the Proposed Action will be determined once a contractor(s) is selected by the Proponent. In doing so, the Proponent will seek to further minimise impacts to biodiversity values, particularly MNES.

Where avoidance is not possible, a comprehensive strategy to mitigate the unavoidable impacts of the Proposed Action will be prepared and implemented prior to the commencement of construction and these measures will be designed and described within an Environmental Management Plan (EMP), a Biodiversity Management Plan (BMP) and a Bird and Bat Adaptive Management Plan (BBAMP) that will be prepared in accordance with the relevant conditions of the Development Consent and approval under the EPBC Act for the Proposed Action. Outlines of these three management plans are provided in **Section 6.3**.

Mitigation measures have been developed based on the following fundamental principles:

- Avoid impacts where possible.
- Minimise impacts that could not be sufficiently avoided.
- Offset residual impacts.

Table 6.3 summarises the potential mitigation measures proposed for the Proposed Action, including the timing, action, outcome, and responsibility of these measures. It is noted that these are preliminary measures based on information currently available and all final mitigation measures will continue to be refined throughout the detailed design phase of the Proposed Action, including through development of the relevant management plans.

The Proponent commits that all mitigation and management measures will be developed to meet the S.M.A.R.T. principle, that is specific (S), measurable (M), achievable (A), relevant (R) and time-bound (T).

Table 6.3 Biodiversity Mitigation Measures (to be further refined during Detailed Design Phase of the Proposed Action)

Impact	Measure	Timing	Proposed Techniques	Outcome	Responsibility
Removal of native vegetation and habitats.	Demarcation of approved Development Footprints and Development Corridors	Prior to clearance and during clearance activities	<ul style="list-style-type: none"> Establish construction fencing or nightline (reflective bunting) around remnant vegetation in proximity to the construction footprint and no-go-area along waterway in the Development Corridor - TWA Facility. Particular attention should be made to ensure that the Commonwealth Box Gum Woodland CEEC and threatened species habitat that is to be retained is clearly demarcated. 	<ul style="list-style-type: none"> Ensuring the extent of clearance is understood and visible to all involved contractors. Minimisation of unnecessary and accidental impacts to surrounding vegetation and habitats. Ensuring impact thresholds identified for the Proposed Action are not compromised. 	Site supervisor
Trenching (ground disturbance, risk of fauna entrapment, weed)	Back filling and management of underground cable trenches	Ideally on the day of trenching, or at the latest, the day of laying cabling within the trench	<ul style="list-style-type: none"> Back-fill trenches using the soil removed for the trench. Compact the soil following back-filling in accordance with the erosion and run-off controls. Depending on the location of the trench, stabilise the back-filled soil. Where the trench occurs within native vegetation, revegetate with local native grasses (i.e. kangaroo grass, wallaby grass or spear grass). Where the trench occurs in exotic vegetation or disturbed lands, use mulch from chipped vegetation. 	<ul style="list-style-type: none"> Avoid/minimise risk of inadvertent impact to fauna species by species being injured by the trench or trapped within the trench. Ensures soil stabilisation and minimises risk of erosion and run-off. Speeds up the recovery of the land. Secures the stability of the site. Reduces risk of erosion. Reduces risk of weed species taking control. 	Site Environmental Officer

Impact	Measure	Timing	Proposed Techniques	Outcome	Responsibility
Blockage of fish passage by waterway crossing structures	Installation of Safe Fish Passageway	Prior, during and following clearance activities	<ul style="list-style-type: none"> Ensure any construction within or adjacent to the major waterways within the Development Corridor, being Gundare Creek, Coolaburragundy River, Turee Creek, Starkeys Creek, Talbragar River and Goulburn River minimises impacts to fish habitat. As per Section 4.2 of DPI's policy and guidelines for fish habitat conservation and management, construction across any of the abovementioned waterways will require a minimum waterway crossing structure to avoid impacts to fish habitat. 	<ul style="list-style-type: none"> Avoid/minimise risk of impacts to aquatic species and habitats. Construction of minimum waterway crossings to match the waterway classification as defined in Section 3.2.2 of DPI's policy and guidelines for fish habitat conservation and management, (DPI 2013) will avoid blockage of fish passage and minimise impacts to fish habitat. 	Site Environmental Officer Site Supervisor
Habitat removal and/or modification.	Pre-clearance and tree-felling protocol for the removal of all key fauna habitat (i.e. hollow-bearing trees, termite mounds, large hollow logs, rock piles, large stick nests)	Prior to clearance and during clearance activities	<ul style="list-style-type: none"> Develop and implement a pre-clearance and clearance protocol (incl. tree-felling) for the removal of all key fauna habitat (i.e. hollow-bearing trees, termite mounds, large hollow logs, rock piles, large stick nests). Where possible avoid key fauna habitat, particularly hollow-bearing trees, through detailed design and micro-siting of the Development Corridor. Pre-clearance surveys for greater glider in Development Corridor near Coolah Tops National Park to include nocturnal surveys to detect individuals and drone surveys to identify suitable den hollows in limbs as such hollows may not be detected from the ground. 	<ul style="list-style-type: none"> Substantially minimise impacts to fauna species, including threatened and non-threatened fauna. Minimise gaps between trees to facilitate gliding of the greater glider and minimise fragmentation impacts for the greater glider in habitats near Coolah Tops National Park. 	Site Environmental Officer Ecologist

Impact	Measure	Timing	Proposed Techniques	Outcome	Responsibility
			<ul style="list-style-type: none"> • Pre-clearance surveys along ridgelines near Coolah Tops National Park in potential habitat for the greater glider to identify potential locations where clearance for access tracks may be narrowed where possible to minimise the gap between canopies while providing safe access during construction. To consider this where access tracks will clear stands of trees and or increase fragmentation. • Inspect all treed vegetation, including scattered paddock trees within final development footprint prior to clearance. • Mark up key fauna habitat (e.g. hollow-bearing trees, termite mounds, large hollow logs, rock piles, large stick nests), to be cleared under the supervision of an ecologist to capture and release fauna. 		
	Identification of any hollow bearing trees within 50 m of a proposed wind turbine blade tip	Prior to finalisation of development footprint (wind farm)	<ul style="list-style-type: none"> • Undertake detailed survey to record any hollow bearing trees within 50 m of a proposed wind turbine blade tip. 	<ul style="list-style-type: none"> • Facilitate micro-siting, where possible to avoid and/or minimise removal of hollow bearing trees. • Ensure that any micro-siting does not move wind turbines closer to existing hollow bearing trees to minimise potential collision risk with avifauna. 	Site Environmental Officer Ecologist

Impact	Measure	Timing	Proposed Techniques	Outcome	Responsibility
	Identification of all hollow bearing trees within the proposed external road upgrades design	Prior to finalisation of development footprint (public road upgrades)	<ul style="list-style-type: none"> Undertake pre-clearance surveys to record all hollow bearing trees within the required public road upgrades design that are potentially impacted by the proposed upgrade works. Where possible avoid hollow-bearing trees, through detailed design and micro-siting of the development footprint of the public road upgrades. 	<ul style="list-style-type: none"> Facilitate avoidance measures, where possible. 	Site Environmental Officer Ecologist
	Avoidance or salvage key fauna habitat	During clearance activities	<ul style="list-style-type: none"> Where key fauna habitat (e.g. hollow bearing trees, hollow logs, rock piles) occurs in the final development footprint but is not required to be impacted through construction work, if possible leave as is. If it needs to be cleared, move into adjacent vegetation after felling, ensuring it remains within the Development Corridor (subject to landholder agreement). Allow regeneration of canopy and mid-storey flora species to a height permissible underneath the transmission line. Avoid the mulching of fallen vegetation to avoid smothering of ground-layer flora species. 	<ul style="list-style-type: none"> Minimise additional impacts to fauna species. Minimise the clearance of fauna habitat. Facilitate the maintenance of biodiversity values within the easements. Creation of fauna habitat. 	Site Environmental Officer Ecologist
Temporary disturbance of vegetation – risk of erosion and weed spread.	Rehabilitation and revegetating temporary disturbance areas	Proceeding clearance activities	<ul style="list-style-type: none"> Revegetate areas of temporary disturbance with previously collected native grasses, prioritising the use of several native grass species with seed locally sourced where practicable (ideally from within the Indicative Development Footprints during construction) or sourced from specialist native seed suppliers. 	<ul style="list-style-type: none"> Speeds up the recovery of the land. Secures the stability of the site. Reduces risk of erosion. Reduces risk of weed species taking control. 	Project Manager Site Environmental Officer

Impact	Measure	Timing	Proposed Techniques	Outcome	Responsibility
Partial impacts to vegetation and habitats in transmission lines.	Natural regeneration and recruitment of native flora species within the transmission line easement	Post construction and operational phase	<ul style="list-style-type: none"> • Allow natural regeneration and recruitment of native flora species that are unlikely to intrude on the safe conductor clearance distances within the transmission line easement. • Complete post-construction monitoring within the transmission line easement to confirm regeneration and recruitment is occurring. • Vegetation within the transmission line easement will need to be maintained to a maximum height of 4 m. 	<ul style="list-style-type: none"> • Facilitate the maintenance of biodiversity values within the easements, balancing electrical safety requirements. • Maintain some level of connectivity for flora and fauna species across the transmission line easement. 	Site Environmental Officer Ecologist
Loss of habitat	Installation of artificial nest boxes (or similar habitat augmentation) within proximity to glider habitat assessed as part of the Project	Proceeding clearance activities	<ul style="list-style-type: none"> • Installation of artificial nest boxes (or similar habitat augmentation) within the greater glider and yellow-bellied glider species polygon assessed and impacted as part of the Proposed Action. Artificial habitat for gliders to consider species requirements. Alteration to improve thermal properties of artificial habitat may improve their use by the greater glider. • Artificial nest boxes (or similar habitat augmentation) are to be installed at a ratio of 1:4 for hollow bearing trees removed within the greater glider and yellow -bellied glider species polygon. That is, for every four hollow bearing trees removed within the greater glider and yellow -bellied glider species polygon, an artificial nest box (or similar habitat augmentation) should be installed. 	<ul style="list-style-type: none"> • Minimises impacts of the Proposed Action on connectivity of habitat for the greater glider and yellow-bellied glider. • Minimised impacts of loss of hollow bearing trees on greater glider and yellow -bellied glider. • Minimise gaps between trees and/or fragmentation to facilitate gliding of the greater glider and minimise fragmentation impacts for the greater glider in habitats near Coolah Tops National Park. 	Ecologist

Impact	Measure	Timing	Proposed Techniques	Outcome	Responsibility
			<ul style="list-style-type: none"> • Installation of glider poles for yellow-bellied glider where clearance increases fragmentation by more than 25 metres or a glide ratio (horizontal distance/height dropped) of 2.0 (DAWE 2022b). • Greater gliders rarely use artificial wildlife structures. To minimise fragmentation, pre-clearance surveys will be undertaken along the ridgelines near Coolah Tops National Park in greater glider potential habitat to identify locations where clearance for access tracks may be narrowed to reduce the gap between canopies while providing safe access during construction. 		
Impacts from turbines	Adaptive management of raptor nesting habitat	During construction and operation of the Project	<ul style="list-style-type: none"> • The location of raptor nests are fluid in that new nests can be created over time, similarly active nests can readily become inactive should individuals leave the locality. • As a result of this, the Proposed Action proposes to adaptively manage the interaction of the wind farm with raptor nests through the preparation of the BBAMP. This adaptive management plan will entail an approach of creating additional raptor nesting locations through project design when active nests are recorded. These additional raptor nests will be located more than 430 m from wind turbines, subject to landholder agreements. 	<ul style="list-style-type: none"> • Minimise impacts of the Proposed Action on raptor species, through limiting risk of turbine strike. 	Project Manager Site Environmental Officer Ecologist

Impact	Measure	Timing	Proposed Techniques	Outcome	Responsibility
Vegetation clearance and vehicle movements introducing weeds.	Weed management	Construction and operation	<ul style="list-style-type: none"> Chemical and physical removal of invasive weed species in accordance with the New South Wales Control Handbook (DPI 2018) as appropriate for the weed species, level of infestation and existing land use. Areas of high threat weeds/invasive weeds will be identified during pre-clearance surveys. Appropriate vehicle and machinery washing and hygiene protocols at locations where construction vehicles and machinery leave work site and return to public roads and/or access parts of private landholdings that are not within the Development Corridor as agreed with the landholder. Avoid inadvertent damage or impacts to native species during weed management by ensuring all personnel are competent and experienced in the identification of native flora species. 	<ul style="list-style-type: none"> Minimisation of environmental weeds, high threat weeds and/or invasive species in the final Development Footprint. Minimisation of weed spread from and into the wider locality. 	Project Manager Site Environmental Officer
Sediment and erosion impact to receiving environment including retained vegetation, aquatic environment and habitats.	Avoidance of construction work following heavy rainfall	During Construction	<ul style="list-style-type: none"> Avoid or assess suitability of construction work following heavy rainfall, particularly on the fine, heavy soils of the valley floor. 	<ul style="list-style-type: none"> Minimise direct and indirect impacts to soil, vegetation and waterways. Minimise the risk of vehicles and/or machinery being bogged. 	Project Manager Site Environmental Officer
	Avoid construction within waterways when heavy rainfall is predicted to occur	During Construction	<ul style="list-style-type: none"> Avoid construction within waterways when heavy rainfall is predicted to occur. Monitoring of weather forecasts to plan works around likely heavy rainfall and elevated water levels in waterways. 	<ul style="list-style-type: none"> Minimise direct and indirect impacts to soil and waterways. 	Project Manager Site Environmental Officer

Impact	Measure	Timing	Proposed Techniques	Outcome	Responsibility
	Sediment and erosion control	During and proceeding construction	<ul style="list-style-type: none"> Implement sediment and erosion control measures in accordance with best practice guidelines. 	<ul style="list-style-type: none"> Minimise sediment pollution. Minimise erosion of soils. Minimise impacts to waterways and habitats. 	Site Environmental Officer
Pollution and spills.	Chemical and pollutant spill plan	During and construction and operation	<ul style="list-style-type: none"> Implement a spill plan to prevent chemical and pollutant run off. 	<ul style="list-style-type: none"> Minimise impacts to waterways. 	Site Environmental Officer
Fauna movement impacts	Fencing and access control	Construction and operation	<ul style="list-style-type: none"> Fencing constructed for the Project will not include barbed wire on the top line of the fence, unless required by authorities. 	<ul style="list-style-type: none"> Provides for access control to avoid unwanted human interference and disturbance to non-operational areas. Minimisation of impacts to native fauna species from the use of barbed-wire fences. 	Project Manager Site Environmental Officer
Increased bushfire risk	Bushfire management	Construction and operation	<ul style="list-style-type: none"> Bushfire management will consider asset protection as well as the sensitivities of threatened species and threatened ecological communities. 	<ul style="list-style-type: none"> Protect life and property, while supporting appropriate conditions for the existing ecological features. 	Project Manager Site Environmental Officer
Collision risk (transmission lines)	Avifauna collision with transmission lines	Construction and operation	<ul style="list-style-type: none"> This measure will be considered further during the preparation of the BBAMP and will only be considered should the current research and literature support the approach. Install conspicuous markers on the transmission line wires where the proposed easement traverses through remnant forests and woodlands. Installation of markers is not required where the transmission line occurs through grasslands. 	<ul style="list-style-type: none"> Minimise direct impacts to avifauna species known to be susceptible to injury/death caused by interaction with transmission line wire, in particular white-throated needletail. 	Project Manager Site Supervisor Transmission line operator.

Impact	Measure	Timing	Proposed Techniques	Outcome	Responsibility
Collision risk (wind farms)	Potential research and/or monitoring project to investigate impact mitigation measures in relation to the impact of blade strike on native bird and bat species	Operation	<ul style="list-style-type: none"> These measures will be determined in consultation with DCCEEW, BCS, Umwelt and industry bodies and will be considered as additional mitigation measures within the BBAMP. 	<ul style="list-style-type: none"> Potentially reducing the risk and rate of blade strike/barotrauma to avifauna species. 	Project Manger Site Supervisor Ecologist

Appropriate environmental management measures will be undertaken as part of the construction and operation of the Proposed Action to minimise the potential for direct and indirect impacts, including:

- Water management systems that seek to minimise the potential for damage to flora and fauna habitats from erosion and unnatural flooding events.
- Erosion and sedimentation control.
- Noise control systems.
- Traffic control and speed limits.
- Dust control measures.
- In the event that aviation hazard lighting is required, implement appropriate lighting controls (e.g., use of red lights atop the turbines) to avoid attracting insects, birds and bats.

The measures and strategies identified in Table 6.3 are not considered likely to have a risk of failure if implemented correctly during the periods specified, or that significant residual impacts are likely to occur. The consequences of potential residual impacts (i.e., minor changes to habitat quality in surrounding areas) are considered to be low, due to the existing disturbed nature of the Proposed Action Area and public road corridors through historic and current land management practices.

6.2.2 Additional Biodiversity Mitigation Measures

6.2.2.1 Offsite Measures to Mitigate the Risk of Serious and Irreversible Impacts (SAII)

The Proponent has consulted with BCS and DPHI to determine a set of additional and appropriate measures that the Proponent will commit to implementing as a targeted effort to reduce the risk of serious and irreversible impacts (SAII) to NSW Box Gum Woodland CEEC and in doing so protect additional areas of Commonwealth Box Gum Woodland CEEC over and above what is required under the BOS.

The Proponent, in consultation with BCS and DPHI, has developed a draft proposal to conserve in perpetuity additional areas of NSW and Commonwealth Box Gum Woodland CEEC equivalent to the quantum of Low and Moderate-Good condition class impacted by the Proposed Action (SAII Measures). The Proponent's draft proposal for SAII Measures has been provided to BCS and DPHI for their consideration on the 14 March 2024 and is provided in Appendix C of the Preliminary Offset Strategy contained in **Appendix G** of this PER.

Considering the estimated impacts to Commonwealth Box Gum Woodland CEEC associated with the Indicative Development Footprint – Wind Farm and Indicative Development Footprint – Public Road Upgrades only, this would equate to an additional 217.5 ha of NSW Box Gum Woodland CEEC and an additional 13.9 ha of Commonwealth Box Gum Woodland CEEC that would be conserved in perpetuity as part of the SAII Measures. It should be noted that the additional measures have focused on the Indicative Development Footprint – Wind Farm and Indicative Development Footprint – Public Road Upgrades as it is likely that the External Transmission Line assessed as part of this Proposed Action will not proceed (refer to **Section 2.2.3**).

The mechanism to conserve in perpetuity the additional areas of Box Gum Woodland CEEC will be via the generation and retirement of relevant ecosystem credits from a biodiversity stewardship agreement (BSA) site that will be registered on title as required under the BC Act (SAII Credits). The SAII Credits cannot be traded on the credit market or retired against the Proposed Action, and will simply be retired, or in effect, donated. The SAII Credits are additional to the credits required to offset unavoidable impacts to Box Gum Woodland CEEC under the BOS.

Forming part of the BSA site, the additional areas of Box Gum Woodland CEEC to be conserved will be subject to the standard active management activities relevant to the specific management zones specified in the relevant Biodiversity Stewardship Site Assessment Report (BSSAR) within which the relevant ecosystem credits have been generated.

It is intended that the SAII Credits will be generated from a BSA site that is under the Proponent's control. While the Proponent is establishing new BSA sites at various locations to offset unavoidable impacts associated with the Proposed Action (discussed further in **Section 8.3.1**), it is intended that the SAII Credits will be generated from the proposed Nangarah BSA site, located near Barraba approximately 80 km north of Tamworth within the Peel IBRA subregion (refer to Figure 1 in Appendix C of **Appendix G** to this PER). The Nangarah BSA site is a highly suitable location to deliver the SAII Measures as the Proponent has secured land tenure and has full control over how SAII Credits can be generated within the BSA site. In addition, there is a mix of vegetation classes with evidence of natural regeneration and there are substantial areas of Box Gum Woodland CEEC of equivalent condition to the Low and Moderate-good condition vegetation anticipated to be impacted by the Proposed Action.

The Proponent will generate at the BSA site the required ecosystem credits that are aligned with the NSW and Commonwealth Box Gum Woodland CEEC in a 'like-for-like' manner with the vegetation impacted by the Proposed Action. The quantity of ecosystem credits to be generated will be calculated according to the area of actual impact to Box Gum Woodland CEEC by the Proposed Action.

To maximise the opportunity to reduce impacts while balancing the need to deliver SAII Measures in a timely manner, the Proponent proposes to retire the relevant SAII Credits in a staged manner upon completion of ground disturbing works for each major milestone at the Proposed Action. Because the SAII Credits will be generated from within specific vegetation zones and management zones within the BSA site, the Proponent intends to withhold the SAII Credits until the actual area of impact to Low and Moderate-good condition Box Gum Woodland CEEC can be accurately calculated.

As the additional areas of NSW Box Gum Woodland CEEC to be conserved as part of the SAII Measures will form part of the broader BSA site, those additional areas will be subject to the standard active management actions specified for the relevant management zones within the BSSAR for the BSA site. No active restoration management activities are proposed to be implemented. In particular, the Nangarah BSA site there is evidence of substantial regeneration within the areas of equivalent Low condition NSW Box Gum Woodland CEEC. The required management actions are expected to involve the following:

- Wildlife friendly fencing.
- Feral animal control.
- Weed control.
- Ecoburns when considered appropriate to improve biodiversity value.
- Monitoring.

Further information on the Proponent's draft proposal to implement the abovementioned SAI Measures is contained in the Offset Strategy prepared by the Proponent, Wedgetail, and Umwelt in **Appendix G**. The Proponent will continue to consult with BCS and DPHI to determine the SAI Measures that shall apply as part of the Proposed Action.

6.2.2.2 Additional Onsite Mitigation Measures in the Development Corridor

In addition to the additional mitigation measures described above for the BSA Site, the Proponent has nominated the following measures subject to finalisation in consultation with BCS, DPHI and DCCEEW for consideration, subject to establishment and management costs and landholder consent:

- In selected locations within the Development Corridor that support NSW Box Gum Woodland CEEC that is not proposed to be impacted by the Proposed Action, the Proponent will fund fencing and weed management of land to facilitate the regeneration of the NSW Box Gum Woodland CEEC, where practicable. It is acknowledged this will only be possible in areas that are not required for stock management by the landholder.
- The Proponent will investigate opportunities to partner with organisations and initiatives such as Hollow Hog to assist with contributing more hollows to the landscape; Local Aboriginal Land Councils and Men's Sheds to build appropriate nestboxes; the NSW Local Land Services, Landcare and/or the Saving Our Species program to support the delivery of additional environmental benefits in and around the Development Corridor.
- The Proponent will commit to relocating salvaged tree trunks and logs (at least 10 cm in diameter and one metre in length) from the clearing of native vegetation within the Indicative Development Footprint, to enhance habitat values and fauna habitat of NSW Box Gum Woodland CEEC within the Development Corridor, wherever practicable. The density and location of salvaged materials will be agreed with landowners through reinstatement of the adjacent disturbed areas. The density and location of salvaged materials will also be determined in consultation with BCS and DPHI, through the preparation of the BMP.
- The Proponent will engage with the local Landcare and other community groups to identify and fund programs specifically relating to the regeneration and management of NSW Box Gum Woodland CEEC, within the local region surrounding Coolah and Cassilis.
- The Proponent will engage with involved landholders to identify land parcel boundaries where corridors of NSW Box Gum Woodland CEEC can be replanted, rehabilitated and managed (including fencing and weed management). Corridors will ideally connect to larger patches of NSW Box Gum Woodland CEEC.

