# Bird and Bat Management Plan

PREPARED FOR AURECON ON BEHALF OF ALINTA ENERGY

BAMFORD CONSULTING ECOLOGISTS

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# Table of Contents

List of Acronyms

| Abbreviation | Description |
|---|---|
| BBUS | Bird and Bat Utilisation Survey |
| BESS | Battery Energy Storage System |
| PBBMP | Preliminary Bird and Bat Management Plan |
| EPA | Environmental Protection Act 1986 |
| EPBC Act | Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth) |
| FF | Focal Follow |
| MNES | Matters of National Environmental Significance |
| MW | Megawatt |
| PNT | Potential Nest Tree (for black-cockatoos) |
| PVA | Population Viability Analysis |
| RSA | Rotor Swept Area |
| VP | Vantage Point |
| | |

# 1. Introduction

## 1.1 Background

Marri WF Pty Ltd as trustee for the Marri WF Unit Trust (the Proponent), a wholly owned subsidiary of Alinta Energy Pty Limited (Alinta Energy), is seeking approval to develop Marri Wind Farm (the Proposal) located approximately 20 kilometres (km) south of the township of Dandaragan within the Shire of Dandaragan (Figure 1).

Aurecon is supporting the Proponent as lead consultant for approval delivery. Bamford Consulting Ecologists has been engaged by Aurecon to prepare this Preliminary Bird and Bat Management Plan (PBBMP) to support compliance with relevant Commonwealth and State legislation, including the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Environmental Protection Act 1986* (EP Act). This PBBMP assesses potential impacts on local and migratory bird and bat species and outlines mitigation, monitoring and adaptive management strategies to minimise ecological risks throughout the life of the project.

## 1.2 Purpose and Scope

### 1.2.1 Purpose

The purpose of this PBBMP is to establish a clear and responsive framework for managing potential impacts to bird and bat species associated with the Proposal. In line with the requirements of the EPBC Act and the EP Act, this PBBMP supports the protection of species listed as of national and/or state significance, including those listed as Matters of National Environmental Significance (MNES), and also supports protection of species not listed as threatened or MNES, but which occur in vulnerable populations.

These legislative frameworks mandate that wind farm proponents identify, avoid and mitigate harm to sensitive fauna through comprehensive environmental management. This PBBMP contributes to that obligation by outlining the processes for assessing risk, implementing mitigation measures and monitoring outcomes during both the construction and operational phases of the project.

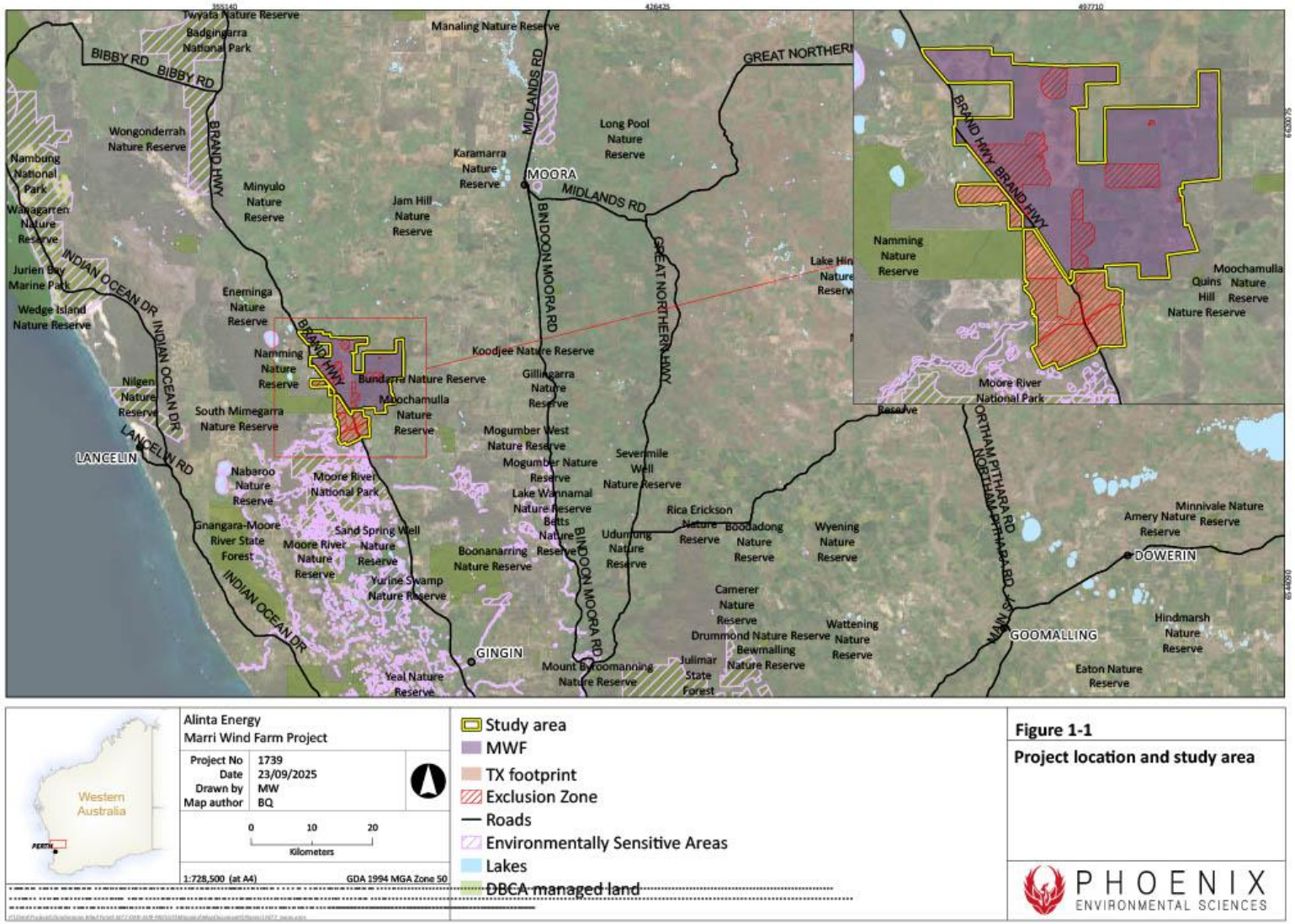


**Figure 1. The proposal project area (source: Phoenix Environmental 2025).**

### 1.2.2 Scope

The scope of this PBBMP encompasses all activities of the Marri Wind Farm Proposal that may result in interactions with bird and bat species. It defines the extent of ecological considerations particularly those of conservation significance, migratory status or regional importance.

This document includes an assessment of potential impacts arising from wind turbine operation and associated infrastructure and outlines mitigation strategies and monitoring protocols designed to manage those impacts within acceptable thresholds. It establishes impact triggers and a decision-making framework to guide adaptive management responses throughout the operational life of the Proposal, currently scoped to 35 years. While the scope does not extend beyond this timeframe, it incorporates flexibility to support future amendments in response to regulatory changes, technological advancements or shifts in ecological understanding.

The PBBMP also defines reporting requirements to ensure transparency and support compliance with relevant Commonwealth and State legislation. These measures contribute to the broader environmental management approach proposed for the Marri Wind Farm, supporting the achievement of acceptable ecological outcomes under the EPBC Act and EP Act.

# 2 Project description

## 2.1 Description

The Proposal is located approximately 20 km south of Dandaragan, 42km north of Gingin and 110 km north of Perth, within the Shire of Dandaragan in Western Australia. The development footprint spans predominantly private rural agricultural properties, with minor components extending into public lots and road reserves.

The site was selected based on its strong wind resource potential, the large proportion of existing cleared agricultural land, and proximity to a suitable connection point on the South-West Interconnected System (SWIS), enabling reliable export of renewable energy. The Proposal is situated within a region that hosts several operational and proposed wind farms, contributing to a growing clean energy corridor in the northern Wheatbelt.

The Proposal is located within a 12,471-hectare Proposed Development Envelope, designed to accommodate up to 82 wind turbine generators with a maximum tip height of 275 metres and minimum tip height of equal or greater than 66m. The layout includes supporting infrastructure such as internal roads, a substation, transmission lines and laydown areas, with potential for future integration of a Battery Energy Storage System (BESS) of up to 2,200 MWh capacity. All construction activities including land disturbance are estimated to be up to 965 ha within the Proposed Development Envelope.

**Table 1: Wind Turbine Specifications**

| Infrastructure Element | Key Features | |
|---|---|---|
| Wind Turbines | Maximum number of turbines | 82 |
| | Project generation capacity | Up to 550 MW |
| | Maximum tip height | Up to 275 m |
| | Minimum tip height | Equal or greater than 66m |
| | Hub height | Up to 184 m |
| | Blade Length | Up to 91 m |
| Turbine Foundations | Supported by concrete gravity foundations | Approximately 0.75 hectares per turbine |

## 2.2 Regional context

The Proposal is situated within the Dandaragan Plateau subregion of Western Australia's Wheatbelt, an area characterised by predominantly agricultural land use and a growing concentration of wind energy developments. The region hosts several operational wind farms, including Yandin, Karakin, West Hills and an early-stage feasibility study; Mint Renewables Nilgen Wind Farm. In addition, there is an approved windfarm at Waddi, about 50km to the north, an operational windfarm (Badgingarra West) about 80km to the north, and at least four other proposed windfarms under investigation between Lancelin and Badgingarra.

# 3 Pre-construction Bird and Bat Information

To-date, a combination of targeted field surveys and supplementary datasets has been compiled to establish a comprehensive ecological context for the Proposal. This includes a Basic and Targeted Terrestrial Fauna Survey undertaken by Phoenix Environmental Sciences (Phoenix) (Phoenix Environmental Sciences, 2025) within the Proposed Development Envelope and the transmission corridor (an additional 3,267ha; collected referred to as the Phoenix study area). This work is complemented by ecological assessment data prepared by Bamford Consulting Ecologists for five wind farm projects located within a 150 km radius for a well-substantiated understanding of regional fauna values.

## 3.1 Terrestrial Fauna

### Desktop Assessment

A desktop assessment was undertaken as part of the Basic and Targeted Terrestrial Fauna Survey to evaluate the fauna assemblage and the potential occurrence of conservation-significant bird and bat species within and surrounding the Proposal area. The review incorporated regional datasets and available records to identify key environmental values and potential ecological constraints. Within the dataset search extent (40km radius around the proposal area), 258 bird species were identified, including 49 listed as Threatened, Conservation Dependent or Specially Protected under the EPBC Act and/or BC Act, 12 Priority species listed by DBCA, and 49 Migratory species (listed under EPBC Act). Six significant bird species have previously been recorded within the Phoenix study area, including Carnaby's Black-Cockatoo (*Zanda latirostris*), Curlew Sandpiper (*Calidris ferruginea*), Red-necked Stint (*Calidris ruficollis*), Wood Sandpiper (*Tringa glareola*), Common Greenshank (*Tringa nebularia*) and Blue-billed Duck (*Oxyura australis).*

### Field Survey Effort for fauna: Phoenix Environmental

The following field surveys have been completed for the Proposal:

- Basic and targeted terrestrial fauna surveys were undertaken by Phoenix Environmental Sciences across the Proposal area between 5–9 August and 26–30 August 2024.