All additional mitigation measures that will be implemented within the Proposed Action Area and the BSA site will be documented in detail within the required BMP and will stipulate the necessary monitoring activities.

6.2.3 Specific Avoidance and Mitigation Measures for MNES

As the magnitude and duration of potential impacts of the Proposed Action differ between the various MNES, specific avoidance and mitigation measures have been developed to address particular MNES.

Construction, operation and decommissioning impacts of the Proposed Action have been identified and assessed for each MNES in **Section 5.3** to **Section 5.6**. How the Proposed Action has avoided impacts through iterative processes during the environmental assessment process and through detailed design have been outlined in **Section 6.1** with more avoidance measures to be implemented during detailed design in micro-siting of elements of the Proposed Action. A summary of the impacts and proposed avoidance and mitigation measures for MNES is provided in **Table 6.4**.

Table 6.4 Potential Impacts on MNES: Specific Avoidance and Mitigation Measures for particular MNES Species/Communities

MNES	Impact to MNES	CWO REZ Avoidance	Objective	Avoidance Measure	Mitigation Measure	Management Plan	Performance criteria	Corrective action	Responsibility
Vegetation clearance resulting in habitat loss									
Commonwealth Box Gum Woodland	Up to 31.6 ha	17.7 ha or 56 per cent	Further avoidance and minimise impact.	Further avoidance through micro-siting of infrastructure at final design.	<ul style="list-style-type: none"> Demarcation of boundaries Pre-clearance and tree-felling protocols Additional and appropriate measures (refer to Section 6.2.2) Natural regeneration and monitoring within transmission easements. 	EMP, BMP, Vegetation clearance plan, rehabilitation management plan	Final clearance area less than or no greater than estimated impact.	Where appropriate revise final design and micro-siting.	During design - Proponent During construction – Construction contractor
regent honeyeater	604.3 ha	105.8 ha 18 per cent	<ul style="list-style-type: none"> Further avoidance and minimise impact. Minimise and/or mitigate realised turbine strike impacts. 	<ul style="list-style-type: none"> Further avoidance through micro-siting of infrastructure at final design. Consideration of specific mitigation measures through 	<ul style="list-style-type: none"> Pre-clearance and tree-felling protocols Proposed research and/or monitoring program to investigate impact mitigation measures in relation to the impact of blade 	EMP, BMP, Vegetation clearance plan, BBAMP	<ul style="list-style-type: none"> Final clearance area less than or no greater than estimated impact. Avoidance of BBAMP impact trigger 	<ul style="list-style-type: none"> Where appropriate revise final design and micro-siting Specific mitigation measure designed and implemented in consultation with DCCEEW. 	During design - Proponent During construction – Construction contractor During operation - Proponent

MNES	Impact to MNES	CWO REZ Avoidance	Objective	Avoidance Measure	Mitigation Measure	Management Plan	Performance criteria	Corrective action	Responsibility
			<ul style="list-style-type: none"> Avoidance of direct impacts 	implementation of BBAMP.	strike on native bird and bat species.				
gang-gang cockatoo	13.4 ha	12.0 ha or 89 per cent	<ul style="list-style-type: none"> Minimise and/or mitigate realised turbine strike impacts. Avoidance of direct impacts. 	Consideration of specific mitigation measures through implementation of BBAMP.	<ul style="list-style-type: none"> Pre-clearance and tree-felling protocols Identification of hollow bearing trees within 50 m of proposed wind turbine blade tip. Proposed research and/or monitoring program to investigate impact mitigation measures in relation to the impact of blade strike on native bird and bat species. 	EMP, BMP, Vegetation clearance plan, BBAMP	<ul style="list-style-type: none"> Final clearance area less than or no greater than estimated impact. Avoidance of BBAMP impact trigger 	<ul style="list-style-type: none"> Where appropriate revise final design and micro-siting Specific mitigation measure designed and implemented in consultation with DCCEEW. 	During construction – Construction contractor During operation - Proponent
glossy black-cockatoo (ecosystem)	83.7 ha	0.0 ha	<ul style="list-style-type: none"> Minimise and/or mitigate realised turbine strike impacts. 	Consideration of specific mitigation measures through implementation of BBAMP.	<ul style="list-style-type: none"> Pre-clearance and tree-felling protocols. Identification of hollow bearing trees within 50 m 	EMP, BMP, Vegetation clearance plan, BBAMP	Final clearance area less than or no greater than estimated impact.	<ul style="list-style-type: none"> Where appropriate revise final design and micro-siting Specific mitigation 	During construction – Construction contractor During operation - Proponent

MNES	Impact to MNES	CWO REZ Avoidance	Objective	Avoidance Measure	Mitigation Measure	Management Plan	Performance criteria	Corrective action	Responsibility
			<ul style="list-style-type: none"> Avoidance of direct impacts. 		<ul style="list-style-type: none"> of proposed wind turbine blade tip. Proposed research and/or monitoring program to investigate impact mitigation measures in relation to the impact of blade strike on native bird and bat species. 		Avoidance of BBAMP impact trigger	measure designed and implemented in consultation with DCCEEW.	
Glossy-black cockatoo (species credit species – breeding habitat)	2.0 ha	0.0 ha	<ul style="list-style-type: none"> Minimise and/or mitigate realised turbine strike impacts. Avoidance of direct impacts. 	Consideration of specific mitigation measures through implementation of BBAMP.	<ul style="list-style-type: none"> Pre-clearance and tree-felling protocols. Identification of hollow bearing trees within 50 m of proposed wind turbine blade tip. Proposed research and/or monitoring program to investigate impact mitigation measures in relation to the impact of blade 	EMP, BMP, Vegetation clearance plan, BBAMP	<ul style="list-style-type: none"> Final clearance area less than or no greater than estimated impact. Avoidance of BBAMP impact trigger. 	<ul style="list-style-type: none"> Where appropriate revise final design and micro-siting Specific mitigation measure designed and implemented in consultation with DCCEEW. 	<p>During construction – Construction contractor</p> <p>During operation - Proponent</p>

MNES	Impact to MNES	CWO REZ Avoidance	Objective	Avoidance Measure	Mitigation Measure	Management Plan	Performance criteria	Corrective action	Responsibility
					strike on native bird and bat species.				
Painted honeyeater	628.0 ha	105.8 ha or 17 per cent	<ul style="list-style-type: none"> Minimise and/or mitigate realised turbine strike impacts. Avoidance of direct impacts. 	Consideration of specific mitigation measures through implementation of BBAMP.	<ul style="list-style-type: none"> Pre-clearance and tree-felling protocols Proposed research and/or monitoring program to investigate impact mitigation measures in relation to the impact of blade strike on native bird and bat species. 	EMP, BMP, Vegetation clearance plan, BBAMP	<p>Final clearance area less than or no greater than estimated impact.</p> <p>Avoidance of BBAMP impact trigger</p>	<ul style="list-style-type: none"> Where appropriate revise final design and micro-siting Specific mitigation measure designed and implemented in consultation with DCCEEW. 	<p>During construction – Construction contractor</p> <p>During operation - Proponent</p>
White-throated needletail (terrestrial)	463.3 ha	140.9 ha or 30 per cent	Minimise and/or mitigate realised turbine strike impacts.	Consideration of specific mitigation measures through implementation of BBAMP.	<ul style="list-style-type: none"> Avifauna collision with transmission lines. Proposed research and/or monitoring program to investigate impact mitigation measures in relation to the impact of blade strike on native 	BBAMP	Avoidance of BBAMP impact trigger	Specific mitigation measure designed and implemented in consultation with DCCEEW.	During operation - Proponent
White-throated needletail (aerial)	4,298,475 m ² or 430 ha	not applicable							

MNES	Impact to MNES	CWO REZ Avoidance	Objective	Avoidance Measure	Mitigation Measure	Management Plan	Performance criteria	Corrective action	Responsibility
					bird and bat species.				
swift parrot	302.5 ha	16.9 ha or five per cent	<ul style="list-style-type: none"> • Further avoidance and minimise impact. • Minimise and/or mitigate realised turbine strike impacts. • Avoidance of direct impacts. 	<ul style="list-style-type: none"> • Further avoidance through micro-siting of infrastructure at final design. • Consideration of specific mitigation measures through implementation of BBAMP. 	<ul style="list-style-type: none"> • Pre-clearance and tree-felling protocols • Proposed research and/or monitoring program to investigate impact mitigation measures in relation to the impact of blade strike on native bird and bat species. 	EMP, BMP, Vegetation clearance plan, BBAMP	<ul style="list-style-type: none"> • Final clearance area less than or no greater than estimated impact. • Avoidance of BBAMP impact trigger 	<ul style="list-style-type: none"> • Where appropriate revise final design and micro-siting • Specific mitigation measure designed and implemented in consultation with DCCEEW. 	During design - Proponent During construction – Construction contractor During operation - Proponent
superb parrot	22.9 ha	12.0 ha or 52 per cent	<ul style="list-style-type: none"> • Minimise and/or mitigate realised turbine strike impacts. • Avoidance of direct impacts. 	Consideration of specific mitigation measures through implementation of BBAMP.	<ul style="list-style-type: none"> • Pre-clearance and tree-felling protocols • Identification of hollow bearing trees within 50 m of proposed wind turbine blade tip • Proposed research and/or monitoring program to investigate 	EMP, BMP, Vegetation clearance plan, BBAMP	<ul style="list-style-type: none"> • Final clearance area less than or no greater than estimated impact. • Avoidance of BBAMP impact trigger. 	<ul style="list-style-type: none"> • Where appropriate revise final design and micro-siting • Specific mitigation measure designed and implemented in consultation with DCCEEW. 	During construction – Construction contractor During operation - Proponent

MNES	Impact to MNES	CWO REZ Avoidance	Objective	Avoidance Measure	Mitigation Measure	Management Plan	Performance criteria	Corrective action	Responsibility
					impact mitigation measures in relation to the impact of blade strike on native bird and bat species.				
large-eared pied bat	106.7 ha	0.0 ha	<ul style="list-style-type: none"> Minimise and/or mitigate realised turbine strike impacts. Avoidance of direct impacts. 	Consideration of specific mitigation measures through implementation of BBAMP.	<ul style="list-style-type: none"> Pre-clearance and tree-felling protocols. Proposed research and/or monitoring program to investigate impact mitigation measures in relation to the impact of blade strike on native bird and bat species. 	EMP, BMP, Vegetation clearance plan, BBAMP.	<ul style="list-style-type: none"> Final clearance area less than or no greater than estimated impact. Avoidance of BBAMP impact trigger. 	<ul style="list-style-type: none"> Where appropriate revise final design and micro-siting. Specific mitigation measure designed and implemented in consultation with DCCEE. 	<p>During construction – Construction contractor</p> <p>During operation - Proponent</p>
spotted-tailed quoll	193.9 ha	98.5 ha or 51 per cent	Further avoidance and minimise impact.	Further avoidance through micro-siting of infrastructure at final design.	Salvage key fauna habitat	EMP, BMP, Vegetation clearance plan	Successful salvage and placement of fauna habitat as committed to in the bmp	Replacement of habitat from external sources i.e. large tree logs	<p>During construction – Construction contractor</p> <p>During operation - Proponent</p>

MNES	Impact to MNES	CWO REZ Avoidance	Objective	Avoidance Measure	Mitigation Measure	Management Plan	Performance criteria	Corrective action	Responsibility
Corben's long-eared bat	156.8 ha	86.5 ha or 55 per cent	<ul style="list-style-type: none"> Minimise and/or mitigate realised turbine strike impacts. Avoidance of direct impacts. 	Consideration of specific mitigation measures through implementation of BBAMP.	<ul style="list-style-type: none"> Pre-clearance and tree-felling protocols. Proposed research and/or monitoring program to investigate impact mitigation measures in relation to the impact of blade strike on native bird and bat species. 	EMP, BMP, Vegetation clearance plan, BBAMP	<ul style="list-style-type: none"> Final clearance area less than or no greater than estimated impact. Avoidance of BBAMP impact trigger 	<ul style="list-style-type: none"> Where appropriate revise final design and micro-siting Specific mitigation measure designed and implemented in consultation with DCCEEW. 	<p>During construction – Construction contractor</p> <p>During operation - Proponent</p>
greater glider	19.3 ha	0.0 ha	<ul style="list-style-type: none"> Further avoidance and minimise impact. Avoidance of direct impacts. 	Further avoidance through micro-siting of infrastructure at final design.	<ul style="list-style-type: none"> Pre-clearance and tree-felling protocols. Identification of hollow bearing trees within 50 m of proposed wind turbine blade tip. 	EMP, BMP, Vegetation clearance plan	No direct impacts to the species	Commitment to species specific mitigation measures e.g. installation of artificial hollows, research project in Coolah Tops National Park for population studies.	During construction – Construction contractor
yellow-bellied glider	15.2 ha	0 ha	<ul style="list-style-type: none"> Further avoidance and 	<ul style="list-style-type: none"> Further avoidance through micro-siting of infrastructure 	<ul style="list-style-type: none"> Pre-clearance and tree-felling protocols. 	EMP, BMP, Vegetation clearance plan	No direct impacts to the species	Commitment to species specific mitigation measures e.g. installation of	During construction – Construction contractor

MNES	Impact to MNES	CWO REZ Avoidance	Objective	Avoidance Measure	Mitigation Measure	Management Plan	Performance criteria	Corrective action	Responsibility
			minimise impact <ul style="list-style-type: none"> Avoidance of direct impacts 	at final design.	<ul style="list-style-type: none"> Identification of hollow bearing trees within 50 m of proposed wind turbine blade tip. 			artificial hollows, research project in Coolah Tops National Park for population studies.	
koala	721.0 ha	192.3 ha or 27 per cent	<ul style="list-style-type: none"> Further avoidance and minimise impact. Avoidance of direct impacts. 	<ul style="list-style-type: none"> Further avoidance through micro-siting of infrastructure at final design. 	Pre-clearance and tree-felling protocols.	EMP, BMP, Vegetation clearance plan	No direct impacts to the species	Commitment to species specific mitigation measures e.g. installation of artificial hollows, research project in Coolah Tops National Park for population studies.	During construction – Construction contractor During operation - Proponent
grey-headed flying-fox	312.1 ha	16.9 ha or 5 per cent	Minimise and/or mitigate realised turbine strike impacts.	Consideration of specific mitigation measures through implementation of BBAMP.	<ul style="list-style-type: none"> Proposed research and/or monitoring program to investigate impact mitigation measures in relation to the impact of blade strike on native bird and bat species. 	BBAMP	Avoidance of BBAMP impact trigger	Specific mitigation measure designed and implemented in consultation with DCCEEW.	During operation - Proponent

MNES	Impact to MNES	CWO REZ Avoidance	Objective	Avoidance Measure	Mitigation Measure	Management Plan	Performance criteria	Corrective action	Responsibility
satin flycatcher	101.8 ha	30.3 ha or 30 per cent	Further avoidance and minimise impact.	Further avoidance through micro-siting of infrastructure at final design.	<ul style="list-style-type: none"> Proposed research and/or monitoring program to investigate impact mitigation measures in relation to the impact of blade strike on native bird and bat species. 	BBAMP	Avoidance of BBAMP impact trigger	Specific mitigation measure designed and implemented in consultation with DCCEEW.	During construction – Construction contractor During operation - Proponent

6.3 Management Plans

Mitigation measures described in Table 6.3 will be finalised through the preparation and approval of the BMP, BBAMP and EMP. As per the relevant approval conditions, all plans will be prepared to the satisfaction of the Minister, and where required will be prepared in consultation with regulatory agencies and in accordance with all relevant State and Commonwealth approvals and legislation. Each of the control measures identified in Table 6.3 will contribute to the maintenance of habitat quality for MNES within and adjacent to the final impacts of the Proposed Action.

To mitigate unavoidable impacts to protected matters during construction and operation and support the implementation of other licences and permits and environmental framework will be developed including Environmental Management Strategy and associated management plans, including but not limited to:

- Environmental Management Plan.
- Biodiversity Management Plan including Vegetation Clearance Plan and Koala Plan of Management.
- Bird and Bat Adaptive Management Plan.

Each of these plans are described in the sections below. Rehabilitation and decommissioning plans and measures are discussed in **Section 7.0**.

6.3.1 Environmental Management Plan Outline

An EMP will be prepared to describe how the Proposed Action might impact on the natural environment and to set out clear commitments for impact avoidance, minimisation and management. An outline of the EMP framework is provided in **Table 6.5** which considers the environmental management plan guidelines prepared by the Commonwealth of Australia (CoA 2014).

Tilt is experienced in the preparation of EMPs and has successfully implemented approved EMPs on all of their operating projects.

Table 6.5 EMP Framework outline

Section	Summary of potential content
Introduction	Will include a description of key elements of the Proposed Action, an outline of the purpose of the EMP, and the strategic framework for environmental management for the Proposed Action (to be detailed in a flow chart format) and a clear definition of the objectives of the EMP and the intended environmental outcomes.
Statutory Requirements	Will include details of Commonwealth and NSW approvals (including any post-approval licences and permits) and a reference table which will outline the approval conditions and any required actions and provide a cross reference to the section of the EMP which addresses these requirements.
Project Description	This will provide context for the EMP and including figures showing the location of key actions, a description of all activities to be undertaken (broken down between construction, operation and decommissioning phases) and a schedule of intended commencement and completion dates for each phase.

Section	Summary of potential content
Roles and Responsibilities	This section will outline the personnel responsible for environmental management for the Proposed Action and will define position titles, roles and responsibilities as well as environmental training requirements for all personnel involved with the Proposed Action and the emergency contacts and procedures for managing environmental emergencies.
Monitoring and Reporting	A list of reporting requirements for routine monitoring, environmental incident reporting, non-compliance reporting, corrective actions and auditing will be provided in line with regulatory requirements and approval conditions. Information to be provided will include a description of standard report content, the schedule and/or triggers for report preparation, external report recipients and document control procedures.
Potential Environmental Impacts and Risks	This section will identify, locate and quantify the potential impacts (both direct and indirect) of the Proposed Action including information regarding timing (construction, operation and/or decommissioning) and any uncertainties around predictions. It will include a risk assessment for each potential impact based on its likelihood and consequences to ensure that mitigation and management measures are appropriate and commensurate with the level of risk and will also describe contingencies for events such as accidental vessel or machinery spills, heavy or prolonged rainfall or storms.
Environmental Management Measures	For each potential impact identified above, the EMP will address any proposed environmental management activities, controls and performance targets and will include monitoring programs to determine the effectiveness of the proposed measures with trigger values for corrective actions. Specific measures relating to dust suppression and reduced construction zone vehicle speeds will be included.
Audit and Review	This section will detail the schedule or triggers for auditing (both internal and external) and regular review of the EMP.

6.3.2 Biodiversity Management Plan

A BMP will be developed and approved prior to commencement of construction. It will detail the avoidance, mitigation and management measures that will be implemented by the Proposed Action to avoid and minimise impacts on MNES. An outline of the BMP is provided in **Table 6.6**, with the final details to be determined following detailed design of the Proposed Action. The BMP will be prepared in accordance with the Federal Development Consent and consultation with DCCEEW.

Table 6.6 Proposed BMP Outline

Feature	BMP
Baseline data	The BMP will utilise the following data: <ul style="list-style-type: none"> • Surveys and associated results of the original approval and the Proposed Action.
Seasonal changes	The timing of monitoring and management components will be defined in the BMP based on known appropriate seasonal conditions specified by the BAM for the flora and fauna entities being addressed.
Monitoring methods	Ecological monitoring program to be developed which identifies at a minimum: <ul style="list-style-type: none"> • Ensure the persistence of BC Act and EPBC Act listed CEECs within the partial direct impacts within the transmission line balance of easements.

Feature	BMP
	<ul style="list-style-type: none"> • Ensure the assumed partial direct impact within the transmission line balance of easements are representative of the realised impacts through completion of post-construction BAM – Vegetation Integrity Plots (ensuring sufficient time has past to ensure vegetation recovery). • Site vegetation condition. • Presence of threatened species. • Evidence of erosion. • Occurrences of weeds and feral fauna. • Human disturbance. <p>Monitoring will inform further requirements for corrective actions to be undertaken.</p>
Trigger values	<p>Trigger values will be defined in the BMP and will be generated for the threatened (and significant) ecological communities, populations and species identified in Section 3.5 to Section 3.9. Impact triggers will be established to relate to a sliding scale of mitigation measures, where minor mitigation measures will be the first considered. The outcomes of these minor mitigation measures will be monitored and analysed, with more intensive mitigation measures required to ensure the targeted mitigation is achieved i.e. impact to a particular species is adequately managed.</p>
Management actions	<p>The BMP will provide detailed management actions including actions specifically addressing:</p> <ul style="list-style-type: none"> • Disruption to connections between suitable habitat for fauna foraging. • Implementing an integrated feral animal monitoring and control program targeting cats and foxes. <p>These management actions will be prepared in consultation with DCCEEW.</p>
Rehabilitation	<p>The BMP will provide detailed commitments for rehabilitation during construction, including rehabilitation acceptance criteria / completion criteria. Further detail on rehabilitation is provided in Section 7.0.</p>
Measurement of impacts	<p>The information collected during monitoring events conducted under the BMP will be used to analyse condition trends over time, to assess initial and ongoing impacts of the Proposed Action. These may be used to inform further action to be undertaken during ongoing operations to reduce the extent of indirect impacts.</p>

6.3.2.1 Vegetation Clearance Plan Outline

As identified in **Table 6.3**, mitigation measures relating to vegetation clearance will be outlined in the BMP. The Vegetation Clearance Plan (VCP) will include the following:

- Identification of vegetation that is potential nesting or breeding habitat for relevant listed threatened species and listed migratory species, within the Proposed Action Area.
 - The VCP will include an individual detail figure set of potential nesting or breeding habitat for MNES fauna species considered to be impacted, or with the potential to be impacted by the Proposed Action.

- Identification of the likely breeding season for relevant listed threatened species and listed migratory species, within the Proposed Action Area.
 - The VCP will include a table that presents the likely breeding season for MNES fauna species considered to be impacted, or with the potential to be impacted by the Proposed Action.
 - Information will be based on published literature including but not limited to approved Conservation Advice, Listing Advice, Recovery Plans, scientific literature and where applicable the NSW TBDC profile.
- Pre-clearance survey methods, which include, but are not limited to the following requirements:
 - Clearance of habitat within breeding season.
 - Clearing of habitat of a species occurs during the breeding season of that species, a qualified ecologist must undertake a pre-clearance survey within 72 hours prior to the removal of the habitat, or removal of vegetation within 50 m of nesting or breeding habitat.
 - If a breeding activity of a listed threatened species is identified during pre-clearance surveys, vegetation clearing within 100 m of the breeding activity must be delayed up until the breeding activity ceases.
 - Clearance of habitat outside of breeding season.
 - Prior to the clearance and during clearance activities a comprehensive pre-clearance and clearance protocol (incl. tree-felling) for the removal of all key fauna habitat (i.e. hollow-bearing trees, termite mounds, large hollow logs, rock piles, large stick nests) will be undertaken by a qualified ecologist.
 - Inspect all treed vegetation, including scattered paddock trees within final development footprint of the Proposed Action prior to clearance.
 - Mark up key fauna habitat (e.g. hollow-bearing trees, termite mounds, large hollow logs, rock piles, large stick nests), to be cleared under the supervision of an ecologist to capture and release fauna. All non-key fauna habitat is to be cleared the day prior to the removal of the key-fauna habitat giving any fauna species utilising the key fauna the opportunity to vacate.
 - Clearance of key fauna habitat is to occur no sooner than the day after all non-key fauna habitat directly surrounding it is removed.
 - Pre-clearance surveys must be completed within 2-weeks of the treed vegetation, including scattered paddock trees, being cleared.
 - Where a vertebrate fauna species is identified within vegetation to be cleared (not limited to key fauna habitat), clearance works will be stopped directly surrounding it to give adequate time for the animal to disperse.
 - Where a MNES vertebrate fauna species is identified within vegetation to be cleared (not limited to key fauna habitat), clearance works will be stopped directly surrounding it and will not recommence until the animal disperses. That is, unless the animal can be safely (to staff and the animal) captured and removed without the removal of the vegetation.

- Vegetation Disturbance Permit Process:
 - The vegetation disturbance permit process will provide a hold-point to ensure the Proposed Action is being undertaken in accordance with the Commonwealth approval and clearance limits, minimise the impacts of the Proposed Action on fauna and their habitat and reduce impacts to hollow-dependent native species from clearing activities.
 - It will include a process to identify if proposed impacts will contribute to the approved disturbance limits and ensure they will not be exceeded. In a circumstance where a disturbance limit is trending towards its limit, it is the responsibility of the Proponent to provide internal guidance to ensure that limits are not exceeded. If an exceedance does occur the Proponent will notify the relevant agencies to determine corrective procedures.
 - During construction, the Proponent will be responsible for ensuring the vegetation disturbance permit process is implemented, the tree-felling procedure has been communicated to those undertaking the work, the pre-clearance and tree-felling procedures have been implemented, and all necessary documentation and evidence has been recorded.

6.3.2.2 Koala Plan of Management Outline

The Koala Plan of Management for the Proposed Action will include:

- A description of the Proposed Action and its potential impacts on koalas and their habitat.
- A description of the koala habitat within the Proposed Action Area, including the location through detailed figures and location of known records.
- Options for protective covenants on un-impacted areas, in particular, areas which are better quality habitat for koalas.
- A description of the koala population adjacent to the Proposed Action Area, including the size, distribution, and health of the population.
- A description of the measures that will be taken to avoid or minimize impacts on koalas and their habitat during the construction phase of the Proposed Action, i.e. pre-clearance and clearance protocols.
- A description of the measures that will be taken to manage any residual impacts on koalas and their habitat after the construction phase of the Proposed Action.
- Analysis of the quality of habitat, which will be avoided and discussion of its effectiveness in achieving conservation outcomes for these species.
- Includes mitigation measures to prevent the Koala to travel to the Indicative Development Corridor.
- Includes mitigation measures to prevent the impacts of proposed action (including but not limited to direct mortality, indirect mortality and injury; e.g., vehicle strike, habitat loss from edge effect and fragmentation) on the koala.
- Includes plans for re-establishment of native vegetation communities and koala habitat.

6.3.3 Bird and Bat Adaptive Management Plan Outline

A BBAMP will be developed to monitor and mitigate impacts to birds and bats attributable to the operation of the proposed action. An outline of the BBAMP framework for the proposed action is provided below.

Introduction: Provide a summary of the Proposed Action and understanding of the assessed direct and indirect impacts associated with the Proposed Action during operation on bird and bat species in particular threatened entities.

BBAMP Objectives: The overall objective will be to ensure the Proposed Action does not result in a significant impact on birds and bats by retaining viable local populations of threatened species.

Key components of the BBAMP will include:

- A fit for purpose monitoring program of birds and bats that includes pre-construction and on-going monitoring during the operational phase.
- Impact triggers to species of concern that may result in significant impacts to the species.
- Minimisation and mitigation strategy.

Pre-construction monitoring: A bird and bat utilisation monitoring plan will be developed prior to construction that will provide sufficient data about bird and bat behaviour in the locality prior to construction. This information will be used to benchmark any operational impacts post construction. The pre-construction monitoring will build on the extensive bird and bat monitoring that was completed for the Approved Action and Proposed Action. However the Proposed Action commits to developing and implementing a bird and bat utilisation monitoring program, that will be replicated in the operational phase, directly following approval of the Proposed Action.

Operational phase monitoring: A operational phase bird and bat monitoring plan, consistent with the pre-construction monitoring plan, will be implemented to monitor any changes or trend in bird and bat presences, movements, abundance or behaviour to understand whether the operation of the windfarm has had an impact on these guilds of species. The operational phase monitoring will include surveys during the commissioning phase of the Proposed Action, however, will likely be interim surveys (i.e. a subset of the surveys) as existing construction activities will prevent access to areas. The operational phase of monitoring will include the following:

- Seasonal vantage point surveys (summer, autumn, winter and spring).
- Targeted regent honeyeater and swift parrot surveys in winter.
- Transect surveys for woodland birds.
- Seasonal bat monitoring (including within the rotor sweep area [RSA] and ground levels).
- Habitat assessments for avifauna in proximity to wind turbines.
- A carcass search program across ~50 per cent of all proposed wind turbines.
- Carcass persistence trial.

- Carcass detectability trial.
- Incidental finds protocol.
- Mortality estimation.

Impact Triggers and Response Procedure: This section will define impact trigger thresholds for threatened and non-threatened bird and bat species, as well as the processes to be followed in cases where trigger thresholds are met. The main objective of setting impact trigger thresholds is to prevent the operation of the Proposed Action resulting in significant impacts on the viability of the local population of threatened and non-threatened bird and bat species. Impact trigger criteria will be based on the combination of the following factors:

- EPBC Act and BC Act status.
- Number of individuals impacted.
- Number of turbines where the species has been impacted.
- Frequency of impacts for the particular species across monitoring events (i.e., has the impact been recorded in two consecutive monitoring events).
- Particular season the impact was recorded (i.e., breeding season for the particular species).
- The BBAMP will not ascribe numerical values to what should be considered an adverse impact at the total population and/or the local population scale. Rather, the BBAMP will describe an assessment process through which an ecologist first prepares an impact investigation that examines whether the event may be regular or may constitute, or lead to, an adverse impact on the species' local or total population. The findings of this impact investigation will determine whether consultation with DCCEEW regarding the need for additional monitoring or mitigation action is required. The minimum requirements of the impact investigation report are detailed below:
 - Specify the particular impact trigger level that was recorded including the species and number of individuals.
 - Specify the date/s and location/s of recovered carcasses/featherspot.
 - Discuss any potentially influential ecological factors that may have contributed to the impact trigger such as recent climate, weather, presence of prey species/foraging opportunities or seasonal factors (i.e., migration).
 - Estimate whether the event is likely to be rare or regular.
 - Verify whether or not the species has been impacted (including number of individuals and frequency) at neighbouring wind farms within a 10 km radius of the Proposed Action by accessing their publicly available annual BBAMP reports. Neighbouring wind farms within this radius will be considered at the time the impact trigger is recorded to consider any future wind farms.

Post-trigger assessment of impacts on threatened and/or migratory species will be conducted with reference to the species' total population and local population, being:

- Total population refers to the estimated total Australian population or, in the case of international migrants, the relevant subspecies' entire population. Local population refers to the estimated population in the Proposed Action Area. Density is to be estimated using data from the pre-construction surveys in combination with existing density estimates from primary literature (preferably from temperate woodland in south-eastern Australia where distinction is made between different habitat types).
- Local population estimates are to be derived using vegetation mapping for the Proposed Action. Estimates should take into consideration population dynamic assumptions such as, but not limited to, seasonal or inter-annual fluctuations in abundance in the Proposed Action Area. The local population of a given species is to be estimated by the contracted ecologist if an impact trigger for that species is met.

Impact triggers will not be required for all non-threatened species and common species such as the sulphur-crested cockatoo and little corella will not be included. Impact triggers will be determined separately for wedge-tailed eagle and other non-threatened species in recognition of increased susceptibility to turbine strike. For non-listed species, assessment of impacts is to be conducted with reference to the species' local population only. Local population estimates are to be derived using vegetation mapping for the Proposed Action. Estimates should take into consideration population dynamic assumptions such as, but not limited to, seasonal or inter-annual fluctuations in abundance in the Proposed Action Area. The local population of a given species is to be estimated by the contracted ecologist if an impact trigger for that species is met. There will be no management actions triggered following introduced species mortalities.

Minimisation and mitigation strategy: A minimisation and mitigation strategy will be developed to manage identified impacts of the Proposed Action, specifically wind turbines, on bird and bat species. Mitigation measures will include mechanisms that are adaptive to on-going changes in the environment, technological advances. Mitigation measures may include consideration of the following, amongst others:

- Carrion removal program:
 - At the very least, the carcass search monitoring programs will remove any carcasses recorded.
 - Additional carrion removal programs may be deemed necessary should impact triggers occur for bird of prey species.
- Pest animal control:
 - Pest animal control specifically relating to the BBAMP may be deemed necessary in the event that rodent or rabbit populations substantially increase AND impact triggers for bird of prey species occur.
- Raptor perch management:
 - Raptor perch management may be deemed necessary in proximity to particular wind turbines where impact triggers for bird of prey species occur i.e. it is not feasible or recommended to manage or remove all potential raptor perches throughout the Proposed Action as this would result in increased biodiversity impacts.

- Lighting and deterrents:
 - Lighting may be removed or altered on wind turbines, meteorological masts or any other tall man-made structures required for the Proposed Action should impact triggers occur for micro-bat species.
- Alteration of cut-in speeds:
 - Alteration of cut-in speeds for wind turbines at particular times of the evening/night may be deemed necessary if impact triggers for micro-bat and/or owl species occur.
 - This mitigation measure, if implemented, would be done so at particular wind turbines and not across the entire Proposed Action and will be based on those particular wind turbines where impact triggers to micro-bat species are observed.
 - This mitigation measure, if implemented, would be facilitated with additional monitoring to ensure it is having the desired outcomes, being reducing impacts to micro-bat species.
 - This mitigation measure, if implemented, would likely involve the use of smart-curtailment technology whereby curtailment only occurs when a particular bird or bat species is confirmed as being present.
- Testing of painted turbine blades or part thereof:
 - If impact triggers for particular bird species occur, a research and monitoring program may occur to test the success of painted turbine blades on reducing the particular impact.
 - This mitigation measure will only be considered if the particular bird species being impacted is likely to respond to the measure, i.e. not all bird species are likely to respond to a painted blade in the same way.
 - The Proposed Action has a number of proposed wind turbines where they have no visual impact on the community, these are where this mitigation measure would need to be tested to avoid negatively impacting the community.
- Acoustic deterrents:
 - Acoustic deterrents may be deemed necessary if impact triggers for bird and/or bat species occur.
 - A testing and monitoring program for the implementation of this mitigation measure would occur to ensure it is having the desired outcome.
- Transmission line warning markers:
 - Transmission line warning markers may be deemed necessary if impact triggers for bird and/or bat species occur directly associated with the proposed transmission line of the Proposed Action.
 - Transmission line warning markers, if required, would be proposed and implemented in distinct sections of the proposed transmission line where impacts were recorded and high utilisation areas of the Proposed Action of the particular species impacted.

- Radar consideration.
 - The use of real-time radar detection may be deemed necessary if impact triggers for particular bird species occur.
 - This mitigation measure is likely to be restricted to particular species that the current radar technology can successfully detect and track.
 - A testing and monitoring program for the implementation of this mitigation measure would occur to ensure it is having the desired outcome.
 - It is acknowledged that this mitigation measure may have up to or beyond a year lead in time.
- Temporary shutdown of turbines.
 - Temporary shutdown of turbines may be deemed necessary if particular impact triggers on birds and/or bat species occur.
 - Turbine shutdowns would likely be temporary in nature, in terms of particular times of day (i.e. day or night) or particular times of the year (i.e. breeding season or migration period of particular species).
 - This is likely to be a last resort for the Proposed Action.

Neither a finalised list of mitigation measures, nor a finalised set of impact triggers (which would determine when particular mitigation measures would be implemented) can be presented currently as this is part of the process of preparing the BBAMP in full, for review and approval by the relevant NSW and federal ministers. Furthermore, as part of the BBAMP, a particular impact would trigger an impact assessment to determine the severity of the impact, also triggering immediate (timeframe to be identified in the BBAMP) consultation with DCCEEW and/or BCS to determine the most appropriate mitigation measures. The Proponent is committed to employing the necessary mitigation measures to adequately manage identified triggers for bird and bat species.

The BBAMP is required to be adaptive and the most current and relevant mitigation measures will be considered and developed in consultation with DCCEEW and/or DPE. No mitigation measure will be implemented in the absence of consultation and approval from DCCEEW and/or DPE.

Reporting Requirements: carcass search programs will be reported on annually for two years, with review of the program occurring following two years of operation. Impact triggers will be reported on as described above. Annual reports will also be prepared for three years and once following the fifth year of monitoring.

BBAMP Review: A minor review of the BBAMP will occur once after the first year, following completion of the first annual report. Then the BBAMP will be subject to a major review after the third year, following completion of the third annual report; and again after the fifth year, following the completion of the annual report.

7.0 Rehabilitation Requirements

7.1 Rehabilitation Commitments

The planned rehabilitation activities are designed to reintegrate any disturbed area with the surrounding land and existing vegetation to a condition similar to that existing prior to construction, to ensure it is safe, stable and non-polluting. Rehabilitation activities will occur progressively for areas temporarily disturbed during construction, and further rehabilitation activities will occur as part of decommissioning.

To help ensure the rehabilitation program is successful in the longer term post-closure, periodic site monitoring will be undertaken for up to 2 years following decommissioning. Any remediation works will be carried out by the Proponent as required until the rehabilitation criteria are achieved.

7.1.1 Construction

7.1.1.1 Temporary Disturbance Areas

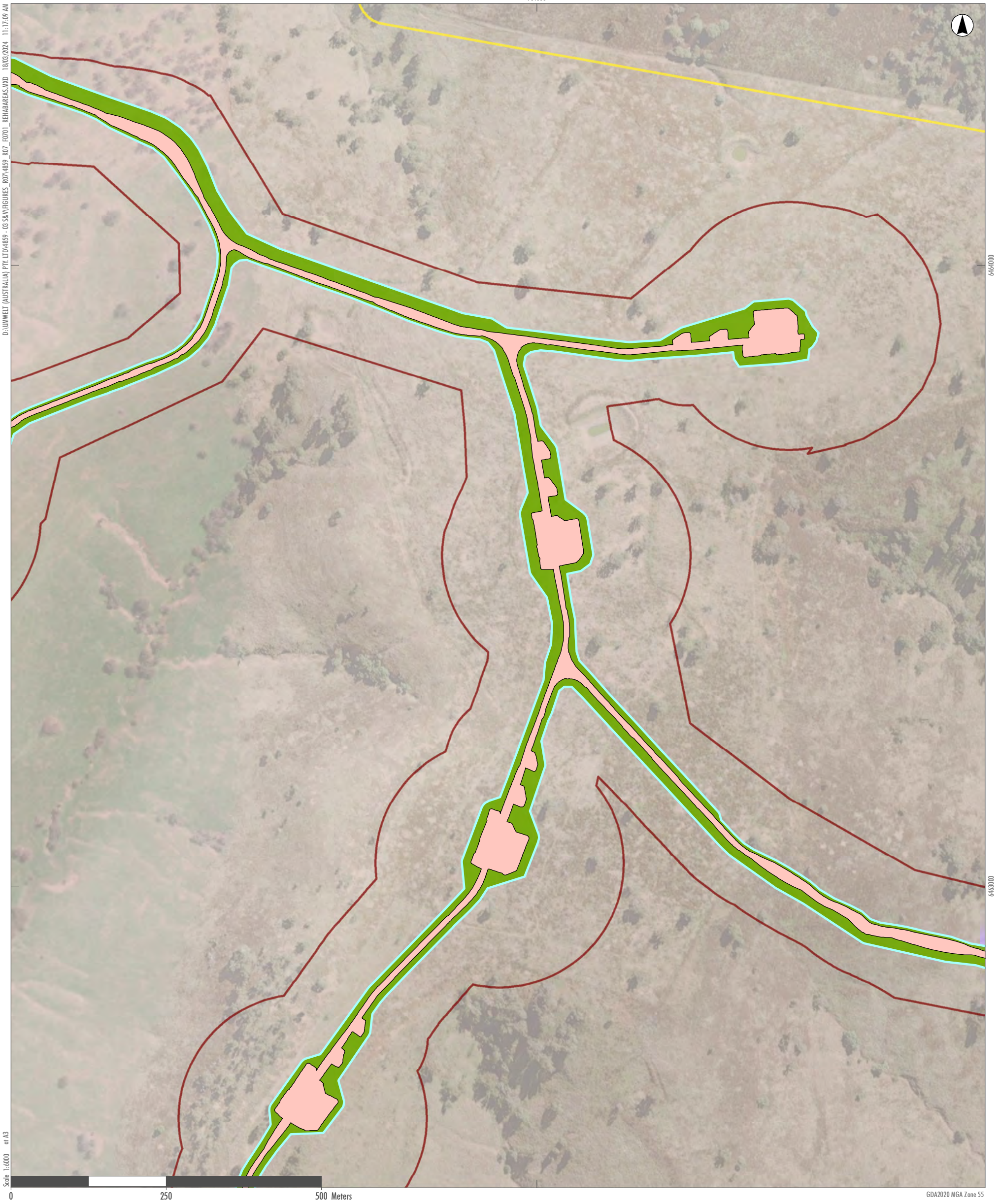
Rehabilitation of temporary disturbance areas which are no longer required for construction or ongoing operations of the Proposed Action (e.g. underground cable trenches, access track and hardstand batters, temporary laydowns) will be carried out progressively to minimise the total area exposed at any time. Temporarily disturbed areas available for rehabilitation and revegetation will be identified routinely throughout construction. An indication of areas that will be rehabilitated is provided in **Figure 7.1**.

On completion of construction, all waste materials would be removed and disposed of appropriately.

Cleared areas would be backfilled with soil resources that were initially removed and windrowed/stockpiled adjacent to the work area, for example with soil from works associated with access tracks, hardstand construction and laying underground cable trenches. Other areas will be backfilled with clean, compatible sub-grade material and would be graded to preserve the slope of the surrounding area, where reasonably practicable. The ground will be remediated as appropriate and dressed with the topsoil resources associated with the work area that were removed through initial stripping, seeded and/or planted with improved pasture grasses or native species subject to landowner agreement.

Mitigation measures have identified that where temporary disturbance areas occur in native vegetation, the area will be revegetated with previously collected local native grasses (i.e. kangaroo grass, wallaby grass or spear grass) with seed locally sourced where practicable or sourced from specialist native seed suppliers. Where temporary disturbance occurs in exotic vegetation or disturbed lands, mulch will be used from chipped vegetation (refer to **Table 6.3**).

Rehabilitation acceptance criteria will be developed as part of the rehabilitation management plan (see **Section 7.2**).



Legend

- ▬ Proposed Action Area
- ▬ Development Corridor - Wind Farm
- ▬ Indicative Development Footprint - Wind Farm
- ▬ Indicative Permanent Ground Disturbance
- ▬ Indicative Temporary Ground Disturbance to be Rehabilitated

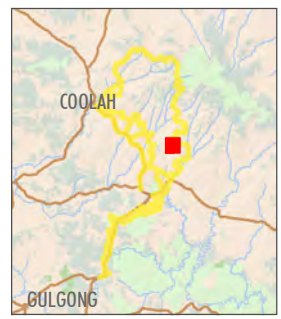


FIGURE 7.1
Example of Areas to be Rehabilitated during Construction

7.1.1.2 Transmission Line Easements

Within the transmission line easements of the wind farm and external transmission line, natural regeneration and recruitment of native flora species will be allowed provided the native flora species is unlikely to intrude on the safe conductor clearance distances within the transmission line easement.

Vegetation will be maintained to a maximum height of four (4) metres.

7.1.1.3 Permanent Areas

The Proponent does not propose to rehabilitate areas of permanent disturbance during construction (including the edge of permanent disturbance areas, sealed access tracks and turbine hardstands) with native grasses or a particular PCT given the potential for these areas to require future works through maintenance of the wind farm and transportation of equipment, part and materials. Additionally, the return of trees and shrubs in these areas is not suitable due to the potential for bird and bat species to be encouraged to return to areas in proximity of wind turbines, thus increasing risk of turbine strike. Some permanent areas such as access tracks and turbine hardstands will be capped with material such as gravel or concrete to stabilise the area and allow access for maintenance. Other permanently cleared areas These areas will be vegetated to a level suitable for ongoing agricultural use of the land, with the primary objective being to stabilise the surface and prevent erosion and scouring. Pasture grass seed will be used, or a cover crop used to support the return of the pre-existing grasses contained in the topsoil.

7.1.2 TWA Facility

The TWA Facility would be demobilised following the completion of construction of the Proposed Action. Due to the modular, transportable nature of the built form, most buildings can be either removed or disassembled and sold on or moved to another project/location.

The rehabilitation criteria and final landform requirements would be subject to both requirements of the landowner agreement for the TWA Facility and rehabilitation requirements of temporary infrastructure for the Proposed Action. At a minimum, the TWA Facility will be rehabilitated to a safe, stable and non-polluting landform that restores the land capability of the previous land use prior to the establishment of the TWA Facility.

There may be an opportunity to leave infrastructure (on-site or in/around nearby communities) that is important to the landholder and the local community in place once construction has ceased and the construction workforce has demobilised. This could include groundwater bores (for firefighting purposes for instance), potential water / sewerage treatment facilities, housing or community infrastructure. Should this be considered in the future, an agreed alternative use would need to be negotiated and approved by DPHI and the landowner.

7.1.3 Decommissioning of the Wind Farm

The Proponent commits that within 18 months of cessation of operations, rehabilitation of the wind farm will be completed. The decommissioning rehabilitation objectives are summarised in **Table 7.1**.