  Nine fauna sites and 21 bird bat utilisation survey sites were established to capture the diversity of habitat types within the Proposed Development Envelope. Site selection was guided by both broad-scale and fine-scale criteria, including landform, aspect, topography, land systems, proximity to water bodies, vegetation complexes and soil condition. The survey design prioritised coverage of distinct habitat associations, with targeted sampling of areas identified through desktop review as having potential ecological value for species of conservation significance. This structured approach ensures that the survey effort provides a robust and defensible foundation for assessing bird and bat habitat values and informing appropriate mitigation and management strategies.

- Three rounds of targeted surveys were completed to identify potential nesting trees for Carnaby's Black-Cockatoos. These surveys were completed between 11 and 13 March 2025, 24 to 28 July 2025 and 11 to14 August 2025.

  Field methods employed during these surveys included sighting of the species, roost monitoring, assessments of foraging value of the habitat and an assessment of the trees to be potential nesting trees.

- Phoenix have commenced Bird and Bat Utilisation Surveys (BBUS) starting in August 2024 and have completed four field visits to date. No data are currently available for the development of this PBBMP.

Full details of the above surveys are presented in Phoenix reports (Phoenix 2025a and Phoenix 2025b) which are appended to the Environmental Referral Document.

## 3.1 Bird Survey

### 3.1.1 Bird Survey Methodology

- Phoenix Environmental Sciences' Point Count Method

Bird surveys were conducted at 21 BBUS sites and four supplementary fauna sites using timed habitat-based searches and fixed-point counts methods (Brett Lane & Associates Pty Ltd, 2005). Each site was surveyed with two replicate 15-minute censuses, focusing on peak activity periods around sunrise and sunset. Observations were recorded through visual sightings and call recognition, with 15.8 person-hours of structured survey effort supplemented by opportunistic records during other fieldwork.

- Avifauna audio recording

To complement visual and point-count surveys, SongMeter SM4 audio recorders were deployed at all 21 BBUS sites, 10 of which were within the Phoenix study area, to capture bird vocalisations over extended, undisturbed periods. Devices operated for one to three nights per site, totalling 36 recording nights, and were particularly useful for detecting nocturnal and cryptic species.

- Carnaby's Black-Cockatoo Habitat Assessment

The proposal lies within the modelled breeding range of Carnaby's Black-Cockatoo with habitat assessments focused on identifying potential breeding trees, foraging habitat quality and roosting suitability. Potential Nesting Trees (PNTs) were identified based on diameter at breast height (DBH), hollow characteristics and signs of use (consistent with DAWE 2022), with suitable hollows inspected via pole camera where possible. Foraging habitat was scored using the Bamford (2021) method, incorporating site condition, landscape context and species presence. This scoring system produces a numerical value out of 10, supporting impact significance and offset assessments by Department of Climate Change, Energy, the Environment and Water (DCCEEW), Department of Water and Environmental Regulation (DWER) and the Environmental Protection Authority (EPA). To strengthen the dataset and improve confidence in habitat value assessments, three targeted field surveys were conducted in March, July and August 2025, in addition to surveys undertaken in August 2024. To supplement records of roost sites from the Great Cocky Count database (Birdlife Australia 2020), roosting evidence was recorded through field searches for clipped foliage and droppings beneath suitable trees.

### 3.1.2 Bird Survey Results

#### *Site Description*

The basic and targeted terrestrial fauna surveys conducted by Phoenix Environmental Sciences identified six broad fauna habitats within the project area:

- Cleared land (92.5%)
- Open woodland (4.4%)
- Shrubland (1.7%)
- Pine plantations (0.8%)
- Drainage line & riparian zones (0.5%)
- Wetlands (<0.1%)

Although highly modified, cleared areas are notable due to the presence of isolated trees, farm dams and agricultural crops such as canola, which are known to be foraged on by species like Carnaby's Black-Cockatoo. Native vegetation was limited to fragmented patches, primarily along roadside verges and small bush plots, offering modest ecological value but potential refugia for fauna, and with a connectivity function.

#### *Black-Cockatoos*

Bird Survey results from fieldwork conducted in March, July and August 2025 by Phoenix Environmental Sciences confirm the ecological significance of the proposal for black-cockatoos, particularly Carnaby's Black-Cockatoo (CBC) and Forest Red-tailed Black-Cockatoo (FRTBC). A total of 1,060 CBC individuals was recorded across 43 occasions, while 26 FRTBC were seen on four occasions, with additional call detections suggesting broader presence. Foraging evidence for both species was observed throughout the site, indicating active use of the landscape. The Potential Nesting Tree (PNT) survey identified 1,609 trees that met the basic DBH criterion (Table 2), but only 101 of these trees had obvious hollows, and just one tree had a hollow from which a Carnaby's was flushed, suggesting it was being used for nesting. Twenty trees did have hollows with fresh chew-marks, suggestive of visitation and possible use by the species. Most of these high value PNTs were in farmland (Figure **2**).

Three distinct night roosts were confirmed along the Moore River, supported by tall vegetation, permanent water sources and adjacent foraging habitat. Figure **3**illustrates the locations of roost sites..

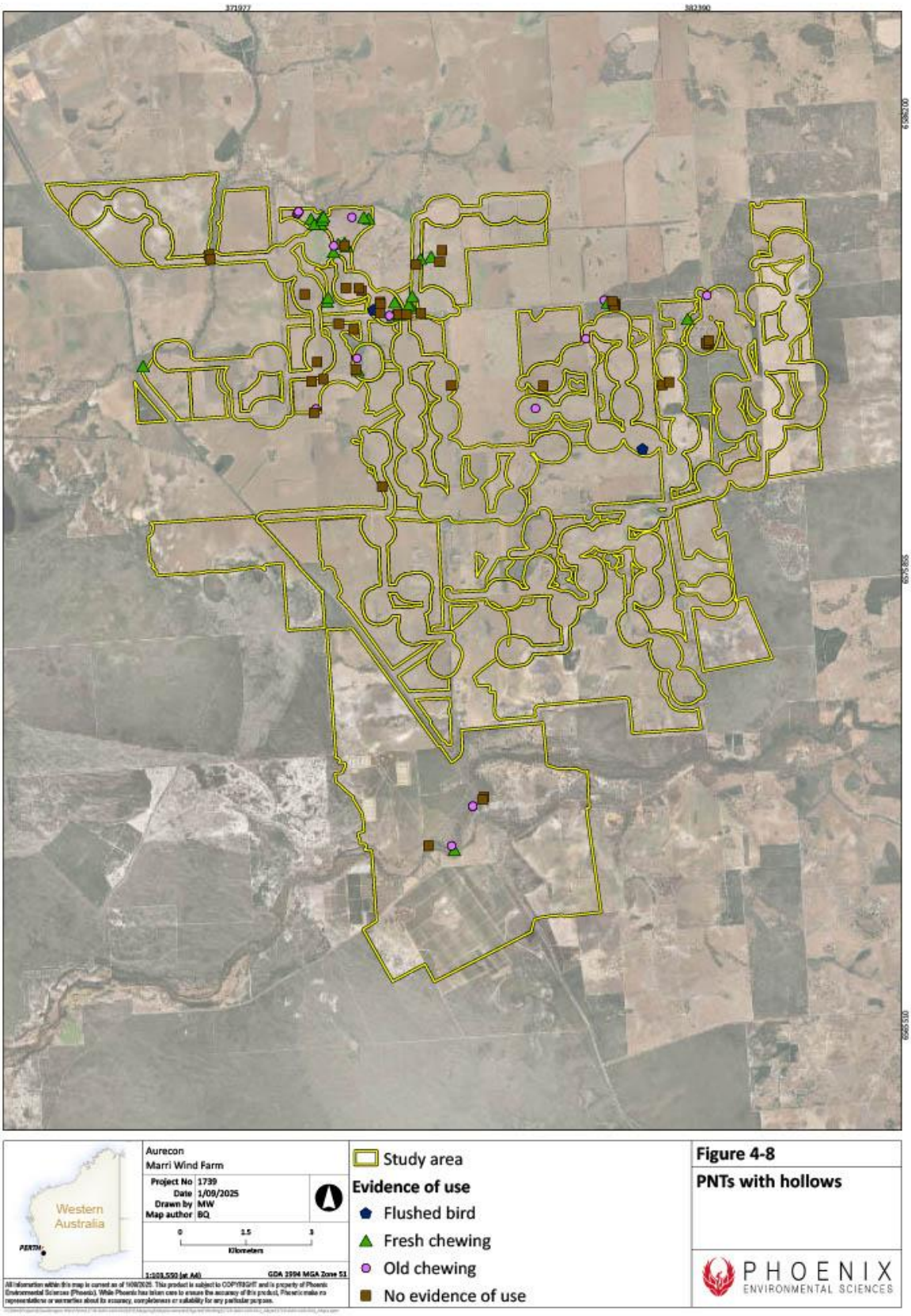


Figure 2. Distribution of Potential Nest Trees (PNT) for black-cockatoos (source: Phoenix 2025b).