Table 7.1 Decommissioning Rehabilitation Objectives

Feature	Objective
Development site (as a whole)	<p>Safe, stable and non-polluting.</p> <p>Minimise the visual impact of any above ground ancillary infrastructure agreed to be retained for an alternative use as far as is reasonable and feasible.</p>
Revegetation	<p>Restore native vegetation in rehabilitated areas via use of seed mixes selected to match existing vegetation generally as identified in the BDAR (Umwelt 2023a) in Appendix D.</p> <ul style="list-style-type: none"> • Where the pre-existing community was native vegetation, the revegetation seed mix will contain the dominant canopy and midstorey species relevant to the originally impacted PCT. For example for Commonwealth Box Gum Woodland CEEC the dominant species include: <ul style="list-style-type: none"> ○ Canopy species: <i>Eucalyptus albens</i>, <i>E. melliodora</i>, <i>E. blakelyi</i>, <i>E. moluccana</i> and <i>Brachychiton populneus</i>. ○ Midstorey species: <i>Acacia implexa</i>, <i>Acacia decora</i>, <i>Acacia leucoclada</i>, <i>Acacia paradoxa</i>, <i>Cassinia arcuata</i>, <i>Solanum cinereum</i>, <i>Bursaria spinosa</i>. • Dominant species will be either be defined by survey data or information in the NSW BioNet Vegetation Classification. Understorey species will include a complete mix of groundcover species and include some forbs (at least 10 species). <p>High threat weeds do not spread into new, disturbed or rehabilitated areas.</p> <p>A qualified ecologist will be involved in the preparation of the rehabilitation and monitoring program where the target community is native vegetation.</p> <p>A qualified ecologist will advise on adaptive management where rehabilitation fails to meet criteria.</p>
Above ground wind turbine infrastructure (excluding wind turbine pads)	To be decommissioned and removed unless agreed otherwise.
Turbine hardstands / pads	To be covered with soil and/or rock and revegetated, unless agreed otherwise.
Above ground ancillary infrastructure	To be decommissioned and removed, unless an agreed alternative use is identified in consultation with landowners and approval authorities.
Internal access roads	To be decommissioned and removed, unless and agreed alternative use is identified in consultation with landowners.
Land use	Restore or maintain land capability.
Community	Ensure public safety.

7.2 Rehabilitation Management Plan Outline

A rehabilitation management plan for areas disturbed during construction and decommissioning will be developed for the Proposed Action as part of the BMP to ensure all temporary construction areas (e.g. temporary construction facilities, lay-down areas...etc) are rehabilitated to a condition similar to pre-construction vegetation conditions. As per other projects being developed by the Proponent (e.g. Rye Park Wind Farm), the rehabilitation management plan for construction activities is expected to be included within the BMP consistent with relevant NSW legislation. The rehabilitation management will address any relevant conditions required by Commonwealth, State, and local government legislation, such as rehabilitation conditions under the NSW Development Consent. See **Section 9.0** for further details regarding the progress of relevant approvals and permits.

The rehabilitation management plan will provide a framework to guide rehabilitation works and adaptive management actions to ensure vegetation is on a trajectory to the original vegetation conditions.

The rehabilitation management plan will contain the following sections:

- **Introduction and Objectives:** The introduction will provide a summary of the Proposed Action and the associated impacts on biodiversity. It will also outline the extent of rehabilitation associated with temporary impacts and any additional areas that will be seen as important rehabilitation areas and outline the objectives for rehabilitation across the Proposed Action Area.
- **Rehabilitation Framework:** The rehabilitation framework will be established to guide rehabilitation works post-construction. The framework will include important site management actions that will facilitate the re-establishment of biodiversity values and agricultural lands post construction. Any opportunities for progressive rehabilitation during operations will also be included in the framework, while this is likely to be limited in application, it may be identified as necessary within the balance of easements of the proposed transmission line to ensure the Commonwealth Box Gum Woodland CEECs persist where they previously occurred. Any proposed closure or decommissioning of the Proposed Action will be subject to a separate demolition and rehabilitation plan, based on the technology available at the time (see **Section 7.3**).
- **Topsoil Management and Erosion/Sediment Control:** where possible topsoil should be conserved to allow for redistribution post construction in areas of native vegetation. The utilisation of topsoils from the Proposed Action Area will provide a seed bank that may facilitate natural recruitment of native species that would usually be found in associated vegetation communities or re-establishment of soils associated with previous use agricultural practices. Erosion and sediment management measures relating to rehabilitated areas will be outlined.
- **Rehabilitation Methods:** A detailed methods section will outline rehabilitation methods that should be used to re-establish the pre-construction vegetation condition or proposed post development land use. Rehabilitation methods will include but not limited to:
 - Site preparation works: This will include details on weed control, rehabilitation of soil profile such as decompaction, ameliorants and the redistribution methods for topsoil.

- Vegetation Re-establishment: Vegetation will be established via various methods that include:
 - Cover crops to be used in high-risk erosion areas or areas where there is high risk of topsoil loss.
 - Direct seeding of native and exotic species guided by the post-construction target vegetation.
 - Tubestock installation where rapid establishment of native vegetation is preferred for canopy and shrub layers.
- Weed and Pest Control: On going weed and pest control to reduce competition on establishing rehabilitation.
- Species List: Establish appropriate species list for each area to be rehabilitate to the target post-construction vegetation type.
- **Rehabilitation Acceptance Criteria:** A set of rehabilitation acceptance criteria / completion criteria will be developed to ensure rehabilitation works are on a trajectory towards the target vegetation. Where rehabilitation works are required within the balance of easements of the proposed transmission line to ensure the Commonwealth Box Gum Woodland CEECs persist, species completion criteria will relate to key characteristics and/or key diagnostics of the CEECs. Contingency measures will also be identified (see **Section 7.2.1**).
- **Monitoring Program:** A monitoring program will be outlined to determine the success of rehabilitation activities implemented, achievement of the rehabilitation acceptance criteria (see **Section 7.2.2**).

7.2.1 Summary of Procedures and Contingency Measures

Procedures that would be developed to support the implementation of the rehabilitation management plan and achieve the rehabilitation acceptance criteria include:

- Landform rehab procedures including for topsoil re-establishment.
- Vegetation re-establishment procedures.
- Revegetation maintenance procedures (e.g. for weed control, insect pest control and watering).
- Monitoring procedures (see **Section 7.2.2**).

Contingency measures will be included in the rehabilitation management plan for cases where rehabilitation acceptance criteria are not met. These will include measure for aspects such as:

- Reseeding.
- Follow up weed and pest control.
- Additional watering.

7.2.2 Summary of monitoring program

As outlined above, the rehabilitation management plan will include details of a monitoring program to determine the success of rehabilitation activities implemented by the Proponent. This monitoring program will include monitoring objectives, methods, parameters/indicators, locations and responsibilities for monitoring of:

- Landform / erosion / topsoil.
- Vegetation parameters as per rehabilitation acceptance criteria / completion criteria.
- Weeds and pests.

Monitoring will be undertaken for two years post cessation of the operation.

7.3 Decommissioning Plans

Prior to decommissioning of the wind farm, an appropriate Decommissioning and Rehabilitation Plan will be prepared in consultation with relevant stakeholders. This plan will consider relevant best practice guidance for rehabilitation of wind farms including the recently published report by the CEC (2023) *Winding Up Decommissioning, Recycling and Resource Recovery of Australian Wind Turbines*.

A separate decommissioning and rehabilitation plan will be prepared for the TWA Facility, given that it would be decommissioned and rehabilitated, or repurposed, at the end of the construction phase (see **Section 7.1.2**).

8.0 Offsets

8.1 Residual Impacts Summary

Despite the best avoidance and minimisation efforts made by the Proponent, the Proposed Action will still result in direct impacts to a number of MNES. These residual impacts are summarised below:

- Commonwealth Box Gum Woodland CEEC (31.6 ha proposed to be impacted by the Proposed Action).
- Regent honeyeater (604.3 ha of potential foraging habitat proposed to be impacted by the Proposed Action).
- Gang-gang cockatoo (13.4 ha of potential habitat proposed to be impacted by the Proposed Action).
- South-eastern glossy black-cockatoo (83.7 ha of potential foraging habitat and 2.0 ha of breeding habitat proposed to be impacted by the Proposed Action).
- Painted honeyeater (628 ha of potential habitat proposed to be impacted by the Proposed Action).
- White-throated needletail (463.3 ha of wooded habitat over which the species may fly, proposed to be impacted by the Proposed Action).
- Swift parrot (302.5 ha of potential foraging habitat proposed to be impacted by the Proposed Action).
- Superb parrot (22.9 ha of potential habitat proposed to be impacted by the Proposed Action).
- Large-eared pied-bat (106.7 ha of potential habitat proposed to be impacted by the Proposed Action).
- Spotted-tail quoll (193.9 ha of potential habitat proposed to be impacted by the Proposed Action).
- Corben's long-eared bat (156.8 ha of potential foraging and roosting habitat proposed to be impacted by the Proposed Action).
- Greater glider (southern and central) (19.3 ha of potential habitat proposed to be impacted by the Proposed Action).
- Yellow-bellied glider (south-eastern) (15.2 ha of potential habitat proposed to be impacted by the Proposed Action).
- Koala (combined populations of QLD, NSW and the ACT) (721 ha of potential habitat proposed to be impacted by the Proposed Action).
- Grey-headed flying-fox (312.1 ha of potential habitat proposed to be impacted by the Proposed Action).

Residual impacts must be offset in accordance with the EPBC Act Environmental Offsets Policy 2012 and Offsets Assessment Guide (OAG), or other endorsed offset framework (for example, the NSW BOS).

8.2 Environmental Offset Requirements

8.2.1 Offsetting Framework

8.2.1.1 Offsetting framework for residual impacts

The NSW BAM and BOS have been endorsed by the Commonwealth. This means that offsetting outcomes achieved through the BAM will be accepted for the purposes of the EPBC Act, provided that they are 'like-for-like' in relation to listed threatened species and communities as defined for the purposes of the EPBC Act.

As the Proponent is seeking to offset the Proposed Action using the NSW BAM, the BDAR prepared by Umwelt (2023a) has been attached to the PER (refer to **Appendix D**), which includes the credit summary reports for each IBRA region impacted by the Proposed Action. Specifically, the credit summary reports are provided as Appendix I of the BDAR. These reports present the complete credit liability for the Proposed Action that are being used to guide the Preliminary Biodiversity Offset Strategy (Offset Strategy) being implemented by the Proponent. The Offset Strategy is contained in **Appendix G**.

The offsets identified for the Proposed Action are the result of residual direct impacts that remain despite the best avoidance and minimisation efforts made by the Proponent. The offsets have been calculated within the BAM – Credit Calculator assessments for the Proposed Action and include complete impacts as well as partial direct impacts (in accordance with Section 8.1.1.2 of the BAM [DPIE 2020a]) that have been calculated in the balance of easement component of the transmission lines (internal and external). Within the balance of easement, a proportion of biodiversity values will remain within select vegetation zones following construction and during the operation of the Proposed Action. All Vegetation Zones, except Vegetation Zones 8, 12, 17 and 18 (being derived grasslands and therefore less than 4 m in height) were assigned partial impact values where they occurred within the transmission line easements (i.e., Vegetation Zones 1, 2, 4–7, 9–16), with the exclusion of areas where full clearance is required, such as string pads, pole/tower disturbance areas, and access tracks.

8.2.1.2 Offsetting Framework for Prescribed Impacts

Impacts relating to wind turbine strike (and barotrauma) are possible for the Proposed Action, as they are for any wind farm. The frequency and particular species that are impacted by wind turbine strike (and barotrauma) cannot be confidently known until operational monitoring occurs. Where prescribed impacts relating to turbine strike (and barotrauma) are required to be offset, the Proponent will investigate other mechanisms available under the Biodiversity Conservation Regulation 2017 (BC Regulation 2017) which are not credit based. One option may be the “funding of a biodiversity conservation action that would benefit the relevant threatened species or ecological community and that is equivalent to the cost of acquiring the required like-for-like biodiversity credits as determined by the offsets payment calculator referred to in section 6.32 of the Act” as per Section 6.2 (2c) BC Regulation 2017. It is anticipated that this mechanism would similarly apply should the Proposed Action result in impacts to MNES species(s) by wind turbine strike (and barotrauma) on the Proposed Action. Details of the approach to offsetting prescribed impacts relating to turbine strike (and barotrauma) will be detailed in the BBAMP that will be prepared for the Proposed Action in consultation with DPHI, BCS and Commonwealth DCCEEW.

The NSW Government Ancillary Rules of the BOS outlines requirements for specific conservation actions that do not currently include the proposed approach to offsetting prescribed impacts of turbine strike or connectivity. Approval of the use of conservation actions which are not currently prescribed by the Ancillary Rules will be required through consultation with BAM policy team. The listed biodiversity conservation actions target threatened species that are difficult to effectively manage at a biodiversity stewardship agreement (BSA) site due to limited understanding of its ecology, threats or management requirements or threatened species with a limited known distribution where research to find more locations where the entity is present will be beneficial. In this instance, the species at risk of impact satisfy the requirements above and offsetting through a conservation action is the most appropriate approach.

This offset mechanism is considered to be more suitable for the type of impacts being considered, how sporadic they will likely be and most importantly is considered to result in a better conservation outcome for impacted threatened species than a credit-based scheme to offset prescribed impacts.

For potential operational impacts to birds and bats, is not possible to fully ascertain what the particular biodiversity conservation action or cost of the Proposed Action would be until a particular impact to MNES occurs (if it does). It is proposed that an adaptive management framework would be agreed to as part of the BBAMP through consultation with DCCEEW for MNES (and BCS and the NSW Credit Supply Taskforce for BC Act listed species).

A proposed approach to implementing this mechanism is identified below:

- Impacts to threatened bird and/or bat species listed under the BC Act and/or EPBC Act would be identified through the implementation of the BBAMP.
- The particular biodiversity conservation action in response to the impact will be based on the listing status of the impacted species in consultation with the relevant agencies in accordance with the approved BBAMP. Details of actions and associated costs would be detailed in the approved BBAMP.

The BBAMP will propose impact trigger levels and appropriate mitigation in the event that impacts to species threatened under the EPBC Act occur from the Proposed Action.

No offset mechanism is proposed for impacts of turbine strike and/or barotrauma on protected bird or bat species that are not threatened under the BC Act or EPBC Act. It is considered suitable that the generation of ecosystem credit liabilities on the Proposed Action through the application of the BAM (DPIE 2020a) adequately accounts for any such impacts.

The Proposed Action is not considered to result in any indirect impacts that requires offsetting.

8.2.2 Offset Outcome for Proposed Action

The total residual offset liability relating to the residual impacts of the entire Proposed Action (i.e. wind farm, public road upgrades, and external transmission line to Ulan) on the Commonwealth Box Gum Woodland CEEC is 1,068 credits (refer to **Table 8.1**), including the applicable IBRA – Subregion to which the impact occurs.

Table 8.2 presents total residual offset liability relating to the residual impacts of the entire Proposed Action on NSW BAM species-credit species that are MNES, including the applicable IBRA – Subregion to which the impact occurs.

Table 8.1 Residual MNES (TECs) impacts requiring offset – PER IBRA – Subregion

	White box – yellow box – Blakely’s red gum grassy woodlands and derived native grasslands CEEC (EPBC Act)		
	PCT281 – VZ 2	PCT483 – VZ 6	PCT488 – VZ 9
Brigalow Belt South – Liverpool Range			
Total Area of Vegetation Zone (ha)	0.7	15.5	58.9
Total Credits	8	539	2,091
Total Area of CEEC (ha)	0.7	15.5	2.0
Proportion of Vegetation Zone that is CEEC (per cent) ¹	100	100	3
Number of CEEC Credits per Vegetation Zone ¹	8	539	71
Brigalow Belt South – Pilliga			
Total Area of Vegetation Zone (ha)	2.2	0.5	-
Total Credits	84	27	-
Total Area of CEEC (ha)	2.2	0.5	-
Proportion of Vegetation Zone that is CEEC (per cent) ¹	100	100	-
Number of CEEC Credits per Vegetation Zone ¹	84	27	-
Sydney Basin – Kerrabee			
Total Area of Vegetation Zone (ha)	10.5	0.2	-
Total Credits	335	4	-
Total Area of CEEC (ha)	10.5	0.2	-
Proportion of Vegetation Zone that is CEEC (per cent) ¹	100	100	-
Number of CEEC Credits per Vegetation Zone ¹	335	4	-
Total credits	427	570	71

¹ Rounded to the nearest whole number.

Table 8.2 Residual MNES (species) impacts requiring offset – Per IBRA – Subregion

Species-credit	Brigalow Belt South – Liverpool Range IBRA Bioregion		Brigalow Belt South – Pilliga IBRA Bioregion		Sydney Basin – Kerrabee IBRA Bioregion		Total Area (ha)	Total credits
	Area (ha)	Credits	Area (ha)	Credit	Area (ha)	Credits		
Large-eared pied-bat	92.6	4,336	0.6	23	13.5	480	106.7	4,839
Greater glider	19.3	692	-	-	-	-	19.3	692
Glossy black-cockatoo	-	-	0.3	8	1.7	30	2.0	38

In addition to those credit liabilities presented above for species-credit species that are MNES, the Proposed Action will also have residual direct impacts on MNES species that are not species-credit species. While these species do not have their own offset liability under the NSW BOS scheme, they do still have an offset liability. For MNES ecosystem-credit species, their offsets will be satisfied by the Proposed Action in the form of retirement of ecosystem-credits (i.e. PCTs, applicable vegetation zones only) that are associated with the particular MNES species. Each ecosystem-credit species has a unique association with PCTs, as per the NSW TBDC profile and this has been used to define potential habitat for each MNES, as identified in the general environment section for each MNES (refer to **Section 3.5**, **Section 3.7** and **Section 3.8**).

The combination of associated PCTs and applicable vegetation zones is consistent with the process of identification of suitable habitat used in the assessments of significance prepared as part of the PER. The applicable vegetation zones for each MNES ecosystem-credit species is presented below in **Table 8.3**. Simply, impacts to MNES ecosystem-credit species will be offset through the process of retiring ecosystem-credit species that are associated with the particular species. The offset liability for MNES ecosystem-credit species is presented below in **Table 8.3**.

Large-eared pied bat and greater glider are not included in this analysis as their entire offset liability relates to the credit obligation for species-credit species as presented above in **Table 8.2**.

A summary of credit liability under the BOS for the entire Proposed Action (i.e. wind farm, public road upgrades, and external transmission line) for all relevant MNES are provided in **Table 8.4**.

Table 8.3 Credit Liability for Ecosystem-credit Species MNES for Proposed Action – Per IBRA Subregion

Threatened species	Brigalow Belt South – Liverpool Range IBRA Bioregion		Brigalow Belt South - Pilliga IBRA Bioregion		Sydney Basin - Kerrabee IBRA Bioregion		Total Area (ha)	Total credits
	Area (ha)	Credits	Area (ha)	Credit	Area (ha)	Credits		
Regent Honeyeater (VZs 1, 2, 4, 5, 6, 7, 9, 10 and 11)	469.1	12,954	97.4	2,650	37.4	1,123	603.9	16,727
Gang-gang Cockatoo (VZ 2)	0.7	8	2.2	84	10.5	335	13.4	427
South-eastern Glossy Black-cockatoo (VZs 9, 10 and 14)	83.1	2,517	0.6	14	-	-	83.7	2,531
Painted Honeyeater (VZs 1, 2, 4, 5, 6, 7, 9, 10, 11 and 14)	492.8	13,369	97.4	2,650	37.4	1,123	627.6	17,142
White-throated Needletail (VZs 1, 2, 4, 5, 6, 9, 10, 11, 13, 14, 15 and 16)	320.3	8,687	77.7	1,726	65.2	1,293	463.2	11,706
Swift Parrot (VZs 2, 9, 10, 11 and 14)	283.1	7,587	5.3	153	14.1	390	302.5	8,130
Superb Parrot (VZs 1 and 2)	7.2	122	5.2	116	10.5	335	22.9	573
Spotted-tail Quoll (VZs 1, 2, 9, 10, 14, 15 and 16)	90.3	2,639	47.2	1,069	56.4	1,156	193.9	4,864
Corben’s Long-eared Bat (VZs 1, 9, 10, 15 and 16)	65.9	2,216	45.0	985	45.9	821	156.8	4,022
Yellow-bellied Glider (VZ 13)	15.2	447	-	-	-	-	15.2	447
Koala (VZs 2, 4, 5, 6, 7, 9, 10, 11, 13, 14, 15, 16)	501.5	13,702	135.8	3,557	83.3	1,944	720.6	19,203
Grey-headed Flying-fox (VZs 1, 2, 9, 10, 11 and 14)	289.6	7,701	8.3	185	14.1	390	312.0	8,276

Table 8.4 Summary of MNES credit liability of the Proposed Action – per IBRA subregion

MNES	Brigalow Belt South – Liverpool Range IBRA Bioregion		Brigalow Belt South - Pilliga IBRA Bioregion		Sydney Basin - Kerrabee IBRA Bioregion		Total Area (ha)	Total credits
	Area (ha)	Credits	Area (ha)	Credits	Area (ha)	Credits		
Threatened Ecological Community								
White box - yellow box - Blakely's red gum grassy woodlands and derived native grasslands CEEC (EPBC Act)	13.4	427	16.2	570	2.0	71	31.6	1,068
Species (Species-credits)								
Large-eared pied-bat	92.6	4,336	0.6	23	13.5	480	106.7	4,839
Greater glider	19.3	692	-	-	-	-	19.3	692
Glossy black-cockatoo (breeding habitat)	-	-	0.3	8	1.7	30	2.0	38
Species (Ecosystem-credits)								
Regent Honeyeater	469.1	12,954	97.4	2,650	37.4	1,123	603.9	16,727
Gang-gang Cockatoo	0.7	8	2.2	84	10.5	335	13.4	427
South-eastern Glossy Black-cockatoo	83.1	2,517	0.6	14	-	-	83.7	2,531
Painted Honeyeater	492.8	13,369	97.4	2,650	37.4	1,123	627.6	17,142
White-throated Needletail	320.3	8,687	77.7	1,726	65.2	1,293	463.2	11,706
Swift Parrot	283.1	7,587	5.3	153	14.1	390	302.5	8,130
Superb Parrot	7.2	122	5.2	116	10.5	335	22.9	573
Spotted-tail Quoll	90.3	2,639	47.2	1,069	56.4	1,156	193.9	4,864
Corben's Long-eared Bat	65.9	2,216	45.0	985	45.9	821	156.8	4,022
Yellow-bellied Glider	15.2	447	-	-	-	-	15.2	447
Koala	501.5	13,702	135.8	3,557	83.3	1,944	720.6	19,203
Grey-headed Flying-fox	289.6	7,701	8.3	185	14.1	390	312.0	8,276

8.2.3 Progressive confirmation of credit obligations

As the Proposed Action progresses through detailed design, construction and into operations there may be a requirement to make further revisions to the impact areas and offset credit liabilities summarised in Table 8.4 as more detail becomes known.

As described in the Preliminary Biodiversity Offset Strategy (**Appendix G**) there are a number of key development milestones where updates to the calculations of impact to MNES and associated offset liabilities will occur. These milestones are identified in **Table 8.5**.

Table 8.5 Development milestones and updates to offset credit liabilities

Development milestone	Credit Estimation Requirements
Preliminary Layout (Proposed Action)	Used as the basis for the biodiversity credit obligation set out in the Preliminary Biodiversity Offset Strategy (Preliminary Layout) (refer to Appendix G).
Pre-construction Layout	Once a construction contractor has been engaged and detailed design progresses, updates to the Preliminary Offset Strategy may be required. The revised Biodiversity Offset Strategy (Pre-construction Layout) will be submitted for approval under both NSW EP&A Act and Commonwealth EPBC Act, prior to commencement of construction, which will contain all changes to the calculations of impacts to MNES and total offset credit obligations.
Final/as-built Layout	Once construction has been completed, updated calculations of impacts to MNES and total offset credit obligations will be made based on the final as-built construction footprint. Where required, all changes will be captured in the Biodiversity Offset Strategy (Final/As-built) that will be submitted to both NSW EP&A Act and Commonwealth EPBC Act.

8.3 Biodiversity Offset Strategy Outline

The Proponent has developed and is actively working towards the implementation of a comprehensive biodiversity offset strategy for the Proposed Action. The Proponent has engaged Wedgetail Project Consulting Pty Ltd (Wedgetail) for the implementation of this strategy. A full copy of the Preliminary Biodiversity Offset Strategy (Offset Strategy) is provided in **Appendix G**, and a summary of key components is provided below.

8.3.1 Biodiversity Stewardship Agreement (BSA) Sites

The Proponent intends on satisfying the majority of their offset obligations for the Proposed Action for the Indicative Development Footprint – Wind Farm and Indicative Development Footprint – Public Road Upgrades, through securing land-based offset sites or Biodiversity Stewardship Agreement (BSA) sites under the BAM. To-date the Proponent has made significant progress in implementing the Offset Strategy and has secured eight land-based offset opportunities, five of which will be established as new BSA sites and the remaining three relate to the purchase of credits from established BSA sites.

Together, the eight land-based opportunities are expected to generate over 90 per cent of the ecosystem and species credits required to offset the unavoidable impacts associated with the wind farm and public road upgrade components of the Proposed Action. Moreover, the Proponent has gone through extensive efforts to strategically offset the Proposed Action through identifying suitable properties that do not simply generate the suitable credits, but that would also deliver additional strategic landscape-scale biodiversity wins. This includes but is not limited to the strategic connection of habitat between presently disconnected conservation areas or locating BSA sites adjacent to existing national parks or conservation areas. Details of the proposed BSA sites including how the offset area provides connectivity with other habitats and corridors, habitat that is known to occur and the mechanism to deliver the offset is described in detail in Appendix G and summarised in **Table 8.6**.

The Proponent has successfully identified five strategic properties that are in the final stages of being established as new BSA sites. Wedgetail has completed detailed desktop assessments and biodiversity surveys and are in the process of finalising the Biodiversity Stewardship Agreement Site Reports (BSSARs) for the five new BSA sites, prior to being submitted to NSW Biodiversity Conservation Trust (BCT) for review, comment and finalisation (refer to **Table 8.6**). These three properties are expected to generate a substantial proportion of the ecosystem and species credit required to satisfy the offset liability for the Proposed Action as identified in **Section 8.2.2**.

The Proponent intends to progressively lodge the five BSSARs with the NSW Biodiversity Credit Supply Taskforce over the first half of 2024. The Proponent is working closely with the NSW Biodiversity Credit Supply Taskforce to progress these new BSA sites and expects that all will be established prior to the commencement of construction or the impact occurring.

In addition, Wedgetail is assisting the Proponent to search for suitable credits on the public credit market to satisfy the estimated minor shortfall in credits associated with the wind farm and public road upgrade components of the Proposed Action.

Where the abovementioned land-based offsetting options have been exhausted and a credit shortfall remains, the Proponent may also pay into the Biodiversity Conservation Fund (BCF) administered by the NSW BCT or the recently announced NSW Biodiversity Credits Supply Fund. This is considered a last-resort option and where land-based offsets cannot be secured prior to commencement of construction or the impact occurring.

Table 8.6 Proposed Land-based Offset Opportunities for the Wind Farm and Public Road Upgrades Components of the Proposed Action

Offset Area	Details of BSA Site	Connectivity	MNES and/or their habitat present	Mechanism to deliver offset
'Nangarah'	Location: Barraba, NSW LGA: Tamworth Peel IBRA subregion Area: 3,000 ha	Nestled between Linton Nature Reserve and Woodsreef State Conservation Area, effectively creating a continuous biodiversity corridor spanning east – west nearly 20 km between the two areas in perpetuity.	Located in a mapped important habitat area for Regent Honeyeater (one of only two in NSW). Supports NSW Box Gum Woodland CEEC. Supports following BC Act listed threatened species: squirrel glider, bluegrass, border thick-tailed gecko, grey-crowned babbler, speckled warbler, dusky woodswallow, diamond firetail, black-chinned honeyeater and brown treecreeper. While none of these species are the assessed MNES there are some EPBC Act listed species supported.	Establish a new BSA site – purchase
Glenleigh	Location: Scotts Creek, NSW LGA: Upper Hunter Tomalla IBRA subregion Area: 465 ha	Glenleigh is a central portion of woodland / forest vegetation that extends to the west, north and north east. The conservation of Glenleigh ensures the connectivity to the adjoining large, vegetated areas is protected in perpetuity.	Supports the NSW Box Gum Woodland CEEC. Supports the following threatened species, bluegrass, squirrel glider, and breeding koalas recently recorded during BSA surveys.	Establish a new BSA site – purchase
Ups and Downs	Location: Timor, NSW LGA: Upper Hunter Tomalla IBRA subregion Area: 2,200 ha	Ups and Downs is connected via extensive vegetation corridors travelling south to Glenleigh Offset area and is adjacent to the existing Wallabadah Conservation Area to the north.	Supports NSW Box Gum Woodland CEEC and is adjacent to an existing Wallabadah Conservation Area. Potential habitat for large-eared pied bat and koala.	Establish a new BSA site – purchase
Brodie	Location: Coolah, NSW LGA: Warrumbungle Shire Liverpool Range IBRA subregion Area: 350 ha	The Brodie offset area is located within the Proposed Action Area directly connected to the Coolah Tops National Park to the north and to southern linking vegetation through private land,	Supports New England Grassy Woodland and Eastern Riverine Forests. Potential habitat for the greater glider.	Establish a new BSA site – partnership

Offset Area	Details of BSA Site	Connectivity	MNES and/or their habitat present	Mechanism to deliver offset
Wesley	Location: Coolah, NSW LGA: Warrumbungle Shire Liverpool Range IBRA subregion Area: 130 ha	Located within the Proposed Action Area. Minimal connectivity through the landscape.	Supports Western Slopes Grassy Woodland.	Establish a new BSA site – partnership
Stanley Station	Location: Merriwa, NSW LGA: Upper Hunter Liverpool Range IBRA subregion Area: 480.5 ha	Poorly linked in the landscape, however, is part of a woodland structured corridor running north- south through grazing properties.	Supports NSW Box Gum Woodland CEEC and Commonwealth Box Gum Woodland CEEC.	Credit purchase
Mumbil	Location: Mumbil, NSW LGA: Dubbo Regional Council Inland Slopes IBRA subregion Area: 534 ha	Poorly connected in the landscape, adjoins another woodland structure property to the south west. Will improve habitat connectivity in the landscape.	Supports NSW Box Gum Woodland CEEC, the squirrel glider and breeding pairs of the superb parrot.	Credit purchase
Jerrong	Location: Jerrong NSW LGA: Oberon South Eastern Highlands IBRA Sub-region Area: 213 ha	Some connectivity to nearby reserves, including Blue Mountains Nature Reserve to the east, Wiaborough Nature Reserve to the south and Abercrombie Nature Reserve to the west.	Supports BC Act listed squirrel glider. Identified as providing credits for the southern greater glider.	Credit purchase

Source: Table 14 Liverpool Range Wind Farm Biodiversity Offset Strategy – Preliminary Layout (refer to **Appendix G** of this PER).

Table 8.7 presents the current estimates of credit generation for ecosystem and species credit species across the eight proposed land-based credit opportunities identified in **Table 8.6**.

Specifically relating to MNES, the eight proposed land-based credit opportunities are expected to generate in excess of 90 per cent of the ecosystem credit liability (that relate to MNES habitat) and in excess of 90 per cent of the species credit (that relate to MNES species) liability of the wind farm and public road upgrade components of the Proposed Action (refer to **Table 8.7**). Note that this excludes liability for the glossy black-cockatoo as a species-credit species as the Indicative Development Footprint – Wind Farm and Indicative Development Footprint – Public Roads Upgrade will not impact any breeding habitat for this species.

It is worthy to note that the new BSA sites the Proponent is progressing are also considered to deliver a meaningful strategic biodiversity conservation outcome that would have otherwise not been possible in the absence of the Proposed Action. Of particular importance are the planning and implementation of the additional and appropriate measures that are described below in **Section 8.3.2** and the strategic location of the proposed BSA sites adjacent to existing conservation areas and national parks and extension of habitat corridors (see **Appendix G**).

The Proponent has made substantial progress to implement the Offset Strategy and is therefore in a positive position to satisfy the credit obligation for the wind farm and public road upgrades components of the Proposed Action. The Proponent has been proactive in the management and planning on how the credit obligation for the Proposed Action will be satisfied and is on-track to have all required credits satisfied prior to commencement of construction, which is scheduled for mid-2025.

Table 8.7 Proposed BSAs Secured – Indicative Credit Generation

Veg Zone	PCT	Offset Trading Group	Total Credits Required (Wind Farm and Public Road Upgrade only)	Stanley Station		Mumbil		Glenleigh		Brodie		Nangarah)		Ups and Downs		Wesley		Jerrong		Total Credit Generated	Proportion of Credit Liability Satisfied
				Credits	% of Obl	Credits	% of Obl	Credits	% of Obl	Credits	% of Obl	Credits	% of Obl	Credits	% of Obl	Credits	% of Obl	Credits	% of obl		
Ecosystem credits																					
1	84	Eastern Riverine Forests less than 50%	146	71	49%	0	0%	0	0%	9	6%	0	0%	124	85%	0	0%	0	0%	204	140%
2	281	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC (EPBC)	45	35	78%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	35	78%
4	479	Western Slopes Dry Sclerophyll Forests less than 50%	14	0	0%	15	107%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	15	107%
6, 7 & 17	483	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC	8,321	0	0%	0	0%	0	0%	0	0%	8,702	105%	0	0%	0	0%	0	0%	8,702	105%
8	483	Western Slopes Grassy Woodlands greater than or equal to 90%	5,997	2,365	39%	1,989	33%	908	15%	0	0%	0	0%	550	9%	421	7%	0	0%	6,233	104%
9, 10, 11 & 12	488	New England Grassy Woodlands greater than or equal to 50% and less than 70%	7,313	0	0%	0	0%	437	6%	1,091	15%	0	0%	6,131	84%	0	0%	0	0%	7,659	105%
13	490	New England Grassy Woodlands less than 50%	447	0	0%	0	0%	447	100%	0	0%	0	0%	0	0%	0	0%	0	0%	447	100%

Veg Zone	PCT	Offset Trading Group	Total Credits Required (Wind Farm and Public Road Upgrade only)	Stanley Station		Mumbil		Glenleigh		Brodie		Nangarah)		Ups and Downs		Wesley		Jerrong		Total Credit Generated	Proportion of Credit Liability Satisfied
				Credits	% of Obl	Credits	% of Obl	Credits	% of Obl	Credits	% of Obl	Credits	% of Obl	Credits	% of Obl	Credits	% of Obl	Credits	% of Obl		
14	495	New England Dry Sclerophyll Forests less than 50%	415	0	0%	0	0%	0	0%	0	0%	0	0%	218	53%	0	0%	0	0%	218	53%
15	1661	Western Slopes Dry Sclerophyll Forests greater than or equal to 50% and less than 70%	6	0	0%	10	157%	0	0%	1	16%	0	0%	0	0%	0	0%	0	0%	11	173%
16	1675	South Coast Sands Dry Sclerophyll Forests less than 50%	7	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
5,18	481, 1661	N/A	0	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Totals			22,711	2,471	11%	2,014	9%	1792	8%	1,101	5%	8,702	38%	7,023	31%	421	2%	0	0%	23,524	104%
Species-credit MNES species																					
Large-eared Pied Bat			4,337	0	0%	0	0%	0	0%	0	0%	3,987	92%	0	0%	0	0%	0	0%	3,987	92%
Southern Greater Glider			692	0	0%	0	0%	0	0%	149	22%	0	0%	0	0%	0	0%	543	78%	692	100%
Totals			5,029	0	0%	0	0%	0	0%	149	3%	3,987	79%	0%	0	0%	0	543	11%	4679	93%

Source: Table 15 Liverpool Range Wind Farm Biodiversity Offset Strategy – Preliminary Layout (refer to **Appendix G** of this PER).

8.3.2 Additional and Appropriate Measures

Section 7.16(3) of the NSW BC Act states that the Minister for Planning is “required to determine whether there are any additional and appropriate measures that will minimise those impacts if consent or approval is to be granted”, if an SAII is considered likely. In light of this, the Proponent is committing to additional and appropriate measures to directly minimise impacts to the NSW Box Gum Woodland CEEC. While these additional and appropriate measures specifically relate to NSW Box Gum Woodland CEEC, the proposed additional and appropriate measures also relate to the residual impacts of the Proposed Action on Commonwealth Box Gum Woodland CEEC.

The additional and appropriate measures committed to by the Proponent would see an additional 13.9 ha of Commonwealth Box Gum Woodland CEEC that would be conserved in perpetuity at a proposed BSA site, over and above what is required under the BOS. The mechanism to conserve in perpetuity the additional areas of Box Gum Woodland CEEC will be via the generation and retirement of relevant ecosystem credits from a BSA site that will be registered on title as required under the BC Act (SAII Credits). The SAII Credits cannot be traded on the credit market or retired against the Proposed Action, and will simply be retired, or in effect, donated. The intended location to implement these additional and appropriate measures is the Nangarah BSA site, located north of Tamworth, within the Peel IBRA subregion.

The Proponent will provide evidence to DCCEEW of credit retirement relating to the additional and appropriate measures insofar as they relate to Commonwealth Box Gum Woodland CEEC. More details of these measures are provided in **Section 6.2.2**, with extensive detailed provided in Appendix C of the Offset Strategy which is contained in **Appendix G** of this PER.

9.0 Other Approvals and Conditions

The Proposed Action will be undertaken in accordance with the requirements of both Commonwealth and NSW legislation. The primary legislative instruments of relevance are the Commonwealth EPBC Act, for which this PER has been prepared, and the NSW EP&A Act as discussed in **Section 1.5** and addressed in further detail in **Section 9.2**.

Internal and external auditing programs will be undertaken to review how the Proposed Action is complying with relevant legislation and approval conditions.

Additional legislation applicable to the Proposed Action is described in the sections below.

9.1 Commonwealth Legislation

9.1.1 Native Title Act 1993

The *Native Title Act 1993* (NT Act) recognises that First Nations people have rights and interests to land and waters which derive from their traditional laws and customs. Native Title may be recognised in places where First Nations people continue to follow their traditional laws and customs and have maintained a link with their traditional country. It can be negotiated through a Native Title Claim, Indigenous Land Use Agreement (ILUA) or future act agreements.

The Proposed Action Area is within the boundaries of two registered Native Title claims: the registered claim area of the Gomeroi People (NC2011/006), and the registered claim area of the Warrabinga-Wiradjuri #7 (NC2018/002). Representatives of both registered native title claims were consulted during the preparation of Aboriginal Cultural Heritage Assessments undertaken as part of NSW approval processes (Umwelt 2023h, Umwelt 2022c).

The Proponent is currently applying for two Crown land licences to occupy and use Crown land for the purposes of public road upgrades and construction and operation of the wind farm (refer to **Section 9.2.9**). The Proponent is of the understanding that native title has been extinguished on all Crown land parcels that are impacted by public road upgrades and wind farm infrastructure.

9.1.2 Civil Aviation Regulations 1988

The *Civil Aviation Regulations 1988* require any potential aviation obstacles and hazards be assessed under the National Airports Safeguarding Framework Guideline D: Managing Wind Turbine Risk to Aircraft. An Aviation Impact Assessment has been undertaken for the Proposed Action as part of NSW approval process.

9.1.3 Heavy Vehicle (Adoption of National Law) Act 2013

Relevant approvals under the *Heavy Vehicle (Adoption of National Law) Act 2013* will be required for the transport of wind turbines and associated infrastructure by OSOM vehicles. All relevant approvals will be sought by the proponent, in accordance with any consent condition requirements, prior to construction.

9.1.4 Radio Communications Act 1992

Under Part 4.1 of the *Radio Communications Act 1992*, a legislative framework has been established to regulate equipment that uses or is affected by radio emissions. Radio communications can be impacted by proposed wind farms through electromagnetic interference produced by the turbines. An Electromagnetic Interference Assessment has been undertaken for the Proposed Action as part of the NSW approval process.

9.2 NSW Legislation

9.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act is the primary instrument which regulates the environmental impact assessment and approval process for development in NSW. The relevant assessment pathway for a development is determined by environmental planning instruments such as local environmental plans and State Environmental Planning Policies (SEPPs). *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) declares certain development to be SSD. Under the SRD SEPP, Schedule 1, clause 20(a) prescribes that development for the purpose of electricity generating works with a capital investment value of greater than \$30 million is SSD. As the proposed wind farm will generate electricity and has a capital investment value of more than \$30 million, it meets these criteria and is therefore SSD. As SSD, the Proposed Action is subject to the general assessment requirements under Part 4 of the EP&A.

A summary of the approval steps taken under the Commonwealth and NSW pathways to date is provided in **Table 9.1**.

Table 9.1 NSW and EPBC approval process summary to date

Year	NSW Project Name	EPBC Act Reference	Key features
2018	Approved Project (SSD-6696)	2014/7136 (Approved Action)	The NSW approved project SSD-6696 allows for the construction, operation and decommissioning of up to 267 wind turbines with a maximum tip height of 165 m and associated infrastructure including a transmission line with an indicative capacity of 330 kV from within the wind farm to the proposed connection point at Ulan.
2022	Modification 1 (NSW Mod-1 Application) (Undetermined)	2022/09416 referral March 2023 (Referred Action)	A modification application was submitted under Section 4.55(2) of the EP&A Act. The key changes proposed in the NSW Mod-1 Application were a reduction in the number of wind turbines to 220, an increase in the maximum blade tip height to 250 m agl and amendments to the associated infrastructure (including substations, internal and external transmission lines, site access and ancillary infrastructure), and increases to the native vegetation/habitat clearance limits.

Year	NSW Project Name	EPBC Act Reference	Key features
2023	Modification1 – Amendment 1 (RTS Project) (Undetermined)	2022/09416 This report (Proposed Action)	In response to ongoing consultation with agencies and further progression of the detailed design, an amendment to the NSW Mod-1 Application was proposed to further reduce the number of turbines to 185, reduce the maximum blade tip height to 215 m above ground level, reduce the indicative rotor diameter by 38 m (based on the preferred Vestas V172 7.2 MW turbine), remove or relocate multiple turbines to avoid or minimise environmental impacts and further infrastructure amendments. This resulted in a reduction in the area of the Development Corridor by approximately 30 per cent compared to the NSW Mod-1 Application (Referred Action).
2024	Modification 1 - Amendment 2 – TWA Facility (Undetermined)	2022/09416 This report (Proposed Action)	Due to an identified shortage of suitably skilled workforce and rental accommodation in the local region, and in response to government and community feedback on the NSW Mod-1 Application, Amendment 2 involves the proposed addition of a TWA Facility as an ancillary component for construction of the Proposed Action.

9.2.2 State Environmental Planning Policies

In addition to the SRD SEPP discussed in **Section 9.2.1** above, the following SEPPs are also applicable to the Proposed Action.

9.2.2.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 (Transport and Infrastructure SEPP) aims to facilitate the effective delivery of infrastructure across NSW. Clause 2.36(1)(b) of the Transport and Infrastructure SEPP states that development for the purpose of electricity generating works may be carried out by any person with consent on any land in a prescribed rural, industrial or special use zone. Under Clause 2.7(1) of the Transport and Infrastructure SEPP, the provisions prevail where there are inconsistencies with any other environmental planning instruments, including Local Environmental Plans (refer to **Section 9.3** for additional detail).

The Transport and Infrastructure SEPP also requires that for a development application which involves certain works related to or near electricity infrastructure, the consent authority must give written notice to the electricity supply authority for the area in which the development is carried out, inviting comments about potential safety risks. The Proponent is involved in ongoing consultation with EnergyCo in relation to the connection of the Proposed Action to the proposed new electricity infrastructure (refer to **Section 1.6** and **Section 2.2.3**).

9.2.2.2 State Environmental Planning Policy (Biodiversity and Conservation) 2021

Chapters 3 and 4 of *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (Biodiversity SEPP) aim to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas.

The Biodiversity SEPP imposes specific requirements which apply where a local Council is the consent authority, which is not the case for SSD. Accordingly, only the aims of the SEPP are relevant to the Proposed Action. An assessment of impacts on the koala with reference to the aims of the Biodiversity SEPP has been undertaken in the BDAR (Umwelt 2023a) as part of the NSW Mod-1 Application (refer to **Appendix D**).

9.2.3 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) regulates pollution to the environment and requires licences for environmental protection including waste, air, water and noise pollution control. Wind farms are a scheduled activity under the POEO Act and require an Environment Protection Licence (EPL).

Section 4.42 of the EP&A Act confirms that an EPL cannot be refused if it is necessary for carrying out SSD authorised by a development consent and is to be substantially consistent with the consent.

9.2.4 Biodiversity Conservation Act 2016

Under the BC Act, biodiversity assessment in accordance with the NSW BAM is required for any SSD project. The BC Act requires that a modification application under the EP&A Act be accompanied by a BDAR unless the Environment Agency Head is satisfied that modification will not increase the impact of the project on biodiversity values.

A BDAR was prepared to assess the potential biodiversity impacts of the NSW Mod-1 Application (the Referred Action) in accordance with the BAM by accredited assessors (Umwelt 2022a) and has subsequently been updated and expanded to include the more recent amendments of the NSW Mod-1 Application (the Proposed Action), in accordance with the BAM (Umwelt 2023a). The BDAR (Umwelt 2023a) for Amendment 1 of the NSW Mod-1 Application is provided in full in **Appendix D**.

9.2.5 National Parks and Wildlife Act 1974

Heritage NSW is primarily responsible for regulating the management of Aboriginal cultural heritage in NSW under the NPW Act.

Division 4.41 (d) of the EP&A Act specifies that it is not necessary to obtain an Aboriginal Heritage Impact Permit (AHIP) under Section 90 of the NPW Act for designated SSD. Projects approved as SSD under the EP&A Act are subject to conditions of approval which, where relevant, address Aboriginal cultural heritage.

The impacts of the Proposed Action on Aboriginal cultural heritage have been assessed in the Aboriginal Cultural Heritage Assessment undertaken as part of the NSW Mod-1 Application (Umwelt 2022b) and updated for Amendment 1 of the NSW Mod-1 Application (Umwelt 2023h).

9.2.6 Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) provides protection for heritage within NSW. The Heritage Act provides protection of historic places, structures, relics, moveable objects and landscapes of significance. The Heritage Act also affords protection to Aboriginal places of State heritage significance included on the State Heritage Register (SHR) or subject to an Interim Heritage Order.

The requirements of the Heritage Act have been addressed in a Historic Heritage Assessment undertaken as part of the NSW Mod-1 Application (Umwelt 2022c).

9.2.7 Water Management Act 2000

Any water extraction from water sources (including both surface and groundwater) regulated by a Water Sharing Plan (WSP) will require licensing under the *Water Management Act 2000* (WM Act). The Proposed Action will require approximately 627 ML of water over the entire construction phase, which is expected to be sourced from multiple bores and licences within or nearby to the Proposed Action Area. The Proponent has identified potential locations for existing and proposed new groundwater bores and will shortly commence the WM Act licensing process for these bore locations.