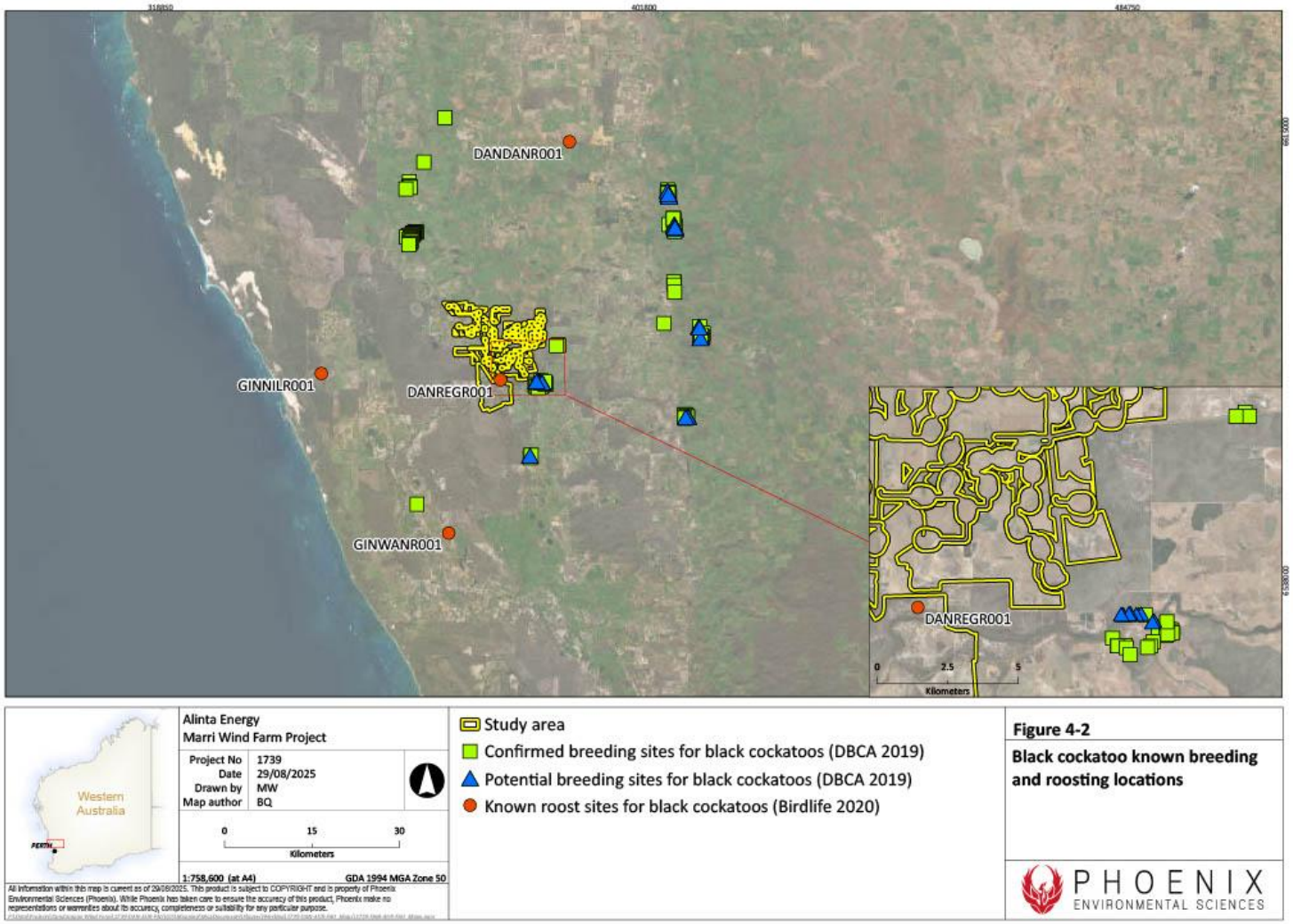


Figure 3. Locations of roost sites and known breeding sites of black-cockatoos (Source: Phoenix 2025b).

**Table 2: PNTs recorded during the survey**

| Tree species | PNTs (#) | PNTs with hollows (#) | Hollow suitability | | |
|---|---|---|---|---|---|
| | | | Unsuitable | **Possibly** | **Suitable** |
| Coastal Blackbutt (*Eucalyptus todtiana*) | 5 | 0 | 0 | 0 | - |
| Unknown eucalypt (*Eucalyptus* sp.) | 82 | 6 | 0 | 6 | - |
| Jarrah (*Eucalyptus marginata*) | 11 | 0 | 0 | 0 | - |
| Marri (*Corymbia calophylla)* | 1,421 | 93 | 32 | 61 | - |
| Powderbark Wandoo (*Eucalyptus accedens*) | 3 | 1 | 0 | 1 | - |
| River Gum (*Eucalyptus camaldulensis*) | 35 | 0 | 0 | 0 | - |
| Tuart (*Eucalyptus gomphocephala*) | 43 | 0 | 0 | 0 | - |
| Wandoo (*Eucalyptus wandoo*) | 9 | 1 | 0 | 1 | - |
| **Total** | **1,609** | **101** | **32** | **69** | **TBC** |

### *Other significant species.*

The only other significant species observed by Phoenix was the Blue-billed Duck, observed twice during the survey at Site 13, located approximately 5 km west (and outside of) the Proposal. A historical record from 1977 also places the species within the broader region, though with a spatial uncertainty of up to 18 km. These observations align with the species' known distribution and preference for large, open freshwater bodies. While the proposal lacks deep waterbodies suitable for breeding, smaller wetlands may offer foraging habitat or serve as part of a broader movement corridor.

Other significant waterbirds, including migratory species, may similarly be present infrequently and in small numbers as suitable habitat is limited.

The Wedge-tailed Eagle, known to be vulnerable to impacts from windfarms, was reported by Phoenix.

*Bamford Consulting Ecologists; methods and summary results from regional surveys of Carnaby's Black-Cockatoo.*

Between August 2024 and March 2025, Bamford Consulting Ecologists conducted baseline bird utilisation surveys across four wind farm sites located between Perth and Eneabba. All sites were situated in agricultural landscapes with remnant native vegetation, including large trees, Banksia woodland/scrub, and freshwater features, habitats known to support Carnaby's Black-Cockatoo, which was the primary target species for the survey.

Two complementary methods were employed:

- Focal Follow (FF), where surveyors tracked flocks throughout the day to record group size, movement, behaviour, and flight height; and
- Vantage Point (VP) observations, which involved fixed-location monitoring over defined periods.

Data collection was consistent across sites, with monthly campaigns yielding 3,772 records over 224 hours of observation. Flight heights ranged from 0 to 60 metres above ground level, with group sizes varying from 1 to 400 individuals. Notably, several flocks exhibited "vortexing" behaviour in response to disturbances such as vehicles or raptors. Despite this, flight heights >50m were extremely rare: only one of the 3,772 records was above 50m and was of two birds that briefly rose to an estimated 60m before descending.

## 3.2 Bat Survey

### 3.2.1 Bat Survey Methodology

- Bat echolocation recordings

Bat echolocation surveys were conducted using Song Meter SM4 devices at 21 sites, including up to 10 within the Phoenix study area. Each device was deployed for three consecutive nights from sunset to sunrise and positioned at a 45° angle in habitats likely to support bat foraging or movement, such as insect-rich areas and potential roosting sites.

### 3.2.2 Bat Survey Results

The field survey identified three species: White-striped Free-tailed Bat (*Austronomus australis*), South-western Free-tailed Bat (*Mormopterus kitcheneri*) and Chocolate Wattled Bat (*Chalinolobus morio*). All three species were not identified in the desktop review.

# 4 Impact Risk Assessment

Wind energy infrastructure presents well-documented risks to avifauna and bats, primarily through collision with moving turbine blades, and stationary components such as towers, nacelles, guy wires, power lines and meteorological masts. These impacts can result in direct

mortality or severe injury, contributing to broader disturbance effects on local and migratory bird populations (Drewitt & Langston, 2006). Bats are particularly vulnerable to wind turbine impacts, with fatalities resulting from both direct collisions and barotrauma (Infinite Green Energy (IGE), 2025).

A preliminary fauna risk assessment for the Proposal is provided in Table 3, in which the Proposal is evaluated against key threatening processes outlined by Gleeson and Gleeson (2012) and listed under the EPBC Act (Department of Climate Change, Energy, the Environment and Water, 1999) In addition, Bamford Consulting Ecologists has developed a regional fauna risk table for the Northern Swan Coastal Plain (see Appendix A). Appendix A presents a detailed review of the local fauna assemblage, assessing the likelihood and consequence of impacts on significant and potentially vulnerable species within the project area.

Together, these assessments identify fauna mortality, disturbance and behavioural disruption as key ecological risks associated with the Proposal. Species at greatest risk (ie. species where the consequences of mortality are greatest) are the two black-cockatoo species (possibly, but recent data suggest they fly below rotor swept area (RSA) most of the time but impacts of disturbance are uncertain), most birds of prey (although with the exception of the Peregrine Falcon none is listed of conservation significance), and the White-striped Bat. Note that many other species do fly at RSA and are at risk of mortality, but the consequences of this risk are negligible as the species are abundant; even over-abundant. This includes the Galah, Western Corella and Australian Raven.

**Table 3: Review of the Marri Wind Farm Proposal with respect to key threatening processes**

| Threatening process | Impact discussion |
|---|---|
| **Habitat loss leading to population decline** | **Negligible.** Little if any direct (ie clearing) impact on native vegetation. Some loss of farmland for access roads and turbine footprints, but farmland is a very extensive environment and therefore proportional loss very low. Farmland may be used for foraging by Carnaby's Black-Cockatoo and the possibility of reduced access for foraging due to disturbance is discussed below. |
| **Population fragmentation and disruption of movement and gene flow due to habitat fragmentation** | **Negligible.** Little if any direct (ie clearing) impact on native vegetation which may have a connectivity function. Possibility of reduced movements along corridors of native vegetation due to disturbance is discussed below. Note that restoration along corridors of vegetation to improve connectivity is a potential offset. |
| **Increased mortality leading to population decline** | **Possibly moderate to major.** There is the possibility of mortality of some birds and bats from interaction with turbines. A preliminary risk assessment is presented in Appendix A and management related to mitigation of such mortality is discussed in section 6. |
| **Habitat degradation due to weed invasion** | **Minor.** The proposal lies in a region that is extensively cleared, and therefore remnant native vegetation is of high conservation value. Degradation due to weed invasion is already a problem. There may be increased pressure due to weed invasion from traffic movement and earth-works, particularly if 'fill' is brought onto the site during construction. Note there are standard hygiene procedures for managing risk of spreading weeds during development projects. |
| **Hydroecology** | **Negligible.** Ther may be some very localised effects on surface flow long tracks and around turbine pads but these should readily be managed through standard track and earth-works management. |
| **Species interactions due to feral or over-abundant native species** | **Negligible.** There may be an increase in feral fauna activity associated with disturbance during construction and possibly during operation, such as if there is sufficient mortality under turbines to attract scavengers. Monitoring of feral fauna could be included in long-term management (see below). |
| **Altered fire regimes** | **Negligible.** Construction and operation may provide new opportunities for ignition sources, but these should be manageable through standard procedures such as hot work permits. |
| **Effects of disturbance, dust and light** | **Probably Minor but uncertain.** There will be some temporary disturbance during construction. Operation of the Proposal may result in noise, light and movement that may displace fauna or alter their behaviour and site utilisation patterns across the site. Monitoring is recommended specifically to target black-cockatoo roosting, foraging, movement patterns and nesting. Monitoring of bird assemblages present along the Moore River and any corridors of native vegetation that may have connectivity function is also recommended. |

# 5 Potential Impacts

This section provides an overview of common impacts to avifauna and bats from wind turbine projects. Impact assessments for significant and vulnerable species should adopt a comprehensive approach, considering the full range of potential effects resulting from the Proposal. This includes collision risk identified in this assessment, as well as other contributing factors such as habitat loss, disturbance and changes to movement or behaviour.

## 5.1 Collision

Wind turbines present a collision hazard to birds and bats when individuals enter the RSA or are affected by blade-induced turbulence. Significant species identified in preceding chapters may be particularly vulnerable depending on flight height, behaviour and habitat use. Risk is elevated near roosting corridors and high-activity areas, where movements may be frequent, involve large numbers, and are more predictable.

Collision likelihood is shaped by turbine design, species-specific flight behaviours and site attributes such as topography and vegetation structure. Flight altitudes elaborated in Appendix A vary widely between species and activities as some routinely operate at rotor height, while others do so intermittently. Environmental conditions, including time of day and weather variables (e.g. wind speed, humidity) further influence visibility and avoidance capacity. Evidence suggests that most collisions occur when individuals fail to detect moving blades in time, rather than from an inability to avoid visible infrastructure.

## 5.2 Barotrauma

Barotrauma refers to internal tissue damage caused by rapid pressure changes created by rotating turbine blades. Pulmonary barotrauma occurs when expanding air cannot be released through exhalation, resulting in potentially fatal injuries. While once considered a major contributor to bat mortality at wind energy facilities, recent ecological and veterinary studies suggest that barotrauma plays a secondary role compared with direct collision trauma (Lentini, Lumsden, & Van H, 2025).

The White-striped Freetail Bat, identified in this assessment as a significant species with moderate to high risk, may be vulnerable to barotrauma due to its high-altitude flight behaviour and potential exposure to rapid pressure changes near turbine blades. Diagnosing barotrauma requires immediate post-mortem examination, which is rarely feasible in field conditions, contributing to the limited availability of published data. As a result, instances of barotrauma may be underreported or misclassified as collision-related trauma, obscuring its true contribution to bat mortality at wind energy facilities. However, the actual cause of death (impact or barotrauma) is largely academic unless the cause of death suggests a different approach to mitigation.

# 6 Monitoring and Mitigation

To minimise potential impacts on birds and bats and to inform adaptive management throughout the operational phase of the Proposal, a combination of targeted monitoring and proactive mitigation measures will be implemented. Monitoring will focus on species presence, movement and collision risk, while mitigation actions aim to reduce attractants and deter high-risk interactions with turbines.

## 6.1 Potential Mitigation Measures

The following mitigation measures respond to potential impacts on birds and bats as outlined in Sections 4 and 5, encompassing listed, non-listed and migratory species. Several measures incorporate targeted monitoring to track species presence, movement patterns and collision risk throughout the operational phase of the Proposal. This integrated approach underpins adaptive management by enabling timely, evidence-based responses to emerging risks, reducing attractants and discouraging high-risk interactions with turbines. Listed species including Carnaby's Black-Cockatoo and the White-striped Freetail Bat are prioritised in survey design and impact assessment, while broader monitoring efforts ensure that trends affecting non-listed fauna (birds of prey in particular) are also captured and addressed.

Table 4 summaries the proposed mitigation measures which may be adopted by the Proposal.

### 6.1.1 Vantage Point and Focal Follow Survey

To support long-term adaptive management and improve understanding of species behaviour in relation to wind farm infrastructure, seasonal Vantage Point (VP) and Focal Follow (FF) surveys will be conducted annually once the Proposal is operational, with a review of frequency and efficacy after two years. Extending the survey period beyond standard monitoring timelines will allow for the development of a robust behavioural dataset, particularly for listed and migratory species. This extended timeframe is critical for capturing seasonal and interannual variation in flight patterns, site utilisation and potential habituation or avoidance responses. VP surveys provide robust, quantified data on abundance and heights of birds, and can be used to detect changes in abundance and patterns of movement through and around the proposal, if any such changes occur. Recommended duration of VP surveys varies, but the duration of individual survey periods is less important than the quantum of survey time overall, and the distribution being throughout the day. FF surveys provide the opportunity to follow single and groups of birds as they move across the landscape, increasing the opportunity to document interactions (if any) with operating turbines. FF surveys can also target bird movements to and from roost sites and breeding areas where consequences of a bird strike may be greater (breeding birds) or where the risk may be greater (due to large numbers of birds).

### 6.1.2 Carrion removal and other attractants

Birds of prey in particular can be attracted to landscapes where livestock provide carrion, and therefore regular carrion removal where livestock graze amongst turbines can reduce risk to species such as the Wedge-tailed Eagle. Extending carrion removal to nearby major roads should also be considered if such carrion attracts birds of prey to the Proposal vicinity. Road

deaths of black-cockatoos have been documented where grain is spilt (M. Bamford pers. obs; also informal advice from CBH), and thus managing grain haulage close to windfarms may be important. Spilt grain can cause aggregation of birds. Black-cockatoos do forage in crops (Lupin, Canola, some cereal crops), but if foraging birds remain below RSA planting of crops should not heighten risk.

### 6.1.3 Bird Surveys in Bush remnants near turbines

Disturbance/displacement of birds from surrounding landscapes has been identified in some studies. Farfan *et al*. (2017) found that in the six years post-construction of a wind farm in Spain, raptor species increased in numbers while abundance of 38 non-raptor species (including 30 passerines) fell significantly. In the Mediterranean region, where migrating waterbirds and raptors are extremely abundant (which is not the case in Australia), multiple studies (Garvin *et al*. 2011, Johnston *et al*. 2014, Cabrera-Cruz and Villegas-Patraca 2016, Farfan *et al*. 2017), have documented changes in flight behaviour with birds avoiding windfarm areas when birds are in transit. Marques *et al*. (2019) note that this change of flight behaviour may lead to functional habitat loss as birds may avoid suitable soaring areas close to wind turbines. It is unclear how applicable these observations are to Australia where there are no migratory raptors. Another study (Garcia *et al*. 2015) compared the abundance of breeding passerines four years before and four years after the construction of a wind farm in Italy. This study found that the abundance of some species decreased during the construction phase of the wind farm, but all of the species increased in abundance when the wind turbines were operating (Garcia *et al*. 2015).

VP and FF surveys (see above) should detect changes in usage and abundance for the larger bird species, but the possibility of offsite impacts on small passerines and other bushbirds needs to be considered and can be documented using ongoing surveys in adjacent native vegetation. These would be a continuation of pre-construction surveys. Such monitoring could be limited to the first two years of operation and then reviewed, to be continued only if an impact is detected.

### 6.1.4 AI Turbine Controls

Systems are available to detect at risk birds and shut down turbines to reduce mortality risk (eg Identiflight). Such systems are only suggested where a high risk is identified, such as where there are large numbers of significant species moving through a region. This is not likely to be the case for this Proposal. Ongoing VP and FF surveys could identify where risk does occur and thus where such systems may be implemented. It should be noted that the technology for such systems is likely to improve rapidly.

### 6.1.5 Low windspeed shutdown

Several studies have documented the effect of low wind speed at night on the flight height of bats, with greater microbat mortality at low wind speeds (Rydell, et al., 2010). Shutting down turbines at night during periods of low wind speed has been found to reduce bat mortality with only a small loss in production.

### 6.1.6 Collaboration with nearby Wind Farms

The Proposal lies in a region with multiple similar proposals and several windfarms already in operation. The region from Lancelin to Eneabba is effectively one very large windfarm with key production areas centred around individual projects. Therefore, a regional approach needs to be taken to consider cumulative impacts, and to share learnings. Birds do not recognise project boundaries, and species such as Carnaby's Black-Cockatoo migrate throughout the region, and while individual site characteristics may affect movement patterns, consequences at a population level need to be considered by all projects.

**Table 4: Summary of monitoring and mitigation**

| Action | Purpose | Timing/Duration |
|---|---|---|
| Quarterly VP and Focal Follow surveys | Track site utilisation and movement patterns, especially for Carnaby's Cockatoo | Quarterly for at least 2 years post-construction |
| Bird surveys in bush remnants near turbines | Detect changes in abundance and habitat use | Quarterly for at least 2 years post-construction |
| Carcass searches | Identify turbine-related mortality | Monthly during operational phase |
| Aural deterrent devices (if implemented) | Discourage birds and bats from entering high-risk areas | As required during operations |
| Carrion Removal Program | Reduce raptor collision risk by removing attractants | Monthly inspections for the operational life of the Project; reviewed after 2 years |
| Turbine controls (eg Identiflight) | Reduce mortality of large birds | Monitor mortality rates and review |
| Low wind-speed shutdown | Reduce bat mortality | Monitor bat mortality and implement if indicated |

## 6.2 Adaptive management and triggers

Implicit in monitoring and mitigation procedures is the need to be adaptive and the need to identify triggers. Adaptive management is where changes are implemented in response to documented impacts so that the impact does not reach a pre-determined unacceptable level or trigger threshold. Identifying triggers requires an understanding of the population biology of at-risk species, which requires contextual information such as mortality from other windfarms and from other sources. Ideally, mortality triggers would be based upon Population Viability Analysis (PVA) for a species, but there is unlikely to be sufficient information for this level of investigation. Mortality triggers also need to consider the age of birds killed, as loss of juveniles from a population is 'normal' and can be sustainable, whereas loss of breeding adults may be more critical. For example, Carnaby's Black-Cockatoos are regularly killed along the Brand Highway that forms the western boundary of the Proposal Development Envelope, and through the overall greater windfarm area in general. This level of mortality is not quantified, but a dead bird (an adult male) was found on the highway near Cataby (35km north of the proposal) in July 2025 (M. Bamford), and a second dead bird (not sexed or aged) was found at Regan's Ford on 12th September (M. Bamford). That is two road-kills along 40km of road in two months. There might be an annual mortality of >10 Carnaby's along the Brand Highway

already affecting the species in the area. There are anecdotal accounts of mortality along this and other major roads, often in much larger numbers.

The impact criteria presented in Appendix A can be used to develop trigger thresholds for the Proposal. These impact criteria are based around proportional impact with a 15km radius or within a Bioregion, and use guidance regarding management of migratory species that proposes 1% represents a significant proportion of a species' population (Ramsar Convention). This has been re-interpreted for migratory species when in Australia as 0.1% (eg. DoE 2015 referral guidelines for migratory species). These percentages were developed to be used at the population level, but at that level such proportions are highly unlikely to be met by individual actions except for a very few and usually critically endangered species; therefore a species-wide trigger is unlikely to be useful in identifying local impacts. It is therefore proposed that a >1% impact (decline) in the local population (within radius of 15km) provides the best trigger definition for a project. This is especially important where there are multiple nearby and similar projects, whereby a local impact trigger is a better way of managing cumulative impacts than a population-wide trigger. Importantly, using the same local impact level for nearby project allows for the management of cumulative impacts.

This trigger approach does need a reasonable, regional population estimate, but for the species of most concern for the Proposal, such information is available. The population estimates below are drawn largely from personal experience in the region (Bamford Consulting Ecologists team). Discussion around juveniles versus adult is included, as the loss of juvenile birds is much less significant than of adults.

### 6.2.1 Listed species within the Proposed Development Envelope

**Carnaby's Black-Cockatoo**. Local population can be estimated at 1,000 birds which would include adults and juveniles. It is probably larger. A 1% annual mortality would therefore be 10 birds. The actual number of breeding adults in the region will be much lower; perhaps in the order of 50 pairs (ie. 50 pairs may breed within about 15km of the Proposal). The loss of a single breeding adult would therefore be a trigger. A response to such losses might be to provide breeding habitat (ie artificial hollows) to enhance breeding opportunities. The high risk associated with the loss of breeding adults emphasizes the need to identify breeding locations and to study movement patterns of nesting birds.