As an existing potable water supply is not available at the site, the TWA Facility will need to rely on alternate water supplies such as groundwater (refer to **Section 4.2.7**). The Proponent will obtain all required licences and permits for the establishment and use of a production bore at the TWA Facility site from WaterNSW. The extraction is subject to the Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources 2020 within the Sydney Basin Murray Darling Basin (MDB) Groundwater Source. The long-term average annual extraction limit for the Sydney Basin MDB Groundwater Source is 19,100 ML/year. The projected water demand for the TWA Facility is well within the available water allocations for this groundwater resource under the Water Sharing Plan.

Details regarding licences and permits required for services and utilities associated with the construction and operation of the TWA Facility will be confirmed in detailed design and outlined in the relevant EMPs.

Section 4.41 of the EP&A Act operates to remove the requirement for other water related approvals for approved SSD projects.

9.2.8 Roads Act 1993

Consent is required under Section 138 of the *Roads Act 1993* (Roads Act) for works on or above a public road or to connect a road to a classified road. The Proposed Action requires road works at key intersections and upgrades to road surfaces to facilitate heavy vehicle movements. These have been planned in consultation with the relevant local authorities including Warrumbungle Shire Council, Upper Hunter Shire Council and TfNSW. Section 4.42 of the EP&A Act operates so that consent under Section 138 of the Roads Act cannot be refused for SSD and must be granted on terms substantially consistent with the Development Consent.

It is noted that upgrades to the State Road network to facilitate the transport of OSOM components from the Port of Newcastle to the Proposed Action Area are being coordinated and undertaken by the NSW government under a separate approval process.

9.2.9 Crown Land Management Act 2016

The *Crown Land Management Act 2016* (CLM Act) provides for the administration and management of Crown Land in NSW. Crown land may not be occupied, used, sold, leased, licensed, dedicated, reserved or otherwise dealt with unless authorised by the CLM Act.

The proponent has consulted with the Crown Lands division within DPHI to discuss options for securing tenure required for construction and operation over Crown land parcels within the Proposed Action Area.

A survey of all infrastructure will be carried out prior to construction to accurately confirm there are no turbines and associated blades encroaching on Crown waterways, parcels and/or roads. A licence will be sought by the proponent for any proposed encroachment into Crown land and upgrade of existing Crown paper roads.

9.3 Local Planning Instruments

As the Proposed Action Area lies within three LGAs, there are three Local Environmental Plans (LEPs) that are applicable to the Proposed Action, being the Warrumbungle LEP, the Upper Hunter LEP and the Mid-Western Regional LEP.

As discussed in **Section 9.2.2.1**, under section 2.36 of the Transport and Infrastructure SEPP, development for the purposes of electricity generating works may be carried out by any person with consent on any land in a 'prescribed rural, industrial or special use zone'. As discussed in **Section 3.1.6**, the Proposed Action will take place on land zoned RU1, RU3, C1, SP2 and C3. Zones RU1, RU3, SP2 are prescribed rural, industrial or special use zones, therefore the Proposed Action is permissible within these zones.

The short section of transmission line through land zoned C1 within the Upper Hunter LGA is consistent with the Approved Action and has been authorised under the NPW Act by way of Deed of Agreement executed on 8 November 2018 and assigned to the Proponent on 22 February 2019. The Proposed Action is therefore permissible in the C1 zone under the Upper Hunter LEP 2013.

The short section of transmission line through land zoned C3 within the Mid-Western Regional LGA is consistent with the Approved Action. In its assessment report prepared for the Approved Action, DPE noted that this land is under the management of the NPWS and that NPWS did not advise against placing the transmission line within the land zoned C3. As Section 4.38(3) of the EP&A Act enables SSD projects to be approved even if they are 'partially prohibited' by an environmental planning instrument, DPE considered that the Development Consent for the Approved Action could be granted notwithstanding this issue.

The Proposed Action is generally consistent with the relevant zoning objectives of all three applicable LEPs and while not generally permissible in some zones, as SSD the Proposed Action does not rely on the provisions of the LEPs for permissibility.

10.0 Consultation

10.1 Prior to the Referred Action

10.1.1 Public Consultation

Substantial effort has been made to share information and receive feedback on the Referred Action and Proposed Action and benefit sharing opportunities to ensure all relevant questions and concerns within the community are clearly understood and appropriately addressed.

Prior to the referral and exhibition of the NSW Mod-1 Application (in September/October 2022) and prior to referral of the Referred Action to DCCEW in late 2022, a range of methods and various activities have been undertaken to reach as many in the community as possible including, but not limited to, the following:

- Attendance by Liverpool Range Wind Farm project team at all Community Consultative Committee (CCC) meetings (generally held quarterly each year). Eleven CCC meetings have been held since the Proponent acquired the project in 2019.
- Mail-out of Project Newsletters via regular mail and email. Copies always left at Coolah, Cassilis and Merriwa Post Offices.
- Advertisements regularly placed in local newspapers: Mudgee Guardian, Dubbo Daily Liberal, Coolah Diary, Dunedoo Diary, and Merriwa Ringer (no longer in print).
- Community radio announcements (3 Rivers Radio).
- ABC Radio Upper Hunter interview with Liverpool Range Wind Farm project team (accessible [here](https://www.abc.net.au/radio/upperhunter/programs/breakfast/coolah-windfarm/13605800): <https://www.abc.net.au/radio/upperhunter/programs/breakfast/coolah-windfarm/13605800>).
- Regional Development Australia Orana promotes consultation activities to its network.

In-person consultation activities took place in Coolah and Cassilis during the week of Monday 25 to Friday 29 October 2021. Semi-structured drop-in information sessions were held between 26 and 28 October 2021, and informal one-on-one discussions were held on 25 and 29 October 2021.

The Proponent engaged C7EVEN Communications and Farm Renewables Consulting to facilitate the drop-in sessions, as the Melbourne-based project team was unable to attend the drop-in sessions due to COVID-19 travel restrictions. Where further information was required, attendees were put in contact with members of the Melbourne-based project team via videoconference or telephone.

The drop-in sessions included live webinars (one on noise, one on visual impact and one general project overview) that were recorded and uploaded to the project website.

A total of 86 individual consultations took place across the various engagement channels and 52 different topics were discussed with the community across the three drop-in sessions. The sentiment from the consultation sessions was generally positive, and many residents and locals expressed keenness to see the Proposed Action commence and to see socio-economic benefits start to flow into the community.

Most conversations and feedback from the community centred on traffic impacts associated with construction and operation of the wind farm (23 per cent). Community benefit topics accounted for 9 per cent of conversations and feedback, as well as Goods and Services opportunities for local businesses also accounting for 9 per cent of conversations. Noise and visual impacts accounted for 7 per cent each of the topics discussed. The remaining 45 per cent of conversations centred on a range of matters, including biodiversity impacts, and general economic impacts.

Consultation with associated landowners has been undertaken via regular telephone, email and face-to-face meetings. The Proponent has ensured that all associated landowners have a designated contact person and regular communication is undertaken to ensure they are informed and can provide valuable input into development of the Proposed Action.

The Proponent continues to engage with non-associated landholders whose properties are located immediately adjacent to where a turbine is proposed to be located within 100 m of the property boundary. As required under the approved NSW Development Consent (SSD-6696) an agreement must be entered into with neighbouring landholders where a turbine (including the blade tip) is to be constructed within 100 m of the neighbouring property boundary.

The Proponent also continues to engage and consult with the local community by way of individual conversations and attendance at various community meetings and social and cultural events.

10.1.2 First Nations Stakeholder Consultation

Targeted consultation with registered aboriginal parties (RAPs) was undertaken as part of the Aboriginal Cultural Heritage Assessment (ACHA) that has been prepared by Umwelt (2022b), in accordance with Clause 60 of the National Parks and Wildlife Regulation 2019 and the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010b) (the Consultation Requirements).

Previously, consultation with RAPs was undertaken as part of the preparation of the ACHA that was prepared by NSW Archaeology in 2014/17 in support of the Approved Action.

Consultation with RAPs has informed the development of management recommendations included in the ACHA which are intended to supplement the existing conditions of the Development Consent that govern the management of cultural heritage.

10.1.3 Agencies and Councils

Over the course of 2020 to 2022, the Proponent has consulted with relevant State and Commonwealth agencies, including:

- DAWE (now Commonwealth DCCEEW).
- NSW DPE (now NSW DPHI).
- BCS of the NSW DCCEEW.
- Crown Lands.
- TfNSW.
- NSW National Parks and Wildlife Service.

The Proponent consulted with the three local councils in the Development Corridor, Warrumbungle, Upper Hunter and Mid-western Regional Councils in August 2020, April 2021 and October 2021 regarding the proposed modification, traffic and community impacts.

The Proponent also consulted with councils along the indicative OSOM Haulage Route in November 2021 through including Muswellbrook and Singleton Shire councils and Newcastle City Council.

The Proponent has consulted with DAWE/DCCEEW, including:

- In July 2020 to discuss the proposed modification of the Approved Action and the biodiversity assessment approach for the modification.
- In November 2021 to provide an update on the modification and the biodiversity assessment findings.
- A pre-referral meeting in November 2022 providing further update on the Referred Action and how the Referred Action compared to the Approved Action.
- Meetings to discuss the PER Guidelines in May and June 2023.
- Project update in December 2023 to introduce the TWA Facility and the proposed temporary project-specific quarry and notification of variation of the Referred Action.

Biodiversity assessments have been designed and executed in keeping with the BAM 2020 in consultation with DPE, BCS and DCCEEW between 2020 and 2023. A summary of consultation is provided in Section 1.6 of the BDAR (Umwelt 2023a) in **Appendix D**. A key component of the agency consultation was to discuss application of the BAM to the targeted threatened species survey strategy in light of the existing State and Commonwealth approvals. Following consultation with DPE and BCS, it was agreed that the application of BAM requirements for species-credit species would only be required within those sections of the Development Corridor where they occurred substantially outside of the Approved Development Corridor. That is, species-credit species surveys and assessment is only required where the Development Corridor is substantially different to the Approved Development Corridor. It was agreed that where the Development Corridor overlays with the Approved Development Corridor (under SSD 6696), the BAM will be used to assess the species-credit species that were identified as being impacted by the existing Approved Project and documented in Section 5.4 of DPIE's Determination Assessment Report (DPIE, 2018).

10.2 Consultation Since Referral

The NSW Mod-1 Application Assessment Report (Tilt Renewables 2022) was placed on public exhibition by DPE from 20 September to 17 October 2022, online and public display at Warrumbungle Shire Council, Upper Hunter Shire Council and at the dedicated 'shopfront' in Coolah. The exhibition period provided stakeholders with an opportunity to review the Assessment Report and, if they chose, to make a submission to DPE.

Following exhibition of the NSW Mod-1 Application Assessment Report, consultation and engagement activities were undertaken with a range of stakeholders including directly impacted landholders, local residents, government authorities, local councils, utilities owners, and community groups. Details of the community consultation and key items of discussion are presented in **Table 10.1** and **Table 10.2**. Details of consultation with key government agencies and councils are presented in **Table 10.3**.

Table 10.1 Community Consultation During and Since Referral

Affected Parties	Dates	Issues discussed
Community / Stakeholder Groups		
Community facilities – hosting project information material	Throughout October and November 2022	Project fact sheets were made available at the Coolah Library, Coolah, Dunedoo and Cassilis Post Offices, and at the Warrumbungle Shire Council office in Coolah. A dedicated shopfront space was leased for the public exhibition period at 50 Binnia Street, Coolah to provide Proposed Action information.
Coolah District Development Group meeting	25 October 2022	Covered consultation and feedback on engagement methods and structure of community benefit sharing approach.
Rural Guide 2023	21 November 2022 (published)	Inclusion of LRWF advertisement to promote Goods and Services Register and employment opportunities during construction.
Group meeting: Coolah and Cassilis District Development Groups, LRWF CCC community representatives, Warrumbungle Shire Councillor, Dunedoo Coolah Landcare, EnergyCo community reference group representative	30 November 2022 – Coolah Youth Hall, 2.5 hr workshop	Community workshops – kick off meeting with targeted combination of community groups to discuss plan for a co-design workshop series to influence benefit sharing outcomes and commitments.
Coolah Diary Fortnightly Advertisements and full newsletter insert	Multiple dates (generally 2 ads per month and 2 sponsored ads per month), from October 2022 – December 2023 (ongoing into 2024).	Ads covered general project information and updates, links to newsletter subscription and Goods and Services Register, benefit sharing updates and community news, planning processes, and other important/timely information.
Dunedoo Diary – newsletter promotion	December 2022 June 2023 October 2023 December 2023	Every edition of the LRWF newsletter is inserted (full colour) into the Coolah Diary and is accompanied with a promotional ad in the Dunedoo Diary.

Affected Parties	Dates	Issues discussed
LRWF Project Newsletter (multiple editions)	December 2022 edition	Content covered a report back from public exhibition – summary, planning process, look ahead to 2023, benefit sharing, active in the community.
	June 2023 edition	Content covered updated changes to the Proposed Action, included project layout maps, transmission line information, a field update, project benefits and community update.
	October 2023 edition	Content covered key changes to the Proposed Action, information on biodiversity offsets, project benefits, including benefit sharing. Promotion of upcoming consultation on proposed TWA and project-specific quarry, and other community updates.
	December 2023 edition	Content covered an update on the Modification Application, TWA Facility and quarry consultation update and a look ahead for early-2024.
	January 2024 edition	Notification of public exhibition of amendment to the NSW assessment (Amendment 2 of the NSW Mod-1 Application) to add TWA facility. Highlighted opportunity to make a submission on the amendment via the NSW Planning Portal.
Mudgee Guardian	December 2022 June 2023 October 2023 December 2023	Half page ad promoting the newsletter.
Dubbo Daily Liberal	December 2022 June 2023 October 2023 December 2023	Half page ad promoting the newsletter.
RDA Orana newsletter	December 2022 June 2023	E-newsletter ad promoting the LRWF newsletter.
Coolah District Development Group (CDDG)	December 2022	Discussions with CDDG members about engagement with Gilgandra LALC.

Affected Parties	Dates	Issues discussed
Ash Group Holdings – First Nations business	17 & 30 January and 13 April 2023	Workforce accommodation options and benefit sharing discussion.
Coolah District Development Group	January–February 2023 December 2022 June 2023 October 2023 December 2023	Made contact with Taralga Wind Farm and Upper Lachlan Shire Council to connect the Coolah District Development Group with a community representative on the Taralga Wind Farm Community Enhancement Fund Committee to learn about how it works and what community representation looks like. The Coolah District Development Group also receives targeted emails each time a project update or newsletter is prepared.
Project shopfront – official opening	15 February 2023 Ongoing opening hours: Monday - Friday, 8.30 am–4.30 pm (or by appointment)	Opening event – daytime catered BBQ promoted to full stakeholder list, attended by approximately 40 community members. Opportunity to speak with Project team.
Re-Alliance – CWO REZ Industry Roundtable	17 February 2023 20 June 2023 15 November 2023	Discussion on the future of community benefits in the CWO REZ and opportunity for proponents to come together and share Project status, assess coordination.
Western magazine	21 February 2023	Advertisement promoting employment on the project and providing information about the Goods and Services Register.
Inland Growth Summit (sponsorship) and Orana Outlook Dinner	20–22 February 2023	The Proponent was one of the event sponsors. Goods and Services Register ad included in all showbags. Industry networking event – seeking opportunities for benefit sharing, procurement, partnerships.
RDA Orana newsletter	25 February 2023	E-newsletter ad promoting the Goods and Services Register.
NSW ICC – First Nations businesses – procurement	27 February 2023	Membership discussion as part of Balance of Plant contractor engagement process.

Affected Parties	Dates	Issues discussed
EPBC Referral – open for public comment	2–17 March 2023	Promotion of the Referral including where to find information and provide comment. Ad in Coolah Diary, emails to stakeholder database, Project website update and public noticeboards.
Active Farmers Dunedoo	3 March 2023	Discussion to support (sponsorship opportunity) Dunedoo Active Farmers event – mental and physical health initiative for farmers.
Native Secrets – First Nations business	24 March 2023	Meeting to discuss partnership to manage biodiversity offset sites.
CWO REZ Skills and Workforce Working Group – led by EnergyCo	5 April 2023 14 June 2023 16 August 2023 18 October 2023 13 December 2023	Quarterly meeting with industry representatives and proponents.
Community Consultative Committee (CCC) meeting	2 May 2023	Presented key information to the CCC and provided a broad update on activity over the past 6 months.
RDA Orana Resources, Energy & Industry Innovation Forum	6–8 June 2023	Presented on the Proposed Action and how it fits into the CWO REZ. Opportunity to discuss the Project with local industry.
Renewables in Agriculture conference	21 June 2023	Sponsor of the event with a stall. Opportunity to speak with farmers and industry about the Proposed Action.
LRWF project newsletter	June 2023 edition	Submissions focus.
LRWF landholders - townhall	5 July 2023	Project update to all involved landholders.
CWO Community Reference Group meeting – led by EnergyCo	20 July 2023	CWO REZ community representatives and EnergyCo – update on approach to community engagement and benefit sharing.
WAAP employment event	27 July 2023	Project information stand with a focus on discussing employment, goods and services.
CWO First Nations Working Group	14 August 2023	Project presentation and update.

Affected Parties	Dates	Issues discussed
CWO REZ benefit sharing workshop	30 August 2023	Workshop with government agencies and proponents regarding a Merit Criteria 7 initiative.
Walhallow LALC	5 September 2023	Presentation at board meeting.
Coolah District Development Group	6 September 2023	Meeting with two members to discuss benefit sharing ideas.
Cassilis District Development Group	6 September 2023	Meeting with two members to discuss benefit sharing ideas.
LRWF CCC meeting	5 October 2023	Project presentation and update to CCC members at the Coolah Shopfront.
Local Land Services	9 October 2023	Meeting to discuss project conservation activities that go above compliance obligations (benefit sharing initiatives).
CWO First Nations Working Group	9 October 2023	Project briefing to Three Rivers Regional Assembly (no other members attended).
NSW TAFE	17 November 2023	Meeting to discuss available / existing training centres in the LRWF project region, Coolah in particular.
CWO REZ benefit sharing workshop	8 November 2023 16 November 2023 1 December 2023	Workshop with government agencies and proponents regarding a Merit Criteria 7 initiative.
Walhallow LALC	5 December 2023	Project update and discussion with available board members.
CWO First Nations Working Group	6 December 2023	Project presentation and update with all group members.
Gilgandra LALC	6 December 2023	Project presentation and update with available board members.
Mudgee LALC	7 December 2023	Project presentation and update with available board members.
Individuals		
Landholders (Dwellings #H6-2, #H6-3, #G6-3, #G6-4, #C5-9, #C6-4, #H7-1, #G6-2)	Telephone calls + written correspondence. Various dates since June 2022	Potential visual impacts (specific to dwelling location). Consultation based on seeking access for black-line visual impact assessment.

Affected Parties	Dates	Issues discussed
Landholder (Dwelling #C6-3)	Various attempts to make contact: 12 December 2022: Phone call. 16 December 2022: Phone call. 21 December 2022: Sent letter to residence. 18 January 2023: Attended residence. 31 January 2023: Attended workplace and left message. 1 February 2023: Dropped letter into workplace and registered mailbox. Invited to shopfront opening.	Potential visual impacts (specific to dwelling location).
Landholder (Dwelling #3)	Telephone calls + in person meeting (17/11/22) and various correspondence	Potential impacts to farming operations, potential Impacts to local road network in proximity to other land owned and potential impacts to local workforce.
Landholder (Dwelling #C4-6)	Multiple telephone calls, in person meetings and written correspondence	Potential visual and noise impact (specific to dwelling location) and potential impact to farming operations.
Landholder (Dwelling #C2-3 & C2-4)	Multiple telephone calls and written correspondence	Potential planning requirement impact to proximity to property boundary.
Landholder (Dwelling #8 & 9)	Multiple telephone calls and written correspondence	Potential planning requirement impact to proximity to property boundary – currently negotiating neighbour agreement.
Landholder (Dwelling #D7-4)	Multiple telephone calls, in person meetings and written correspondence	Discussions around visual impact (specific to dwelling location), potential to sell/purchase property, workforce accommodation.
Coolah township resident	Telephone calls + written correspondence supported by face-to-face meetings and preparation of photomontage. Discussions continued through October 2022.	Potential visual impact (specific to dwelling location).
Coolah township resident	Multiple telephone calls and written correspondence	Discussions around visual impact (overall), VPA and benefit sharing, and biodiversity and offsets.

Affected Parties	Dates	Issues discussed
Justin Brooker – CWO Aboriginal Working Group engagement (consultant)	Various dates (Nov 2022 – June 2023)	Discussions about First Nations engagement best practice in CWO REZ. Contracted to assist in the coordination of engagement with the CWO Aboriginal Working Group.
Maxine Greenfield – TfNSW – First Nations procurement	6 July 2023	Discussion on best practice approach to workforce planning for the region, local content and First Nations procurement.
Member of Parliament briefing – the Hon Mark Coulton MP	19 July 2023	LRWF project briefing to ensure the Member for Parkes is informed on the Project.
1800 Number	Ongoing – multiple calls (estimated approximately 90 calls between October 2022–December 2023)	Frequently raised topics include work on the project – assist callers with completing Goods and Services Register, general project information, cumulative impacts, sponsorship requests.

Table 10.2 Community Consultation on Temporary Workforce Accommodation

Mechanism	Description	Target Stakeholders	Timing/Responsibility	No. Consulted
Preliminary engagement (20 potential sites)	The Proponent undertook engagement with landholders of potential TWA Facility locations to investigate appropriateness against key site selection criteria.	Local landholders in and around Coolah and Cassilis	Between January–August 2023 The Proponent	20
Proximal landholder meetings (neighbours)	The Proponent undertook a series of direct neighbour engagement ahead of the community drop-in sessions.	Neighbouring residents	25 September–20 October 2023 The Proponent	25
CCC meeting	Project update and briefing on upcoming TWA Facility locations and consultation activities.	Liverpool Range Wind Farm CCC	5 October 2023 The Proponent	10 Meeting minutes on Project website

Mechanism	Description	Target Stakeholders	Timing/Responsibility	No. Consulted
Community drop-in sessions	Series of three community drop-in sessions were conducted by the Proponent to engage with and solicit feedback from the broader community. Two sessions were held in Coolah, with a third in Cassilis. These sessions were publicised on the Proponents' Project website, in local newspaper advertorials, via emails and the Project newsletter (refer below for further details).	Neighbouring residents	24–26 October 2023 The Proponent	Community Information Session 1, Coolah: 18 Community Information Session 2, Coolah: 13 Community Information Session 3, Cassilis: 46
Community Survey	Paper feedback surveys for both the TWA Facility sites were provided during the community drop-in sessions. A link to the online feedback survey, hosted by Umwelt, was also circulated and available via the Project website and QR codes for participants to complete either then or at a later date.	Broader community Community Groups	January 2021– Ongoing The Proponent Umwelt	93
Email	Emails containing Project Newsletters, consultation promotions, and Project Updates.	Liverpool Range Wind Farm project stakeholder database	13 October – newsletter + consultation promotion 31 October – reminder email 15 November – Cassilis TWA Facility removal update	Mailing list of approximately 800
Project Website	Multiple updates were made to the Project website in the lead up, during and post consultation. Information online included: <ul style="list-style-type: none"> • neighbour consultation fact sheets • community consultation fact sheets • photomontages • feedback form. 	Broader community	Ongoing – updated regularly The Proponent	Unknown

Mechanism	Description	Target Stakeholders	Timing/Responsibility	No. Consulted
Media and Communications	Advertisements of the Community Information Sessions in the Coolah Diary and Dunedoo Diary, on Coolah and Cassilis community Facebook pages such as the Cassilis Community Page and Community Notice Board – Coolah & Surrounds.	Broader community	Initial notification (soft announcement): 27 September – Coolah Diary 28 September – Daily Liberal 29 September – Mudgee Guardian Detailed ads: 11 October – Coolah Diary 18 October – Dunedoo Diary 20 October – Mudgee Guardian 21 October – Daily Liberal	Coolah and Dunedoo District Diaries: reach approx. 7,000 people Cassilis Community page: approx. 1,800 members (public) Community Notice Board – Coolah & Surrounds page: approx. 3,100 members (private)
Project Newsletter	Project Newsletter with key Project updates and invitation of upcoming community drop-in sessions placed on local notice boards, as a full colour insert in the Coolah Diary, in Dunedoo Diary and Mudgee Guardian, delivered by post to Upper Hunter Shire Council, Warrumbungle Shire Council and Mid-Western Regional Council offices, delivered to Councillors and emailed to full stakeholder database.	Cassilis and Coolah communities	Coolah Diary – 11 October	Mailing list of approximately 800

Note: Following community consultation, the Proponent updated the Project website and then issued a notice via email to the Project's stakeholder database, as well as targeted emails and calls to some stakeholder groups, individuals and both councils, advising them that the Project will not be pursuing the Cassilis site following analysis of the survey and consultation feedback.