**White-striped Bat**. Almost certainly present from autumn to spring, with possibly higher abundance during late autumn and late winter/early spring as the species is a migrant and retreats to the lower south-west over summer. Substantial numbers of deaths reported in south-eastern Australia and in the absence of any population estimate it is not possible to propose a sustainable mortality rate at the Proposal. Phoenix is currently conducting surveys that may provide abundance information. Carcass searching may provide information on peak periods of mortality, and the species may benefit from low wind-speed shutdown. If peak abundance periods can be identified then this shut-down approach could be used at those times.

### 6.2.2 Other species within the Proposed Development Envelope

**Wedge-tailed Eagle**. The Proposal probably encompasses at least part of the home range of two pairs of the species. Studies in south-eastern Australia have found high rates of mortality of this species at windfarms, but with almost all dead birds being juveniles (<4 years old; T. Kelly pers. comm.). It may be possible to estimate the number of juvenile Wedge-tailed Eagles that pass through the proposal annually; but it is probably <100 birds. The underlying mortality rate of juveniles (ie. the proportion of juveniles that fail to survive their first year) is probably very high. Marchant and Higgins (1993) report on breeding success and juvenile survival and give one report of 0.9 chicks fledged per pair per year, and 0.6 chicks surviving to their first year. There appears to be no precedent for assigning a sustainable juvenile mortality rate for Wedge-tailed Eagles at windfarms; it clearly needs to be <30% of juveniles that pass through the windfarm. It also needs to be recognized that at least some of the juveniles that pass through the Proposal Development Envelope will pass through other windfarms located throughout the region from Perth to Geraldton. An annual mortality of juvenile Wedge-tailed Eagles of no more than three birds/year at any one windfarm (ie ca. 10% of the natural annual mortality rate of 100 juvenile birds) in the broader region should be sustainable, particularly as the mortality rate of the species when it was classed as vermin and was regularly shot was very high, but apparently had little effect on the population. Serventy and Whittell (1976) report an annual rate of 3,591 bounties being paid between 1928 and 1968 in Western Australia. Most of these were probably in the wheatbelt region. While loss of juvenile Wedge-tailed Eagles may be sustainable, loss of breeding adults is more of a concern. Monitoring of pairs of the species should take place to follow their breeding success (to ensure there is not a disproportionate loss of local juveniles), and to follow what happens if a member of a pair is killed. Replacement should happen rapidly. It should be possible to demonstrate whether or not there is a decline in the local breeding population or breeding success, or not. Note that the Wedge-tailed Eagle can be protected through the use of Identiflight (refer Section 6.1.4) if mortality rates and local impacts are a concern.

**Peregrine Falcon**. The Proposal is probably within the home range of at least one pair for the species, and breeding may take place. However, it was not recorded by Phoenix, while in multiple studies in the broader region, BCE has recorded the species only very infrequently. Population density is uncertain but broadly across Australia, densities are typically within a pair per 500 – 1,500 $km^2$ (Marchant and Higgins 1993). The density is likely to be very low in the region and furthermore, the species appears to be a rare mortality at windfarms. Surveys are required to determine if the species is present, and particularly if there is a nest in the area. If a breeding pair is found to be resident, it needs to be monitored in order to detect any possible impact.

# 7 Conclusions

The proposed Marri Wind Farm is located in an agricultural region with little remnant native vegetation. The fauna assemblage is therefore modified and reduced in richness and diversity, but it includes some species at risk from the proposal, largely from mortality due to operation of the wind turbines. Species at risk include two species of black-cockatoo, both listed as threatened under state and federal legislation, with Carnaby's Black-Cockatoo present in large numbers, and breeding and roosting within the region. Also at risk are some birds of prey, such as the Wedge-tailed Eagle (not listed) and the Peregrine Falcon (listed under WA legislation only). There are no major wetlands nearby and therefore waterbirds are probably at low risk.

Management of the risk to these species involves understanding how they are using the landscape, and developing procedures to monitor and mitigate impacts. These are discussed in the PBBMP. The context of impacts needs to be considered, particularly as the proposal is in a region with multiple other existing and proposed windfarms, and where other anthropogenic sources of mortality are prevalent (such as roadkill of black-cockatoos).

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# Appendix

Appendix A: Bird (and bat) risk assessment for windfarms in the northern Swan Coastal Plain

**Bamford Consulting Ecologists**

**8th April 2025**

Information presented here is based upon familiarity with species particularly in the south-west, and drawing from the literature such as the HANZAB volumes and WA Museum handbooks. Approach has been to assign each species a status in the project area (as described below), a note on its likely abundance and frequency of occurrence, a note on its likely flight height (>50m and >100m), and a conclusion about risk. Risk combines the likelihood of mortality which is a combination of status, abundance, frequency and flight height. Risk can then be interpreted in terms of significance of mortality, which considers the consequences of the risk level. Significance thus factors in the conservation significance of a species; a common species at high risk may have a low significance (eg Galah; a widespread and over-abundant native species), while a species of very high conservation significance may a low risk of mortality, but the significance of any mortality would be high. Significance of mortality also takes into account population characteristics such as dispersal patterns and reproductive potential. Such factors affect the resilience of a population to a new form of mortality (note that Lumsden *et al.* (2019) consider this in detail). Significance of mortality is roughly scored as per table 3 below.

**Status categories have been developed by BCE and are outlined below.**

Species lists generated from the review of sources of information are generous as they include records drawn from a large region and possibly from environments not represented in the project area. Therefore, some species that were returned by one or more of the database and literature searches have been excluded because their ecology, or the environment within the project area, determined that it is highly unlikely that these species will be present. Such species can include, for example, seabirds that might occur as extremely rare vagrants at a terrestrial, inland site, but for which the site is of no importance. Species returned from the databases and not excluded on the basis of ecology or environment are therefore considered potentially present or expected to be present in the project area at least occasionally, whether or not they were recorded during field surveys, and whether or not the project area is likely to be important for them. This list of expected species is therefore subject to interpretation by assigning each a predicted status, the expected occurrence, in the project area. The status categories used are:

- **Resident:** species with a population permanently present in the project area.
- **Regular visitor:** species that occur within the project area regularly in at least moderate numbers, such as part of an annual cycle (thus includes migrants).
- **Irregular Visitor:** species that occur within the project area irregularly such as nomadic and irruptive species. The length of time between visitations could be decades but when

the species is present, it uses the project area in at least moderate numbers and for some time.

- **Vagrant:** species that occur within the project area unpredictably, in small numbers and/or for very brief periods. Therefore, the project area is unlikely to be of importance for the species.
- **Locally extinct:** species that would have been present but has not been recently recorded in the local area and therefore is almost certainly no longer present in the project area.

These status categories make it possible to distinguish between vagrant species, which may be recorded at any time but for which the project area is not important in a conservation sense, and species which use the project area in other ways but for which the site is important at least occasionally. This is particularly useful for birds that may naturally be migratory or nomadic, and for some mammals that can also be mobile or irruptive, and further recognises that even the most detailed field survey can fail to record species which will be present at times. The status categories are assigned conservatively based on the precautionary principle. For example, a lizard known from the general area is assumed to be a resident unless there is very good evidence the project area will not support it, and even then, it may be classed as a vagrant rather than assumed to be absent if the site might support dispersing individuals. It must be stressed that these status categories are predictions only and that often very intensive sampling would be required to confirm a species' status. It should be noted that the aim of the desktop assessment and field investigations is not to confirm the presence or absence of species in the project area. By using a precautionary approach, the expected species assemblage represents a conservative estimate of the species assemblage that may use the project area, with errors of inclusion rather than exclusion.

BCE also has guidelines for assessing significance of impacts and notes that the significance of impacts is contextual. See Table XX below. These categories have been used in Appendix A (under 'significance of risk'). Note that these impact categories were developed to assess local impacts within a radius of 15km of a proposed action; this value of 15km comes from the EPA (2016), which suggests that the availability of fauna habitats within a radius of 15 km can be used as a basis to predict low, moderate or high impacts. In this case, a high impact is where the impacted environment and its component fauna are rare (less than 5% of the landscape within a 15 km radius or within the Bioregion), whereas a low impact is where the environment is widespread (e.g. >10% of the local landscape). Under the Ramsar Convention, a wetland that regularly supports 1% of a population of a waterbird species is considered to be significant. These percentage values and the concept of a 15km radius or Bioregion were used to develop the impact criteria presented in Table A.1.

**Table A.1. Assessment criteria of impacts upon fauna.**

| Impact Category | Observed Impact |
|---|---|
| **Negligible** | Effectively no population decline; at most few individuals impacted and any decline in population size within the normal range of annual variability. |
| **Minor** | Population decline temporary (recovery after end of project such as through rehabilitation) or permanent, but <1% within the immediate area[1]. No change in viability or conservation status of taxon. |
| **Moderate** | Permanent population decline 1-10% within the immediate area. No change in viability or conservation status of taxon. |
| **Major** | Permanent population decline >10% within the immediate area. No change in viability or conservation status of taxon |
| **Critical** | Taxon extinction within the immediate area and/or change in viability or conservation status of taxon. |

[1] 'Immediate area' can be within a 15km radius of the centrepoint of an action, but needs to be interpreted within the context of the landscape. For example, in fragmented landscapes the distribution of a population may be highly disjunct, while removal of a small patch of habitat that support few individuals but has a critical connectivity function may be significant even if the actual number of individuals lost is very small.

| SPECIES (Common Name) | WA STATUS | EPBC STATUS | HABITAT | STATUS IN AOI | LIKELIHOOD TO OCCUR WITHIN RSA | RISK | SIGNIFICANCE OF RISK |
|---|---|---|---|---|---|---|---|
| **BIRDS** | | | | | | | |
| **Order: Accipitriformes; Family: Accipitridae** | | | | | | | |
| *Haliaeetus leucogaster* White-bellied Sea-Eagle | | Marine | Coastal habitats and terrestrial wetlands in tropical and temperate regions of mainland Australia and offshore islands. Characterised by the presence of large areas of open water (larger rivers, swamps, lakes, the sea). Recorded in (or flying over) a variety of terrestrial habitats. Recorded at or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs, saltmarsh and sewage ponds. Also occur at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest (including rainforest) and urban areas. | **Irregular visitor** in very small numbers for short periods of time, such as an individual flying through the area once every few years. Individuals are likely to be dispersing juveniles. | Will regularly fly >50m and occasionally >100m | Low risk of very occasional deaths, possibly of juveniles. | Negligible |

| SPECIES (Common Name) | WA STATUS | EPBC STATUS | HABITAT | STATUS IN AOI | LIKELIHOOD TO OCCUR WITHIN RSA | RISK | SIGNIFICANCE OF RISK |
|---|---|---|---|---|---|---|---|
| **Order: Anseriformes; Family: Anatidae** | | | | | | | |
| *Oxyura australis* (Blue-billed Duck) | Priority 4 | | Completely aquatic. Deep water in large permanent wetlands and swamps with dense aquatic vegetation. | **Regular visitor** to wetlands in sometimes moderate numbers. Probably present annually. AOI is on the northern margin of the distribution of the species (Marchant & Higgins, 1990). | Uncertain. Rarely flies in daylight but will travel long distances at night; flight height possibly within RSA. | Uncertain due to uncertainty of flight height at night. May therefore be a moderate risk. Birds in this group are generally considered at higher risk (NGH Environmental, 2016). | Minor or possibly moderate. Population of species in the south-west is uncertain but smaller than the Eastern states (Marchant & Higgins, 1990), so a small number of deaths could be a concern. |
| **Order: Apodiformes; Family: Apodidae** | | | | | | | |
| *Apus pacificus* (Fork-tailed Swift) | Migratory | Migratory | Mostly inland plains but sometimes above foothills or in coastal areas. Cliffs, beaches and islands. Also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh, treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. Occasionally above | Irr**egular visitor or Vagrant.** Rarely recorded in the south-west (M. Bamford personal records of two sightings over 50 years of bird-watching in the region, both sightings of <10 birds). | Almost completely aerial. Flies between 1 – 300 m in height (Department of the Environment, 2024b). Both MB sighting of birds at c. 100 m. Other sightings by MB (Murchison, Kimberley, Northern Territory) of birds <10 m. | Moderate risk due to flight height but infrequency of occurrence | Negligible due to infrequency of occurrence and low numbers; the species is also listed as Migratory and is thus not threatened. |

| SPECIES (Common Name) | WA STATUS | EPBC STATUS | HABITAT | STATUS IN AOI | LIKELIHOOD TO OCCUR WITHIN RSA | RISK | SIGNIFICANCE OF RISK |
|---|---|---|---|---|---|---|---|
| | | | rainforests, wet sclerophyll forest or open forest or plantations of pines. | | | | |
| **Order: Charadriiformes; Family: Charadriidae** | | | | | | | |
| *Pluvialis squatarola* (Grey Plover) | Migratory | Migratory | Coastal areas including sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally rocky coasts with wave-cut platforms or reef-flats, or reefs within muddy lagoons. Also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes. Very occasionally recorded further inland around wetlands or salt-lakes. | **Irregular visitor or Vagrant**. A species largely of marine tidal shorelines; therefore little suitable habitat. Despite this, occasional individuals may visit suitable open wetlands (i.e. wetlands with sandy or muddy shorelines) in the general vicinity. Note that migrating birds may overfly the project area. | Moderate. Grey Plovers fly low (<50 m) when moving around within a wetland, but may fly in RSA when travelling long distances. Migrating birds are probably at heights above RSA (Department of Environment, Science and Innovation, Queensland (DESI Qld, 2023). | Low risk due to low flight height and infrequency of occurrence | Negligible due to very low numbers and infrequency of occurrence. The species is migratory but not threatened. |
| *Thinornis rubricollis* (Hooded Plover) | Priority 4 | | Inland saline wetlands, littoral zone of beaches and sandy estuaries. | **Irregular visitor to vagrant (but regular visitor in moderate numbers to salt lakes near Jurien).** A species of saline lakes and sandy beaches, therefore little suitable habitat but some salt lake | Moderate. Hooded Plovers fly low (<10m; M. Bamford pers. obs.) when moving around within a wetland, but may fly in RSA when travelling long distances. | Low risk due to low flight height and infrequency of occurrence. However, abundance in region and flight height when travelling long distances uncertain. | Low; some uncertainty as abundance is uncertain, Population may be small and therefore a small number of deaths could be a concern. |

| SPECIES (Common Name) | WA STATUS | EPBC STATUS | HABITAT | STATUS IN AOI | LIKELIHOOD TO OCCUR WITHIN RSA | RISK | SIGNIFICANCE OF RISK |
|---|---|---|---|---|---|---|---|
| | | | | systems nearby. Birds may therefore pass through the AOI and could occasionally settle on suitable open wetlands (ie wetlands with sandy or muddy shorelines). | | | |
| **Order: Charadriiformes; Family: Scolopacidae** | | | | | | | |
| *Actitus hypoleucos* (Common Sandpiper) | Migratory | Migratory | Coastal wetlands and some inland wetlands, with varying levels of salinity. Mostly found around muddy margins or rocky shores and rarely on mudflats. | **Irregular visitor.** A species that will visit a wide range of freshwater and saline wetlands, but always in small numbers (one or two birds at a time). Note that migrating birds may overfly the project area. | Moderate. Fly low (<10m; M. Bamford pers. obs.) when moving around within a wetland, but may fly in RSA when travelling long distances. Migrating birds are probably at heights above RSA (DESI Qld, 2023). | Low risk due to low numbers and probably low flight height. | Negligible. Low numbers of encounters expected, and the species is not Threatened. |
| | | | | | | | |
| *Arenaria interpres* (Ruddy Turnstone) | Migratory | Migratory | Coastal regions with exposed rock coast lines or coral reefs or near platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches. Occasionally found on sand, coral or shell beaches, shoals, cays and dry ridges of sand or coral and in | **Vagrant away from rocky coastlines.** A shorebird more or less confined to rocky (occasionally sandy with weed wrack) marine coastlines. Therefore no suitable habitat. Note that migrating | Moderate. Fly low (<10m; M. Bamford pers. obs.) when moving around within a wetland, but may fly in RSA when travelling long distances such as when travelling between foraging and roosting sites. Migrating birds are | Low risk due to infrequency of occurrence. | Negligible. Very low numbers of encounters expected, and the species is not Threatened. |

| SPECIES (Common Name) | WA STATUS | EPBC STATUS | HABITAT | STATUS IN AOI | LIKELIHOOD TO OCCUR WITHIN RSA | RISK | SIGNIFICANCE OF RISK |
|---|---|---|---|---|---|---|---|
| | | | estuaries, harbours, bays and coastal lagoons, among low saltmarsh or on exposed beds of seagrass, around sewage ponds and on mudflats. In south-west Australia, it may occur on pebble-strewn shores of saltlakes near the coast. Occasionally live away from coastal areas in habitats such river beds, and on inland lakes and adjacent farmland. Forage between supralittoral and lower littoral foreshore zones often in banks of seaweed or other tide-wrack. | birds may overfly the project area. | probably at heights above RSA (DESI Qld, 2023). | | |
| *Calidris acuminata* (Sharp-tailed Sandpiper) | | Migratory, Vulnerable | Muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation including lagoons, swamps, lakes pools near the coast, dams, waterholes, soaks, bore | **Regular to Irregular visitor.** A species that will visit a wide range of freshwater and saline wetlands, usually away from the coast. Tends to favour wetlands with emergent sedges and | Moderate. Fly low (<10m; M. Bamford pers. obs.) when moving around within a wetland, but may fly in RSA when travelling long distances. Migrating birds are probably at heights above RSA (DESI Qld, 2023). | Moderate risk. Most movements will be below RSA, but there may be occasional and possibly even regular movements of at least moderate numbers of birds through the AOI at RSA. | Low. Exposure of birds to risk will be infrequent (possibly every year for small numbers, but infrequently for large numbers). Worth targeting suitable wetlands in broader region to get an idea of actual abundance and |

| SPECIES (Common Name) | WA STATUS | EPBC STATUS | HABITAT | STATUS IN AOI | LIKELIHOOD TO OCCUR WITHIN RSA | RISK | SIGNIFICANCE OF RISK |
|---|---|---|---|---|---|---|---|
| | | | drains, bore swamps, saltpans and hypersaline saltlakes inland. Also occur in saltworks and sewage farms. Utilise flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. Use coastal mudflats after ephemeral terrestrial wetlands have dried out. Occasionally occur on rocky shores and rarely on exposed reefs. | chenopods. Therefore suitable wetlands in the broader region and at least small numbers could be present every year (September to April) with occasional influxes of larger numbers. May occur in large flocks (100s and rarely 1000s of birds). Note that migrating birds may overfly the project area. | | | frequency of occurrence. |
| *Calidris ferruginea* (Curlew Sandpiper) | Critically Endangered | Migratory, Critically Endangered | Intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. Less often, recorded inland around ephemeral and | **Regular to Irregular visitor.** A species that will visit a wide range of freshwater and saline wetlands, and marine tidal coastlines. Therefore suitable wetlands in the broader region and small numbers | Moderate. Fly low (<10 m; M. Bamford pers. obs.) when moving around within a wetland, but may fly in RSA when travelling long distances. Migrating birds are probably at heights above RSA (DESI Qld, 2023). | Moderate risk. Most movements will be below RSA, but there may be occasional movements of birds through the AOI at RSA. | Exposure of birds to risk will be infrequent (possibly every year in small numbers), but the population decline means that even small numbers of birds are significant. Worth targeting suitable wetlands in broader region to get an idea of actual abundance and |

| SPECIES (Common Name) | WA STATUS | EPBC STATUS | HABITAT | STATUS IN AOI | LIKELIHOOD TO OCCUR WITHIN RSA | RISK | SIGNIFICANCE OF RISK |
|---|---|---|---|---|---|---|---|
| | | | permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. Fresh and brackish water. Occasionally recorded around floodwaters. | could be present every year (September to April). Larger numbers may formerly have been present but the species has declined and is now very rarely seen in the south-west except in very small numbers (such as groups of two or three birds), at locations where hundreds were seen in the 1980s (M. Bamford pers. obs.). Note that migrating birds may overfly the project area. | | | frequency of occurrence. |
| *Calidris ruficollis* (Red-necked Stint) | Migratory | Migratory | Coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and occasionally protected sandy or coralline shores. Have been recorded on exposed or ocean beaches, stony or rocky shores, reefs or | **Regular to Irregular visitor.** A species that will visit a wide range of freshwater and saline wetlands, and marine tidal coastlines. Favours shorelines with little or no vegetation such as bare sand or mud. Therefore suitable | Moderate. Fly low (<10m; M. Bamford pers. obs.) when moving around within a wetland, but may fly in RSA when travelling long distances. They have been observed flying at 50-100m when crossing from the Swan River to Rottnest Island | Moderate risk. Most movements will be below RSA, but there may be occasional movements of birds through the AOI at RSA, such as when travelling between regional wetlands. | Low. Exposure of birds to risk will be infrequent (possibly every year for small numbers, but infrequently for large numbers). The species is not Threatened. Worth targeting suitable wetlands in broader region to get an idea of actual abundance and frequency of occurrence. |

| SPECIES (Common Name) | WA STATUS | EPBC STATUS | HABITAT | STATUS IN AOI | LIKELIHOOD TO OCCUR WITHIN RSA | RISK | SIGNIFICANCE OF RISK |
|---|---|---|---|---|---|---|---|
| | | | shoals. Also occur in saltworks and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in saltflats. Sometimes use flooded paddocks or damp grasslands. Occasionally recorded on dry gibber plains, with little or no perennial vegetation. | wetlands in the broader region and at least small numbers could be present every year (September to April) with occasional influxes of larger numbers. May occur in large flocks (100s and rarely 1000s of birds). Note that migrating birds may overfly the project area. | (M. Bamford pers. obs.). Migrating birds are probably at heights above RSA (DESI Qld, 2023). | | |
| *Calidris melanotos* (Pectoral Sandpiper) | Migratory | Migratory | Coastal or near coastal habitat but occasionally found further inland. Prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. Also recorded in swamp overgrown with lignum. | **Vagrant.** A species that will visit a wide range of freshwater and saline wetlands, usually away from the coast. Tends to favour wetlands with emergent sedges and chenopods. Therefore suitable wetlands in the broader region, but it is a species recorded only in very small numbers | Moderate. Fly low (<10m; M. Bamford pers. obs.) when moving around within a wetland, but may fly in RSA when travelling long distances. Migrating birds are probably at heights above RSA (DESI Qld, 2023). | Moderate risk. Most movements will be below RSA, but there may be occasional movements of birds through the AOI at RSA. | Negligible due to low abundance in region. |