Table 10.3 Government and agency consultation during and since Referral

Agency	Meeting date (post exhibition)	Issues discussed
Warrumbungle Shire Council	14 and 15 December 2022 22 December 2022 3 April 2023 18 April 2023 3 May 2023 28 June 2023 27 July 2023 13 October 2023	Meeting to discuss council submission, including road upgrades and VPA. Public road upgrades site inspection with council officers, post-inspection discussion, and section 138 of the Roads Act approvals process. TWA Facility potential sites and approvals pathway constraints.
Upper Hunter Shire Council)	12 January 2023 27 July 2023 20 October 2023	Meeting to discuss council submission. Public road upgrades site inspection with council officers. Post-inspection discussion, and section 138 of the Roads Act approval process. TWA Facility potential sites and approvals constraints.
DPE (now DPHI)	14 November 2022 30 March 2023 14 April 2023 27 June 2023 6 July 2023	Regular updates on progress responses to submissions and design changes. Efforts to avoid/minimise impacts to Box Gum Woodland CEEC. TWA Facility potential sites and approvals constraints. Potential quarry site and approvals constraints.
TfNSW	20 February 2023	Meeting to discuss TfNSW submission. Update on response to submissions. OSOM route pinch points and approvals, including Denman Bridge. Golden Hwy/ Vinegaroy Road intersection design.
NSW BCS	Post-exhibition meeting: 16 November 2022 Site visit: 9 Feb 2023 with Umwelt 6 July 2023	Meeting to discuss BCS submission. Site visit to attend follow-up surveys. BDAR assessment methodology, partial direct impact assessment methodology, and additional mitigation measures related to Box Gum Woodland CEEC.
NSW NPWS	6 October 2022 11 January 2023 (turbine noise demonstration)	Meeting to discuss NPWS submission. Meeting to present noise and visual impact assessment findings. Turbine noise demonstration within Coolah Tops National Park attended by Sonus and NPWS.
EnergyCo	Fortnightly bilateral CFG meetings	Road upgrades, OSOM route. Cumulative impacts (inc. traffic, waste, water). Partial direct impact assessment approach. Connection and access tender process.
DCCEEW	May 2023 June 2023	Meetings to discuss the PER Guidelines.

Agency	Meeting date (post exhibition)	Issues discussed
DCCEEW	December 2023	Project update to introduce the TWA Facility and the proposed temporary project-specific quarry and notification of variation of the Referred Action.

10.3 First Nations Engagement Since Referral

The Proponent undertakes regular consultation and provides project updates with the LALC in the region associated with the Proposed Action: Walhallow LALC – with at least 80 per cent of the project footprint, Gilgandra LALC – Coolah township associated, and Mudgee LALC – transmission line corridor. The Proponent also engages regularly with the Central West Orana Aboriginal Working Group Chair and members, as per the guidelines prescribed: *First Nations Guidelines: Central-West Orana (October 2023)*. At least six meetings were held with these stakeholders in 2023.

The Proponent has also prepared a stakeholder database of First Nations businesses and community organisations that may be able to support the Proposed Action during the construction period through provision of goods and services, as well as help inform opportunities to collaborate on benefit sharing initiatives.

Targeted consultation with RAPs was undertaken as part of the ACHA that has been prepared by Umwelt for the NSW Mod-1 Application Amendment Report 1 (Umwelt 2023h) and for the NSW Mod-1 Application Amendment Report 2 for the TWA Facility (Umwelt 2023i), in accordance with Clause 60 of the National Parks and Wildlife Regulation 2019 and the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010b).

10.4 Ongoing Consultation

Consultation with the community and key stakeholders is ongoing and will continue prior to and during construction of the Proposed Action. Ongoing consultation activities will aim to provide the community and stakeholders with awareness of construction processes and activities, updates on the proposed timing of construction and opportunities for ongoing feedback and input.

Community engagement relating to the Proposed Action is guided by the following industry and government standards and frameworks:

- NSW Government’s Undertaking Engagement Guidelines for State Significant Projects (DPE 2022d).
- The International Association for Public Participation (IAP2)’s Spectrum of Public Participation (2018).

The Proponent opened a project shopfront in February 2023 in the main street of Coolah township to provide further opportunities for the community to provide feedback on the Proposed Action including the proposed modifications and benefit sharing opportunities. The Coolah Shopfront is open five-days per week and by appointment when not staffed. It is proving to be beneficial for the community as an accessible source of information, while also enhancing relationships within the community by being visible and present. The 1800 number continues to be monitored along with any email project enquiries, including the Goods and Services Register, with a 100 per cent response rate.

The project website, email address, 1800 number and shopfront, will continue to be available prior to and during construction, and into operations. Targeted consultation methods, such as newsletters, notifications, attendance at and sponsorship of community events, signage, face-to-face communications, including workshops, will also continue to occur.

Engagement during operations will focus on maintaining regular communications with the community including reporting back to the community on compliance obligations, operations and generation updates, benefit sharing programs and promotion of community initiatives or events.

11.0 Environmental Records of the Proponent

11.1 Track Record

The Proponent has a satisfactory record of responsible environmental management.

The Proponent is the largest owner of wind and solar generation in Australia – and the largest mainland renewable energy generator after Snowy Hydro.

The Proponent has had a strong track record developing wind assets in Australia and New Zealand. The Proponent owns and operates six wind farms and two solar farms across Australia (within SA, VIC and NSW), with a further wind farm under commissioning (in Queensland) and are in the commissioning phase of the recently constructed Rye Park Wind Farm in NSW. The Proponent currently have a renewable generation capacity of 1,313 MW.

The Proponent was acquired by Powering Australian Renewables (PowAR) in August 2021, merging the two companies trading as 'Tilt Renewables'.

The Proponent aims to operate in a manner that maximises potential positive environmental effects, while minimising the incidence and source of adverse environmental effects. To achieve this, The Proponents' actions that may affect the environment are governed by the company's Environmental Policy (refer to **Appendix H**).

No major environmental incidents have occurred at any of The Proponents' assets under construction or in operation to-date.

11.2 Environmental Policies and Planning Framework

The Proponent is subject to the Environmental Policy provided in **Appendix H**. The Proponent is committed to protecting the environment by incorporating environmental considerations into all decision making and to manage its business in a legally compliant and environmentally responsible manner.

11.2.1 Environmental Principles

The Proponent will:

- Consider the environmental context for our development, construction and operations activities and seek to minimise the environmental impacts of our operations.
- Comply with applicable legal obligations and any related planning and environmental approval conditions for each project/asset.
- Implement systems, standards and processes to enable all activities to be carried out with regard to our environmental principles, including regular reviews to continually improve our environmental performance.
- Keep abreast of trends in technology, regulations and community attitudes, adapting and innovating in response to a rapidly changing society, including planning for climate change.

- Develop measurable environmental objectives and targets (through a risk-based approach to environmental management), including regular reviews to continually improve our environmental performance.
- Communicate and promote environmental awareness and work with stakeholders to ensure positive environmental outcomes and minimise the risk of operational environmental incidents.
- Engage quickly and effectively to respond to environmental incidents should they occur.
- Appoint capable people with appropriate skills and experience to carry out their work in a manner that is compatible with sound environmental performance.
- Provide adequate resources, equipment and training to enable employees at all levels to fulfil their responsibilities in relation to the environment and their work practices.
- Adopt measures to identify and ensure the efficient use of resources and energy, and minimisation of emissions and waste.

11.2.2 Monitoring and Reporting

Tilt commits to identifying and reporting regularly to the Board, environmental performance, hazards, near misses, incidents and impacts, and corrective/preventative actions taken.

11.2.3 Policy Breach

Where a material breach of this Policy has occurred, as soon as practicable the relevant Executive must report the breach to the CEO, who will advise the Board as soon as possible and report it at the next Board meeting along with the reason for the breach and action taken to return to Policy compliance.

11.3 Legal Proceedings

The Palmer Wind Farm project (South Australia) was approved by the Mid Murray Council's Development Assessment Panel in December 2015. The approval decision was subsequently appealed at the South Australian Environment, Resources and Development Court (ERD Court). On 9 March 2018 the ERD Court made judgement to uphold the approval, subject to additional conditions. Following this decision there was a Supreme Court Appeal of the ERD Court decision. In November 2019, the SA Supreme Court handed down its judgement, upholding the decision of the ERD to approve the project.

12.0 Economic and Social Matters

12.1 Economic Impact Assessment

The Proposed Action will result in economic benefits at the local, regional and state level from increased employment opportunities, through procurement of materials, goods and services to support construction of the Proposed Action and better diversification of income for agricultural areas (Hudson Howells 2021). The Proposed Action will also result in a more competitive cost of energy supply, and larger positive contributions to addressing the adverse effects of climate change.

The Proposed Action is expected to inject more than \$6 million each year to the local economy through payments to permanent staff, landholders and benefit sharing contributions. These funds, combined with the construction and the operation of the wind farm, will go on to support approximately \$90 million of regional economic activity during construction and approximately \$30 million every year during operations, further supporting local economic prosperity and resilience (Tilt Renewables 2023). The Proponent will explore opportunities to maximise local employment and develop a housing strategy through the TWA Facility. As the Proposed Action has an estimated capital value in excess of \$500 million, the Proposed Action must be notified to the Australian Industry Participation (AIP) Authority, and an AIP plan must be prepared in accordance with the *Australian Jobs Act 2013* (Cth). The AIP plans must detail the following:

- Expected opportunities to supply key goods and services to the project.
- How proponents will communicate project opportunities and prequalification requirements to potential Australian suppliers. This may include communicating via procurement websites.
- How proponents will assist suppliers to develop capability and integrate into global supply chains.

Commitments of the Proposed Action as updated in Appendix C of the Mod-1 Project Amendment Report 2 (Umwelt, 2024) include:

- Liaise with local industry representatives to maximise the use of local contractors and manufacturing facilities in the construction, operation and decommissioning phases of the project (commitment continued from the Liverpool Range Wind Farm Response to Submissions Report (Epuron 2017)).
- Make available employment opportunities and training for the ongoing operation of the wind farm to local residents where reasonable (commitment continued from the Liverpool Range Wind Farm Response to Submissions Report (Epuron 2017)).
- Prepare an Australian Industry Participation (AIP) plan and submit to the AIP Authority, in accordance with the *Australian Jobs Act 2013* (Cth) (commitment of the Modification Assessment Report (Mod-1), 2022, Tilt Renewable 2022).

- Prepare a Benefit Sharing Plan (BSP), that sets out how additional benefits will be realised during the construction period and in the early years of operations. Should all 185 turbines be constructed, the financial benefit sharing commitments would equate to approximately \$1.2 million per annum during the construction period (including the VPA), approximately \$1.2 million per year for the first 5 years of operations (including VPA and other commitments), and approximately \$800,000 per year (through the VPA) for the rest of the life of the Proposed Action. If the Proposed Action is staged, so will the programs within the BSP (commitment of the Stakeholder and Community Engagement Plan Response to Submissions Phase (Tilt Renewables 2023, Umwelt 2023g)).

12.1.1 Employment

During the construction peak, the Proposed Action will require a workforce of approximately 550 FTE employees. The construction period is scheduled to span across four years. There will be a ramp-up and ramp-down from the peak workforce number as construction progresses and concludes. Due to low local unemployment within the CWO region, it is anticipated that much of the required construction workforce will be sourced from outside the region.

Given the remote location and lack of short- and long-term rental properties within a one-hour drive of the Proposed Act, a temporary workforce accommodation (TWA) facility has been proposed to attract and maintain the workforce required over the construction period, and to lessen the social impacts on nearby communities as a result of the influx of a large external workforce.

The operational phase of the Proposed Action will require a workforce of approximately 40 FTE over the 30-year operational life.

12.1.2 TWA Facility Economic Benefits

Potential economic benefits of the TWA Facility include:

- Potential local employment for the construction of the TWA Facility.
- Potential increase in local spending (food/beverages, entertainment, fuel and ancillary services) by TWA Facility construction crews in Coolah.
- The TWA Facility will alleviate pressure on existing short and long-term rentals in the area, freeing those rentals up to be used for tourism and others.
- Some level of demand for local materials, labour, and services will likely be required during operation and maintenance of TWA (e.g. building and landscape maintenance, food services, domestic/cleaning/admin staff etc), adding to economic benefits.

12.1.3 Benefit Sharing

The Proponent is committed to sharing the benefits of its projects with the local communities that host them. There are several existing and proposed elements of the benefit sharing approach for the Proposed Action which include the executed VPA, CWO REZ Access Fees, the CWO REZ Access Tender Guidelines – Merit Criteria 6 and 7, and other Proponent-led initiatives. Further details on the benefit sharing approach for the Proposed Action are provided in the Stakeholder and Community Engagement Plan (Tilt Renewables 2023). The Stakeholder and Community Engagement Plan is dynamic and is updated as required during the development, assessment, construction and operational phases.

Based on community consultation and feedback, the Proponent has proposed to significantly increase the funding commitment for benefit sharing programs during construction and operation of the Proposed Action, and have committed to the following:

- \$1.2 M per year during the construction period (including VPA commitments).
- \$1.2 M for the first 5 years of operations (including VPA commitments).
- \$800,000 per year (VPA) over the remaining operational lifetime of the Project.

Under the CWO REZ Access Scheme, annual access fees are payable for a range of purposes. The community, employment, and REZ contribution is expected to be a fixed per unit fee of approximately \$4,000–\$5,000/MW/year. The Proponent is working with EnergyCo to ensure the prescribed access fees for the CWO REZ are invested in a manner that is tailored to key priorities in the local communities in and around the Proposed Action Area.

Other benefit sharing activities will include neighbour benefit programs, local employment opportunities and training initiatives, as well as commitments as part of fulfilling Merit Criteria 6 and 7 targets.

A tailored BSP will be prepared prior to construction. The BSP will endeavour to capture the needs of the community by seeking their input in its development.

The Proponent has commenced investment into the local communities of Coolah and Cassilis. Community groups and organisations located in the region of the Proposed Action have been encouraged to apply for funding or in-kind support through the fund. Funds have been provided to support a range of community-initiated projects, events and activities that respond to the local communities' needs and aspirations and contribute to long-term and sustainable outcomes for the region surrounding the Proposed Action. In accordance with this approach, as of July 2023, the Proponent has provided over \$60,000 and nearly 30 grants over the past four years.

Examples of community initiatives that the Proponent has supported over the last 12 months are provided in **Table 12.1**.

Table 12.1 Examples of Community Investment Initiatives

Groups/Individuals	Dates	Details
Coolah Men's Shed opening (annual sponsorship)	18 November 2022	Attendance to uncover new signage of the Men's Shed, including Tilt Renewables logo on Men's Shed ute and funds to assist in covering Men's Shed expenses.
Merriwa Country Education Foundation (scholarship contribution)	November 2022	Contribution towards students' tertiary education costs and discussion with Coolah District Development Group to assist them in setting up a Coolah CEF branch.
Coolah Veterans Touch Football Carnival (sponsorship) x 2	5–6 November 2022 4–5 November 2023	Tilt Renewables had a marquee at the carnival to ensure visibility in the community and speak to community members on the days about the Proposed Action.
Tunes on the Turf (sponsorship)	11–13 November 2022 10–12 November 2023	As above, both events received neutral to positive discourse, however no Tilt Renewables staff were able to attend the 2023 event.
Coolah Swimming Club (sponsorship)	December 2022 July 2023	Contribution of funds towards swimming carnival. Funds to purchase new swimsuits for the team.
Coolah Senior Citizens dinner (sponsorship) x 2	8 February 2023 29 November 2023	Sponsorship of annual event – over 100 attendees. Tilt also provided merchandise for attendees.
Dunedoo Show (sponsorship)	10–11 February 2023	Sponsorship of the event and Tilt Renewables had a marquee with Proposed Action information material and spoke to community members about the Proposed Action.
Coolah Men's Shed – fundraising event	21 May 2023	Sponsored BBQ to raise money for the newly established Coolah Country Education Foundation. Participated in games and took the opportunity to discuss the Proposed Action.
Coolah Roos Rugby League Club (annual sponsorship)	Ongoing – yearly	Team sponsorship including Tilt Renewables logo.
Cassilis Polocrosse Club (sponsorship)	May 2023	Team sponsorship to compete at the championships.
Coolah Dunedoo Landcare	May 2023	Funds to purchase a new trailer and other equipment.
Coolah Country Education Foundation	May 2023	Scholarship funds to support multiple students.
Coolah Black Stump Craft Shop	June 2023	Funds to purchase two split system units for the shop.
Coolah Central School – Boys to the Bush program	September 2023	Funding to support this education initiative helping boys better engage with school / studies.
Cassilis Country Music Festival	30 September– 1 October 2023	Gold event sponsor for the weekend.
Merriwa Country Education Foundation	December 2023	Scholarship funds to support multiple students.
Coolah Christmas Carnival and Parade (sponsorship)	December 2023	Funds to assist with covering the costs of putting on the event.

12.2 Social Impact Assessment

A Social Impact and Management Overview (SIMO) was undertaken as part of the NSW Mod-1 Application to examine the social locality in which the Proposed Action is located (Umwelt 2023e). The SIMO gathered data on social impacts and perceptions and assessed the likelihood and magnitude of these social impacts on various stakeholders. It also presented mitigation and management strategies designed to address salient social impacts.

Potential social impacts likely to be associated with the Proposed Action were identified across the Proposed Action lifecycle, with consideration of design, construction, operation, and decommissioning. The social impacts identified were informed through review of stakeholder engagement outcomes and secondary data review and analysis in the development of the social baseline, and consideration of other technical assessments undertaken for the Proposed Action.

The SIMO has identified the following positive impacts in relation to the Proposed Action:

- Increased energy security and reliability, and reduced reliance on carbon emitting energy sources.
- Generation of employment opportunities through the construction and operational phases of the Proposed Action.
- Support for community development activities and resources through the Benefit Sharing Plan and Voluntary Planning Agreement.
- Increased economic activity for local businesses including local shops, services, accommodation providers and suppliers.
- Improved accessibility, due to public road upgrades, to be delivered by the Proponent and delivery of access tracks through the wind farm for use for firefighting and other emergency services (Umwelt 2023e).

The benefits from the Proposed Action are wide ranging, with the ability to contribute to the provision of an increased and reliable supply of renewable energy for NSW, to the local benefits that may ensue at the local community level, through a Benefit Sharing Plan, investment in local infrastructure as well as local procurement, employment and training opportunities for individuals and businesses within the region.

The SIMO has also identified the following potential negative impacts:

- Reduced availability of short-term accommodation due to the influx of the temporary construction workforce, leading to 'crowding out' of tourists and other visitors.
- Reduced availability and affordability of rental accommodation.
- Reduced access to health service access, due to competition with the project's construction workforce.
- Potential for bird and bat strike and associated loss/deterioration of environmental values held by the community.
- Visual impacts of turbines, resulting in a changed sense of place.
- Consultation fatigue, due to multiple project activities in the region.

The management of cumulative impacts will be a key issue, given the scale and rate of change that is occurring both within the CWO REZ and more broadly across NSW. In this regard, the Proponent will collaborate where possible with other developers/generators and EnergyCo to manage the potential impacts of concurring developments on local communities, particularly with regard to housing and accommodation of project workforces and subsequent impacts on service provision, an area where rural communities are particularly disadvantaged.

The mitigation strategies proposed include environmental management plans, noise and visual impact mitigation and traffic management strategies; as well as a number of social impact management strategies, including development of a Community and Stakeholder Engagement Plan, an Industry and Aboriginal Participation Plan, an Accommodation and Employment Framework, a Community Benefit Sharing Plan and a Complaints Management Plan and register. The implementation of such strategies will assist in reducing social and environmental impacts that may occur because of the Proposed Action and, where possible, will be developed in consultation with key stakeholders.

The TWA Facility included as part of the Proposed Action is a direct response to the outcomes of community feedback and the Accommodation and Employment Framework, which identified a short term and long term accommodation shortage within the Coolah and Cassilis areas and the broader region.

The Social Assessment undertaken for the TWA Facility (Umwelt, 2023f) has identified the following positive social impacts:

- Local economic benefits associated with incoming construction workforces utilising facilities located in proximal towns.
- Local employment generation leading to job opportunities for community members.
- Local procurement opportunities leading to direct investment in local businesses and flow-on benefits from economic stimulus enabling the capacity and capabilities of local businesses to develop/expand during the construction and operation of the TWA Facility.
- Avoidance of unsustainable pressure on existing housing and accommodation in the social locality.

Conversely the assessment also identified several potential negative impacts of the TWA Facility on neighbouring communities including:

- Changes to sense of place, community composition, relations and levels of community cohesion due to influx of incoming construction workforces to small rural settlements.
- Reduced access to health services due to competition for facilities with incoming construction workforce.
- Increases in traffic and reductions in road safety due to increased vehicular movement.

Additional mitigation strategies proposed, specific to the TWA, include proactive and transparent community engagement to involve proximal communities in key decisions, implementation of codes of conduct to manage worker behaviour and positive programs to support workforce wellbeing and involvement/integration with local communities.

13.0 Conclusion

13.1 Summary of the Proposed Action

The Liverpool Range Wind Farm (Approved Action) was approved by the Commonwealth Department of the Environment and Energy under Section 130(1) and 133 of the EPBC Act in June 2018 (EPBC 2014/7136). At the time of approval, the Approved Action was the largest approved wind farm in NSW with 288 wind turbine generators and a proposed installed capacity of up to 960 megawatts that would contribute to both the Commonwealth Government's Renewable Energy Target and NSW's Renewable Energy Action Plan, consistent with the NSW Government's vision for a secure, reliable, affordable and clean energy future for the state.