| SPECIES (Common Name) | WA STATUS | EPBC STATUS | HABITAT | STATUS IN AOI | LIKELIHOOD TO OCCUR WITHIN RSA | RISK | SIGNIFICANCE OF RISK |
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| | | | | (most years) in the south-west. and at least small numbers could be present every year (September. Note that migrating birds may overfly the project area. | | | |
| *Calidris subminuta* (Long-toed Stint) | Migratory | Migratory | Found mainly along the coast with a few scattered inland records. Shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds. Also areas of muddy shoreline, growths of short grass, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire. Also observed at open, less vegetated shores of larger lakes and ponds and on muddy fridges of drying ephemeral lakes and swamps. Permanent wetlands such as reservoirs and | **Vagrant.** A species that will visit a wide range of freshwater and saline wetlands, usually away from the coast. Tends to favour wetlands with emergent sedges and chenopods. Therefore suitable wetlands in the broader region, but it is a species recorded only in very small numbers (most years) in the south-west. and at least small numbers could be present every year (September. Note that migrating birds may overfly the project area. | Moderate. Fly low (<10 m; M. Bamford pers. obs.) when moving around within a wetland, but may fly in RSA when travelling long distances. Migrating birds are probably at heights above RSA (DESI Qld, 2023). | Moderate risk. Most movements will be below RSA, but there may be occasional movements of birds through the AOI at RSA. | Negligible due to low abundance in region. |

| SPECIES (Common Name) | WA STATUS | EPBC STATUS | HABITAT | STATUS IN AOI | LIKELIHOOD TO OCCUR WITHIN RSA | RISK | SIGNIFICANCE OF RISK |
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| | | | artificial lakes. They are uncommon, but occasionally known from tidal estuaries, saline lakes, saltponds and bore swamps. | | | | |
| *Calidris tenuirostris* (Great Knot) | Critically Endangered | Migratory, Critically Endangered | Sheltered coastal habitats, with large intertidal mudflats or sandflats including inlets, bays, harbours, estuaries and lagoons. Occasionally found on exposed reefs or rock platforms, shorelines with mangrove vegetation, ponds in saltworks, at swamps near the coast, saltlakes and non-tidal lagoons. | **Vagrant away from coast**. A species largely of marine tidal shorelines; therefore little suitable habitat. Despite this, occasional individuals may visit suitable open wetlands (ie wetlands with sandy or muddy shorelines) in the general vicinity. Note that migrating birds may overfly the project area. | Moderate. Great Knots fly low (<50 m) when moving around within a wetland, but may fly in RSA when travelling long distances. Migrating birds are probably at heights above RSA (DESI Qld, 2023). | Low risk due to infrequency of occurrence. | Negligible due to very small numbers of birds likely to be impacted. |
| *Phalaropus lobatus* (Red-necked Phalarope) | Migratory | Migratory | Non breeding season: mainly at sea. Breeding Season: Inland and coastal lakes/swamps, including highly saline waters and artificial wetlands notably saltfields. | **Vagrant.** A largely marine species that feeds on open water; also visits large lakes (notably Rottnest lakes being one of the few locations where the species is regularly encountered (some | Moderate. May fly in RSA when travelling long distances. Migrating birds are probably at heights above RSA (DESI Qld, 2023). | Moderate risk. Most movements will be below RSA, but there may be occasional movements of birds through the AOI at RSA. | Negligible due to low abundance in region |

| SPECIES (Common Name) | WA STATUS | EPBC STATUS | HABITAT | STATUS IN AOI | LIKELIHOOD TO OCCUR WITHIN RSA | RISK | SIGNIFICANCE OF RISK |
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| | | | | years; small numbers) in the south-west). and at least small numbers could be present every year (September. Note that migrating birds may overfly the project area. | | | |
| *Tringa glareola* (Wood Sandpiper) | Migratory | Migratory | Well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. Typically associated with emergent, aquatic plants or grass, dominated by taller fringing vegetation, such as dense stands of rushes or reeds, shrubs, or dead or live trees. Inundated grasslands, short herbage or wooded floodplains, where floodwaters are temporary or receding, and irrigated crops. Small wetlands only when they are drying. Rarely found at brackish wetlands, or dry | **Regular to Irregular visitor.** A species that will visit a wide range of freshwater and brackish wetlands. Therefore suitable wetlands in the broader region and at least small numbers could be present every year (September to April). Tends not to form large flocks. Note that migrating birds may overfly the project area. | Moderate. Fly low (<10 m; M. Bamford pers. obs.) when moving around within a wetland, but may fly in RSA when travelling long distances. Migrating birds are probably at heights above RSA (DESI Qld, 2023). | Moderate risk. Most movements will be below RSA, but there may be occasional and possibly even regular movements of at least small numbers of birds through the AOI at RSA. | Low. Exposure of birds to risk will be infrequent (possibly every year for small numbers). The species is Migratory but not Threatened. Worth targeting suitable wetlands in broader region to get an idea of actual abundance and frequency of occurrence. |

| SPECIES (Common Name) | WA STATUS | EPBC STATUS | HABITAT | STATUS IN AOI | LIKELIHOOD TO OCCUR WITHIN RSA | RISK | SIGNIFICANCE OF RISK |
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| | | | stunted saltmarsh. Occasionally stony wetlands. Artificial wetlands, including open sewage ponds, reservoirs, large farm dams, and bore drains. | | | | |
| *Tringa nebularia* (Common Greenshank) | Migratory | Migratory | Coastal and inland environments, in estuaries and mudflats, mangrove swamps and lagoons, and in billabongs, swamps, sewage farms and flooded crops. | **Regular to Irregular visitor.** A species that will visit a wide range of freshwater and brackish wetlands; also tidal marine coasts. Therefore suitable wetlands in the broader region and at least small numbers could be present every year (September to April). Tends not to form large flocks. Note that migrating birds may overfly the project area. | Moderate. Fly low (<10 m; M. Bamford pers. obs.) when moving around within a wetland, but may fly in RSA when travelling long distances. Migrating birds are probably at heights above RSA (DESI Qld, 2023). | Moderate risk. Most movements will be below RSA, but there may be occasional and possibly even regular movements of at least small numbers of birds through the AOI at RSA. | Low. Exposure of birds to risk will be infrequent (possibly every year for small numbers). The species is Migratory but not Threatened. Worth targeting suitable wetlands in broader region to get an idea of actual abundance and frequency of occurrence. |
| *Tringa stagnatilis* (Marsh Sandpiper) | Migratory | Migratory | Permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats | **Regular to Irregular visitor.** A species that will visit a wide range of freshwater and brackish wetlands; also tidal marine coasts. Therefore suitable wetlands in | Moderate. Fly low (<10 m; M. Bamford pers. obs.) when moving around within a wetland, but may fly in RSA when travelling long distances. Migrating birds are probably at | Moderate risk. Most movements will be below RSA, but there may be occasional and possibly even regular movements of at least small numbers of birds | Low. Exposure of birds to risk will be infrequent (possibly every year for small numbers). The species is Migratory but not Threatened. Worth targeting suitable wetlands in broader region to get an idea of |

| SPECIES (Common Name) | WA STATUS | EPBC STATUS | HABITAT | STATUS IN AOI | LIKELIHOOD TO OCCUR WITHIN RSA | RISK | SIGNIFICANCE OF RISK |
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| | | | and also regularly at sewage farms and saltworks. Occasionally at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes. | the broader region and at least small numbers could be present every year (September to April). Tends not to form large flocks. Note that migrating birds may overfly the project area. | heights above RSA (DESI Qld, 2023). | through the AOI at RSA. | actual abundance and frequency of occurrence. |
| **Order: Coraciiformes; Family: Meropidae** | | | | | | | |
| *Merops ornatus* (Rainbow Bee-eater) | | Marine | Open forests and woodlands often dominated by eucalypts, shrublands, including mallee and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. Usually in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water. Also occurs in inland and coastal sand dune systems, mangroves in northern Australia, heathland, sedgeland, vine forest and vine thicket, and on beaches. On migration, may also fly over non-preferred habitats such as | **Regular visitor**. A breeding visitor Likely to occur annually (October to February). Most likely to occur in parkland cleared areas and margins of woodland and forest. | Moderate to high. Flight height of foraging birds determined by perch height, so commonly in range of 5-20 m. Birds feed aerially by sallying from a perch on dead branchlets. On migration, however, birds travel in loose flocks around 50 m or possibly higher (M. Bamford pers. obs.). Migrating birds therefore at least occasionally in RSA. | Moderate risk. The species will be present every year and at least on migration (start and end of season) at least some birds may be in the lower end of the RSA. | Negligible to Low. Exposure of some birds to risk may be frequent but the species is not Threatened. Advice from the commonwealth agency is that Marine listings under the EPBC Act are of conservation interest only in commonwealth waters. |

| SPECIES (Common Name) | WA STATUS | EPBC STATUS | HABITAT | STATUS IN AOI | LIKELIHOOD TO OCCUR WITHIN RSA | RISK | SIGNIFICANCE OF RISK |
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| | | | rainforest or treeless plains | | | | |
| **Order: Falconiformes; Family: Falconidae** | | | | | | | |
| *Falco peregrinus* (Peregrine Falcon) | Other Specially Protected | | Found in most habitat types. Requires abundant prey (small - medium birds, small diurnal mammals). Nests on coastal and inland cliffs, open woodlands near water, high artificial structures. | **Resident**. There will be resident pairs and dispersing birds within the region. | Likely High. The species flies at a range of heights and regularly within RSA. | Moderate to high risk. The species will be present more or less continuously and does fly at RSA regularly. | Moderate. Some mortality is inevitable and while these may often be juvenile birds, there exists the possibility of members of breeding pairs being killed. This has implications for local persistence of the species. Note that the species is widespread at low densities so recolonisation potential is high. |
| **Order: Galliformes; Family: Megapodiidae** | | | | | | | |
| *Leipoa ocellata* (Malleefowl) | Vulnerable | Vulnerable | Semi-arid to arid zones in shrubland and woodland dominated by mallee and wattle species and occasionally Wandoo, Marri and Mallet woodlands. | **Regular to irregular visitor**. The species would formerly have been resident, but habitat loss and fragmentation may have led to local decline; possibly even local extinction. Individuals may still occasionally be present in parts of the region. | Low. The species can fly strongly but appears to only ever fly low, often just above the ground or just above the canopy (M. Bamford has witness two flights, and has also spoken with landholders who have witnessed flights). | Negligible. The species may not be present or present only infrequently, and rarely if ever flies at RSA. | Negligible. Risk is negligible and it is unlikely a breeding population is present. If field investigations did find the species to be present, the risk and significance might be increased, but mostly from clearing and roadkill rather than from flying in the RSA. |
| **Order: Pelecaniformes; Family: Ardeidae** | | | | | | | |

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| *Bubulcus ibis* (Cattle Egret) | | Marine | Tropical and temperate grasslands, wooded lands and terrestrial wetlands. Very rare occurrences in arid and semi-arid regions. High numbers have been observed in moist, low-lying poorly drained pastures with an abundance of high grass. Avoids low grass pastures. Recorded on earthen dam walls and ploughed fields. Uses predominately shallow, open and fresh wetlands including meadows and swamps with low emergent vegetation and abundant aquatic flora. Sometimes observed in swamps with tall emergent vegetation. | **Vagrant**. The Cattle Egret occurs only in very small numbers in the south-west region, with one or two birds reported by birdwatchers annually. Occasional birds may therefore occur in the AOI and the surrounding region, in wetlands, flooded paddocks and on pasture. Such events may occur less than annually. | Low to possibly moderate. No specific observations on Cattle Egret, but other egrets and herons have been seen to fly >50 m occasionally (more often <50 m). | Low risk. The species probably only occasionally flies at RSA. will be present infrequently and only in very small numbers. | Negligible. Low abundance, only occasionally at RSA and the species is not Threatened. Advice from the commonwealth agency is that Marine listings under the EPBC Act are of conservation interest only in commonwealth waters. |
| **Order: Passeriformes; Family: Motacillidae** | | | | | | | |
| *Motacilla cinerea* Grey Wagtail | | Migratory and Marine | Strong association with water (usually fast-flowing), particularly rocky substrates along water courses but also lakes and marshes. | **Vagrant**. The Cattle Egret occurs only in very small numbers in the south-west region, with reports from birdwatchers less than annual. | Low to possibly moderate. Movements are usually close to the ground (<5 m) but birds dispersing and migrating may be at greater height. | Low risk. The species probably only occasionally flies at RSA. will be present infrequently and only in very small numbers. | Negligible. Very low abundance, only occasionally at RSA and the species abundant overseas. It is not Threatened. |

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| | | | | Elsewhere in its range, and on the rare occasions when it is seen in the south-west, it usually occurs on the margins of wetlands. Therefore, a slight possibility exists of individuals very occasionally being present in the AOI. | | | |
| **Order: Psittaciformes; Family: Cacatuidae** | | | | | | | |
| *Calyptorhynchus banksii naso* (Forest Red-tailed Black Cockatoo) | Vulnerable | Vulnerable | Dense Eucalypt forests receiving >600 mm rainfall especially of *Eucalyptus marginata* (Jarrah), *E. diversicolor* (Karri) and *Corymbia calophylla* (Marri). May forage in pasture on weeds | **Regular visitor**. The project area is on the border of the taxon's range so birds may not be present at all times, but are likely to be present regularly, in moderate numbers, where Marri is a major component of the vegetation. Possibly breeding. | Moderate to high. While typically low-flying, birds may occasionally or even regularly fly in RSA, although this may be when flying across valleys so low height likely over high ground (where turbines most likely located). | Low. The bird may be present regularly in at least moderate numbers in parts of the region, but will fly in RSA only occasionally. More information is needed on flight height as this may vary with season, activity and location. | Low or possibly moderate. This is a long-lived sub-species of low fecundity, and already under pressure from other threatening processes. Therefore, any additional mortality may be a concern, especially on the periphery of its range. |
| *Zanda baudinii* (Baudin's Black-Cockatoo) | Endangered | Endangered | Eucalypt forests, especially Jarrah, Marri and Karri forest. Forages in pasture on seeds of weeds; sometimes recorded in pasture in large | **Vagrant in south**. The region is outside the range of the species but individuals may occasionally venture into the far southern edge. | Moderate to high. While typically low-flying, birds may occasionally or even regularly fly in RSA, although this may be when flying across valleys so low height | Low. The bird is unlikely to be present except in extremely small numbers, very occasionally, in the south of the region. | Negligible. This is a long-lived species of low fecundity, and already under pressure from other threatening processes. Therefore, any additional mortality may be a concern, |

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| | | | numbers feeding on *Erodium*. | | likely over high ground (where turbines most likely located). Limited information on this species. | | especially on the periphery of its range. |
| *Zanda latirostris* (Carnaby's Black-Cockatoo) | Endangered | Endangered | Uncleared or remnant native eucalypt woodlands, especially those that contain Salmon Gum and Wandoo, and in shrubland or kwongan heathland dominated by hakea, dryandra, banksia and grevillea species. It also occurs in remnant patches of native vegetation on land otherwise cleared for agriculture. Forages extensively in pasture on weeds, and will also forage on Canola. | **Resident to regular visitor**. The region is within the core of the species' range, with birds probably present all year round, some birds moving away for part of the year, and with breeding taking place. | Moderate to high. While typically low-flying, birds may occasionally or even regularly fly in RSA, although this may be when flying across valleys so low height likely over high ground (where turbines most likely located). | Low. The bird is resident and almost certainly breeding, but will fly in RSA only occasionally. More information is needed on flight height as this may vary with season, activity and location. | Low or possibly moderate. This is a long-lived species of low fecundity, and already under pressure from other threatening processes. Therefore, any additional mortality may be a concern. However, information gathered recently suggests it very rarely flies in the RSA. |
| **MAMMALS** | | | | | | | |
| *Falsistrellus mackenziei* (Western False Pipistrelle) | Priority 4 | Endangered | Old growth forest with suitable tree hollows or abandoned buildings. Jarrah-Karri forest and occasionally Tuart forest and Banksia woodland. | **Vagrant.** The region may be out of range but the species could occasionally occur in the far south | Moderate to high. A moderately high-flying species that typically forages within or just above the canopy of eucalypt forest. May therefore | Low to moderate. Risk is uncertain as flight height of the species is poorly-known. More information is needed on status in the AOI and on flight height | Negligible due to the species probably not being present. |

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| | | | | | occasionally enter RSA. | | |
| **Unlisted species considered at risk** | | | | | | | |
| *Aquila audax* (Wedge-tailed Eagle) | | | Most areas, occasionally in urban places (ALA, n.d.) | **Resident**. Widespread as a breeding resident in the region; also dispersing birds (probably juveniles | High. The species flies at a range of heights and regularly within RSA. | Moderate to high risk. The species will be present more or less continuously at any location and does fly at RSA regularly. Wedge-tailed Eagles have the second highest recorded mortality from wind farms in Australia (Moloney *et al.,* 2019). | Some mortality is inevitable and while these may often be juvenile birds, there exists the possibility of members of breeding pairs being killed, although there is some evidence that breeding pairs Habituate rapidly to the presence of turbines. This has implications for local persistence of the species. Note that the species is widespread at low densities so recolonisation potential is high. |
| *Falco cenchroides* (Nankeen Kestrel) | | | Open grasslands, croplands and urban areas (ALA, n.d.) | **Resident**. Widespread as a breeding resident in the region; also dispersing birds (probably juveniles. | High. The species flies at a range of heights and regularly within RSA. | Moderate to high risk. The species will be present more or less continuously and does fly at RSA regularly. This species is regularly recorded in mortality reports for wind farms in Victoria, Australia | Moderate. Some mortality is inevitable and while these may often be juvenile birds, there exists the possibility of members of breeding pairs being killed. This has implications for local persistence of the species. Note that the species is widespread at |

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| | | | | | | (NGH Environmental, 2016, Moloney *et al.,* 2019). | low densities so recolonisation potential is high. |
| *Falco berigora* (Brown Falcon) | | | Open grasslands, pastures and farmland (ALA, n.d.) | **Resident** Widespread as a breeding resident in the region; also dispersing birds (probably juveniles | High. The species flies at a range of heights and regularly within RSA. | Moderate to high risk. The species will be present more or less continuously and does fly at RSA regularly. This species is regularly recorded in mortality This species is regularly recorded in mortality reports for wind farms in Victoria, Australia (Moloney *et al.,* 2019). | Moderate. Some mortality is inevitable and while these may often be juvenile birds, there exists the possibility of members of breeding pairs being killed. This has implications for local persistence of the species. Note that the species is widespread at low densities so recolonisation potential is high. |
| Hieraaetus morphnoides (Little Eagle) | | | Open forest, woodlands and croplands (ALA, n.d.) | **Resident**. Widespread as a breeding resident in the region; also dispersing birds (probably juveniles | High. The species flies at a range of heights and regularly within RSA. | Moderate to high risk. The species will be present more or less continuously and does fly at RSA regularly. | Moderate. Some mortality is inevitable and while these may often be juvenile birds, there exists the possibility of members of breeding pairs being killed. This has implications for local persistence of the species. Note that the species is widespread at low densities so recolonisation potential is high. |

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| *Tyto novaehollandiae* (Masked Owl) and *Ninox connivens* (Barking Owl) | | | Masked Owl: Caves, woodlands and timbered waterways, in mature trees with suitable nesting hollows close to foraging areas. Barking Owl: Forest and woodland (ALA, n.d.) | **Probably locally extinct. Resident or regular visitor**. Both these species were almost certainly formerly resident, Barking Owl extremely rarely recorded in the overall south-west region (Davis *et al.*, 2022). | Moderate. Flight heights of these owls is not well-understood and may be determined by the height of the tallest trees. | Moderate. In the absence of presence and flight height data, assume there is at least a moderate level of risk. Site-specific data for these species is required. | None to negligible due to the species probably not being present. Moderate. If the species are present. |
| Waterfowl (ducks and swans), herons and allies, terns | | | Wetlands and waterways | A rich assemblage with species ranging from **resident, many regular to irregular visitors. Some vagrants**. Abundance highly variable but a few species occasionally in large numbers. Highly seasonal and with great a annual variation. | Moderate to high. Flight heights of waterfowl variable but will often travel within RSA. Some species, such as ibis, will use thermals to gain altitude during the day. Many ducks and swans travel long distances mostly at night and are probably within RSA for at least part of this time. | Moderate to high. Often abundant and often at RSA. | Low. Despite high risk, low significance as most species are extremely numerous and not of conservation significance. Largest numbers (and thus highest risk) most likely during periods of irruption when numbers peak, so mortality very unlikely to have effects on populations. |
| *Austronomus australis* (White-striped Freetail Bat) | | | Woodland and urban areas (ALA, n.d.) | Probably **resident** but may have seasonal variations in abundance. | Moderate to high. A high-flying species. | Moderate to high. Often abundant and often at RSA. Most commonly reported bat species in mortality reports from wind farms in Victoria (Moloney *et al.*, 2019). | Low to moderate. If mortality rates are high, the vast extent of windfarms could result in regional population declines. |