The Approved Action is located within and forms a component of the CWO REZ that was formally declared in November 2021. The CWO REZ was the first REZ to be declared in Australia and has enormous potential for the development of solar and wind projects that can contribute to the NEM, support jobs and drive investment in the region.

Since acquiring the Approved Action in 2019, the Proponent has undertaken a detailed layout review and design optimisation process to progress towards a safe and efficient construction and operation of the Approved Action. The design optimisation has considered the significant advances in wind turbine technology since the wind farm was approved in March 2018 and to avoid and minimise environmental impacts and the identification of more accurate estimates of the extent of required ground disturbance. As part of this process, more accurate estimates of the extent of required ground disturbance and vegetation/habitat removal have been developed based on 3D terrain modelling and the Proponent's recent wind farm construction experience, most notably the Rye Park Wind Farm project located near Yass, NSW. Ground disturbance required for public road upgrades has also now been accounted for in the Proposed Action, which was not the case for the Approved Action.

Design optimisation has also taken steps towards satisfying NSW pre-construction conditions of consent including updating baseline vegetation mapping, commencing collection of baseline data on threatened and at-risk bird and bat species, noise compliance, progressing biodiversity offsets, public road upgrades, neighbour agreements and VPAs with Upper Hunter and Warrumbungle Shire Councils.

The Minister determined on 30 March 2023 that the Liverpool Range Wind Farm was a Controlled Action, and that approval is required as the Proposed Action has the potential to have a significant impact on MNES. Since referral, the Referred Action has been modified further to reduce the number of wind turbine generators from 220 to 185, lower the hub height and reduce the indicative rotor diameter to avoid impacts to biodiversity values. Other major changes include the inclusion of accommodation (TWA Facility) for the increase in workforce during construction and some additional public road upgrades for critical pinch points identified in detailed design.

The Proposed Action in keeping with the Approved Action is the construction, operation and decommissioning of a wind farm, ancillary facilities and an external transmission line. **Section 2.0** of the PER provides a detailed description of the Proposed Action, how the Proposed Action has evolved since the Approved Action to avoid and minimise environmental impacts and includes a comparison of the impacts of feasible alternatives of the Proposed Action, Referred Action and the Approved Action.

The Development Corridor for the Proposed Action has reduced by approximately 30 per cent from that proposed in the Referred Action. Within the Development Corridor, the Indicative Development Footprint of the wind farm and external transmission line has increased negligibly by only 0.6 per cent. The Indicative Development Footprint of all components of the Proposed Action (1,803.0 ha) are more realistic than that identified in the Approved Action and while the extent has increased marginally from that assessed in the Referred Action (1790.1 ha) but this can be attributed to the inclusion of necessary TWA Facility and as a result of detailed design of public road upgrades. Importantly it should be noted that this additional impact is primarily located in non-native vegetation zones.

Design optimisation and review of the layout of the wind farm component of the Proposed Action has increased the separation distance between turbines as proposed in the Referred Action. The wind turbines in the Proposed Action have a reduced hub height, maximum blade tip height and smaller rotor diameter resulting in a 33 per cent reduction in the indicative RSA of each turbine.

The Proponent has considered and discounted alternative forms of the Action, including the more intensive configuration of the Approved Action, demonstrating how the Proposed Action is the optimal configuration balancing the Action's objectives of efficient delivery of renewable energy with avoidance of biodiversity values and feedback from the local community and stakeholders including government agencies. Since acquiring the Approved Action in 2019, the Proponent has undertaken substantial measures to avoid and minimise impacts to biodiversity to the extent reasonably practicable and engaged with the local community. Residual impacts to biodiversity are unavoidable, and the Proponent has made substantial progress to secure required offsets.

Construction of the Proposed Action will impact directly on native vegetation and associated fauna habitats from 10 PCTs across 17 vegetation zones. The impacts on the ecosystems will be offset as ecosystem credits in accordance with the NSW BOS. Other impacts to biodiversity values include habitat connectivity fragmentation and edge effects, removal of key fauna habitats (hollow-bearing trees, termite mounds, large hollow logs, rock piles, large stick nests), risk of erosion and sedimentation in the receiving environment, spread of weed species particularly in areas of intact vegetation along the Development Corridor – External Transmission Line and risk of collision with construction vehicles.

While the External Transmission Line forms part of the Proposed Action, the estimated impacts to biodiversity values along the External Transmission Line are unlikely to apply, as the Proponent is planning to connect the Proposed Action into the proposed CWO REZ transmission line project being developed by EnergyCo and the Network Operator. Removal of the External Transmission Line component of the Proposed Action will reduce extent of vegetation clearance, habitat fragmentation and reduce impacts of the Proposed Action on MNES. Of importance it is worth noting that removal of the External Transmission Line component would result in the avoidance of impact to approximately 17.7 ha of Commonwealth Box Gum Woodland CEEC.

The main operational impacts of the Proposed Action are associated with the operating wind turbines including risk of collision for birds and bats and noise impacts. Impacts associated with maintenance activities of the wind farm and external transmission line including vehicle movements and spills risks.

The Proposed Action is expected to have a commercial life of approximately 30 years. Decommissioning of the Proposed Action would involve reinstating similar road access arrangements and temporary construction compound/laydown areas to facilitate decommissioning of the wind farm above ground structures. The areas to be impacted during decommissioning would not support native vegetation and it is anticipated that there will be no direct impacts on potential habitat for MNES.

The impacts of all phases of the Proposed Action on listed MNES have identified that the Proposed Action may have a significant impact on the following MNES:

- Commonwealth Box Gum Woodland CEEC through clearance of up to 31.6 ha of which 17.3 ha (approximately 55 per cent) will be partially directly impacted within the transmission line 'balance of easement' proposed by the Proposed Action. All patches of the Commonwealth Box Gum Woodland CEEC are considered to be locally important. The Proposed Action is likely to adversely modify or reduce the composition and quality of retained adjoining vegetation through edge effects. Removal of the External Transmission Line component would result in the avoidance of impact to approximately 17.7 ha of Commonwealth Box Gum Woodland CEEC.
- Swift parrot (*Lathamus discolor*). While the Proposed Action avoids important habitat for the national population of the swift parrot, given the status of the species there is potential that the loss of about 302.5 ha of potential winter habitat may have an adverse effect on the local extent and long-term viability of the swift parrot.
- Regent honeyeater (*Anthochaera phrygia*). While the Proposed Action avoids critical habitat for the national population, and the absence of records, despite extensive surveys for the species, given the status of the species there is potential that the loss of about 604.3 ha of potential foraging habitat may have an adverse effect on the local extent and long-term viability of the regent honeyeater.
- White-throated needletail (*Hirundapus caudacutus*). The Proposed Action has the potential to have a significant impact as there is a chance that there could be mortality of an ecologically significant proportion of its population.

The Proposed Action is not considered to have a significant impact on the following MNES:

- Gang-gang cockatoo (*Callocephalon fimbriatum*). The Proposed Action is considered to have a likely negligible impact on potential habitat for the gang-gang cockatoo given the minimal proposed habitat impacts, lack of records of the species within the Development Corridor, and a greater quality habitat for the species within the nearby Goulburn River National Park.
- South-eastern glossy black-cockatoo (*Calyptorhynchus lathami lathami*) as the Modified Action would clear a negligible amount of potential foraging habitat and breeding habitat, nor impact on an important population of the species.
- Superb parrot (*Polytelis swainsonii*) as there is no evidence of breeding and only one record of the superb parrot by others within a 10 km radius of the Development Corridor and just 22.9 ha of potential habitat will be impacted by the Proposed Action.
- Greater glider (southern and central) (*Petauroides volans*), as potential habitat largely avoided and connectivity to known records in Coolah Tops National Park can be maintained through detail design.

- Koala (*Phascolarctos cinereus*) (combined populations of Qld, NSW and the ACT), as not recorded in MDC, no evidence of breeding population in MDC. Breeding population may occur in forest/woodland habitat adjacent to the IDF-External Transmission Line. In this area the impact will be linear and narrow and is unlikely to fragment or isolate the koala.
- Painted honeyeater (*Grantiella picta*) as potential habitat most likely to be associated with the IDF-External Transmission Line where impacts are linear and narrow and unlikely to fragment habitat for a mobile species.
- Large-eared pied bat (*Chalinolobus dwyeri*) as the Modified Action will not impact roosting and breeding habitat. The Proposed Action is not expected to result in an adverse impact on a potentially occurring important population of the large-eared pied bat due to the very low population density of the species (as evidenced by the lack of records since 2012), no breeding habitat being directly impacted, the retention of substantial areas of potential foraging habitat within the Development Corridor and the mitigation strategies that will be employed as part of the Proposed Action.
- Corben's long-eared bat (*Nyctophilus corbeni*) due to the very low population density of the species, the retention of substantial areas of potential breeding and foraging habitat within the MDC and the mitigation strategies that will be employed as part of the Proposed Action.
- Yellow-bellied glider (south-eastern) (*Petaurus australis australis*) as habitat largely avoided and connectivity to known records in Coolah Tops National Park can be maintained through detail design.
- Spotted-tailed quoll (*Dasyurus maculatus*) despite the impacts to 193.9 ha of potentially suitable habitat as there will be no direct impacts to the species as these impacts are not considered likely to result in any isolation or fragmentation for the species.
- Grey-headed flying fox (*Pteropus poliocephalus*) despite the Proposed Action impacting 312.1 ha of potential foraging habitat given the sheer distances from the nearest known nationally important camp (over 100 km) and nearest known camp (over 40 km) make the species unlikely to frequently forage within the Proposed Action Area.

Despite the best avoidance and minimisation efforts of the Proponent, the Proposed Action will still result in residual impacts to a number of MNES. Residual impacts will be offset in accordance with the EPBC Act Environmental Offsets Policy 2012 and Offsets Assessment Guide, or other endorsed offset framework (for example, the NSW BOS). The NSW BAM and BOS have been endorsed by the Commonwealth. This means that offsetting outcomes achieved through the BAM will be accepted for the purposes of the EPBC Act, provided that they are 'like-for-like' in relation to listed threatened species and communities as defined for the purposes of the EPBC Act.

The Proponent is seeking to offset the Proposed Action using the NSW BAM – Credit Calculator assessments for the Proposed Action and include complete impacts as well as partial direct impacts that have been calculated in the balance of easement component of the transmission lines (internal and external). Within the balance of easement, a proportion of biodiversity values will remain within select vegetation zones following construction and during the operation of the Proposed Action.

Residual impacts associated with the entire (i.e. wind farm, public road upgrades and external transmission line) are summarised in **Table 13.1**.

Table 13.1 Residual Impacts to MNES requiring offsets for entire Proposed Action

MNES	Potential habitat in Development Corridor (ha)	Potential habitat in Indicative Development Footprint (ha)	Total Credits
Threatened Ecological Community			
White Box-Yellow Box-Blakely's Red Gum Woodland and Derived Native Grassland	174.1	31.6	1,068
Species (species credit)			
South-eastern Glossy Black-Cockatoo (breeding habitat)	5.4	2.0	38
Greater Glider (southern and central)	111.3	19.3	692
Large-eared Pied Bat	572.0	106.7 ha	4,839
Species (ecosystem credit)			
Regent Honeyeater	3,233.8	603.9	16,727
Gang-gang Cockatoo (no breeding habitat)	45.7	13.4	427
South-eastern Glossy Black-Cockatoo (foraging habitat)	508.0	83.7	2,531
Painted Honeyeater	3,407.9	627.6	17,142
White-throated Needletail (terrestrial habitat)	2,348.6	463.2	11,706
Swift Parrot	1,653.0	302.5	8,130
Superb Parrot	124.2	22.9	573
Spotted-tail Quoll (SE mainland population)	941.4	193.9	4,864
Corben's Long-eared Bat	721.5	156.8	4,022
Yellow-bellied Glider (south-eastern)	87.4	15.2	447
Koala (<i>Phascolarctos cinereus</i>) (combined populations of Qld, NSW and the ACT)	3,726.1	720.6	19,203
Grey-headed Flying-fox	1,731.5	312.0	8,276

Impacts relating to wind turbine strike (and barotrauma) are possible for the Proposed Action, as they are for any wind farm. The frequency and particular species that will be impacted by wind turbine strike (and barotrauma) cannot be confidently known until operational monitoring occurs. Details of the approach to offsetting prescribed impacts relating to turbine strike (and barotrauma) will be detailed in the Bird and Bat Adaptive Management Plan (BBAMP) that will be prepared for the Proposed Action in consultation with DPHI, BCS and Commonwealth DCCEE.

The Proponent has developed and is actively working with Wedgetail Project Consulting towards the implementation of a comprehensive biodiversity offset strategy for the Proposed Action which has been provided in **Appendix G**.

The Proponent intends on satisfying the majority of their offset obligations for the Proposed Action for the Indicative Development Footprint – Wind Farm and Indicative Development Footprint – Public Road Upgrades, through securing land-based offsets such as establishing new Biodiversity Stewardship Agreement (BSA) sites under the BAM or purchasing credits on the public credit market. To-date the Proponent has secured eight land-based offset opportunities, five of which will be established as new BSA sites and the remaining three relate to the purchase of credits from established BSA sites. The five new BSA sites proposed to be established are currently being investigated and assessed by Wedgetail on behalf of the Proponent. Together, the eight land-based opportunities are expected to generate over 90% of the ecosystem and species credits required to offset the unavoidable impacts associated with the wind farm and public road upgrade components of the Proposed Action. Moreover, the Proponent has gone through extensive efforts to strategically offset the Proposed Action through identifying suitable properties that do not simply generate the suitable credits, but that would also deliver additional strategic landscape-scale biodiversity wins. This includes but is not limited to the strategic connection of habitat between presently disconnected conservation areas or locating BSA sites adjacent to existing national parks or conservation areas.

Where there is shortfall in available credits to retire against the Proposed Action, the Proponent will prioritise the purchase of required offset credits via the public credit market. Wedgetail are assisting the Proponent with searching for and identifying suitable credits on the public market to commence negotiations with potential sellers.

The Proponent has committed to additional mitigation measures to minimise risk of serious and irreversible impacts (SAIL) to the NSW listed Box Gum Woodland CEEC and in so doing minimise impacts to Commonwealth Box Gum Woodland CEEC. The additional SAIL mitigation measures include setting aside land at a 1:1 area ratio of conserved vegetation to impacted Low and Moderate-good condition class Box Gum Woodland CEEC under a BSA (the SAIL Measures). The Proponent proposes to implement the SAIL Measures at a BSA site it is proposing to establish near Barraba, north of Tamworth NSW, located within the Peel IBRA sub-region. Based on the estimated impacts to Low and Moderate-good condition Box Gum Woodland CEEC associated with the Indicative Development Footprint – Wind Farm and Indicative Development Footprint – Public Road Upgrades, the SAIL Measures will result in the conservation in perpetuity of an additional 13.9 ha of Commonwealth Box Gum Woodland CEEC over and above offsetting requirements under the NSW BOS, that would not otherwise occur without the Proposed Action.

13.2 Environmental Acceptability of the Proposed Action

13.2.1 Compliance with the Objects of the EPBC Act

Section 3 of the EPBC Act defines the objects of the EPBC Act as:

- a. *to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance;*
- b. *to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources;*
- c. *to promote the conservation of biodiversity;*
- d. *to promote a co-operative approach to the protection and management of the environment involving governments, the community, landholders and indigenous peoples;*
- e. *to assist in the co-operative implementation of Australia's international environmental responsibilities;*
- f. *to recognise the role of indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity; and*
- g. *to promote the use of indigenous peoples' knowledge of biodiversity with the involvement of, and in co-operation with, the owners of the knowledge.*

The Proposed Action aligns with the current strategic direction of the NSW and Australian energy generation market and assists in achieving the planned transition to an increased contribution of renewable energy to meet Australia's energy needs. The Proposed Action is located within, and forms a component of, the CWO REZ in NSW.

The Proponent has considered and discounted alternative forms of the Action, including the more intensive configuration of the Approved Action and Referred Action, demonstrating how the Proposed Action is the optimal configuration balancing the Action's objectives of efficient delivery of renewable energy with avoidance of biodiversity values and feedback from the local community and stakeholders including government agencies.

Since acquiring the Approved Action in 2019, the Proponent has been engaged in avoidance and minimisation of impacts to biodiversity and the community to the extent reasonably practicable. The residual impacts of the Approved Action are unavoidable and will be offset under an approved biodiversity offset mechanism. To this end, the Proposed Action designed to avoid and minimise impacts to the environment including but not limited to MNES will (a) contribute to the protection of the environment, (b) promote ecologically sustainable development (ESD) and (c) promote the conservation of biodiversity by making a significant contribution towards transitioning to renewable energy to deliver the NSW Climate Change Policy Framework and NSW Government's commitment set out in the *NSW Climate Change (Net Zero Future) Act 2023*, as well as the Commonwealth Government's commitments under the Paris Agreement. In doing so, it will contribute to reduction of climate change pressure on MNES and their habitats.

As discussed in **Section 10.0**, the Proponent has engaged with stakeholders from the local community, government and First Nations people in development of the Proposed Action. Consultation is an ongoing process and will continue prior to and during construction of the Proposed Action. Ongoing consultation activities will aim to provide the community and stakeholders with awareness of construction processes and activities, updates on the proposed timing of construction and opportunities for ongoing feedback and input. To this end, the Proposed Action will (d) promote a co-operative approach to the protection and management of the environment.

The Proposed Action aligns with and will contribute to the NSW Government's and Australian Government's commitments to the Paris Agreement. Other international environmental obligations under the Biodiversity Convention, the Apia Convention, and CITES have been considered in **Section 5.1.2** to demonstrate that the Proposed Action includes measure to avoid and minimise impacts on biodiversity values including but not limited to migratory species listed under international migratory bird agreements.

The Proponent recognises the importance of First Nations knowledge of the Proposed Action Area and engages regularly with the LALCs and the Central West Orana Aboriginal Working Group Chair and members. Targeted consultation with RAPs was undertaken as part of the ACHA that has been prepared for the Referred Action and now Proposed Action. An Aboriginal Cultural Heritage Management Plan will be prepared to govern the management of cultural heritage. Through consultation with First Nations the Proposed Action has started to and will continue to engage with First Nations to (f) recognise their role in conservation and ecologically sustainable use of and (g) promote their knowledge of biodiversity.

13.2.2 Ecologically Sustainable Development

Section 3A of the EPBC Act defines the following principles of ecologically sustainable development:

- a. decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;*
- b. if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;*
- c. the principle of inter-generational equity – that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;*
- d. the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;*
- e. improved valuation, pricing and incentive mechanisms should be promoted.*

In order to achieve a level of scientific certainty in relation to potential impacts associated with the Proposed Action, extensive evaluation of all the key components and any necessary management measures has been undertaken and is comprehensively documented in this report.

Consistent with the precautionary principle, the assessment process has involved detailed studies of the existing environment, consideration of constraints and alternatives, and where applicable the use of scientific modelling to assess and determine potential impacts. The overarching goal of the Proposed Action is to address and reduce the predicted impacts associated with the Approved Action and to facilitate efficiency in construction activities. To this end, there has been careful evaluation to avoid/minimise the risk of irreversible damage to the environment, wherever possible. The decision-making process for the siting, design, impact assessment and development of management processes has been transparent through the consultation process with both government authorities, landowners and the Coolah and Cassilis community.

The key benefit of both the Approved Action (and the Proposed Action) is the potential it provides for a strong positive contribution to build Australia's energy capacity, reliability and security in the transition away from coal-fired power generation. The NEM needs to rapidly transition to renewable energy to support both the NSW and Commonwealth government commitments under the Paris Agreement. The transition to renewable energy is critical to the protection of the health, diversity and productivity of the environment for future generations. The Proposed Action contributes to the realisation of that potential through facilitating construction of the Approved Action in a manner that limits environmental, economic and social impacts.

In particular, the design of the Proposed Action includes measures to minimise impacts on the abundance and distribution of flora, fauna and ecological communities in both the short and long-term by avoiding areas of high ecological value in the first instance and implementing a biodiversity offsets strategy in accordance with both Commonwealth and NSW policies and regulations for unavoidable impacts.

Implementing the mitigation measures for the Approved Action and the Proposed Action would impose an economic cost on the Proponent, increasing both the capital and operating costs of the Action so as to ensure sound environmental outcomes. In this manner, environmental resources have been given appropriate valuation, consistent with the principles of ecologically sustainable development.

13.3 In Summary

The Proposed Action is located within, and forms a key component of, the CWO REZ - an area declared by the NSW Government as suitable for renewable energy development. The Proponent and the Proposed Action have together been designated by EnergyCo as a CFG which further demonstrates the critical role that the Proposed Action plays in helping the NSW Government deliver on its commitments to increase renewable energy generation and decarbonise the electricity generation system. The Proposed Action represents one of the largest approved projects within the CWO REZ, is aligned with the NSW and Commonwealth governments' energy and climate policies and will make a meaningful contribution to achieving the goal of net zero emissions by 2050.

The Proposed Action is a direct response to the NSW and Commonwealth Governments' commitments to transition to renewable electricity generation and forms a key component of the CWO REZ. The NEM needs to rapidly transition to renewable energy to support the NSW Climate Change Policy Framework, as well as the Commonwealth Government's commitments under the Paris Agreement. The Proposed Action will materially assist in addressing this by delivering approximately 1,332 MW of renewable energy capacity to the NEM.

The Proponent has considered and discounted alternative layouts and construction methodologies, including the more intensive configuration of the Approved Action and Referred Action. The Proposed Action is the optimal configuration balancing the key overarching objectives of efficient delivery of renewable energy with avoidance of biodiversity values and consideration of feedback from the local community and stakeholders including government agencies.

The Proponent has completed detailed studies of the existing environment, considered relevant constraints and alternatives, and where applicable used scientific modelling to assess and determine potential impacts. All reasonable and feasible efforts have been made to avoid and minimise the predicted impacts associated with the Proposed Action and to facilitate efficiency in construction activities. To this end, there has been careful evaluation to avoid/minimise the risk of irreversible damage to the environment, wherever possible.

The Proposed Action will result in residual impacts however these impacts can be effectively managed, mitigated and offset in accordance with relevant State and Commonwealth legislation. The Proponent is committed to implement mitigation measures for each phase of the Proposed Action to ensure residual impacts on MNES can be appropriately managed. There will also be further opportunities to reduce impacts on MNES values during the detailed design and construction phase of the project, for example through micro-siting of infrastructure at final design.

The Proposed Action will provide approximately 550 full-time positions during peak construction and approximately 40 full-time staff during its operational life, thus providing increased employment opportunities in the local region. The Proposed Action will result in a direct injection of approximately \$6 million per annum to the local community through direct payments to landholders, VPA contributions and other community benefit sharing initiatives to the local community. The Proponent will also be required to make additional payments through the CWO REZ Access Scheme, a portion of which will be invested by the NSW Government for community and employment purposes in the region.

While the Proposed Action results in several changes to the turbine parameters and infrastructure layout it is considered that the Proposed Action is substantially the same development as the Approved Action. The Proposed Action adheres to ecologically sustainable development principles through the integration of relevant economic, environmental and social considerations. Overall, the Proposed Action is expected to deliver positive net benefits for the community and environment, and therefore warrants approval.

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