Appendix T

Bird and Bat Adaptive Management Plan

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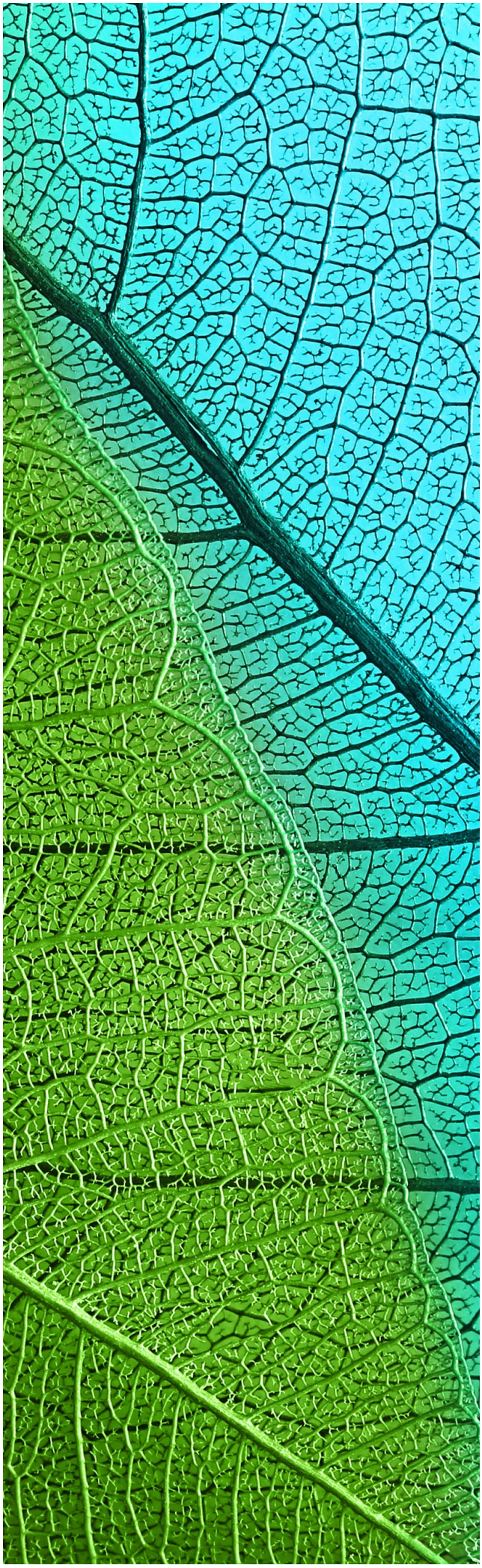

ADVERTISED PLAN

Normanville Energy Park

Bird and Bat Adaptive Management Plan

Prepared for
Normanville Energy Park Pty Ltd

November 2025
Report No. 22271.10 (2.3)

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Nature Advisory acknowledges the traditional owners and sovereign custodians of the land on which we work from – the Wurundjeri people of the Woi Wurrung language group. We extend our respect to their Ancestors and all First Peoples and Elders, past and present.

Document History and Status

The following table outlines the revisions made to this document

Version	Date of Issue	Description	Issued By	Reviewed by	Approved by
V 1.0	16/04/2025	First draft	Robin Leppitt	Andrew Lewis	Inga Kulik
V 2.0	26/05/2025	2nd draft	Andrew Lewis	Inga Kulik	Inga Kulik
V 2.1	03/06/2025	3rd draft	Andrew Lewis	Inga Kulik	Inga Kulik
V 2.2	03/07/2025	4th draft	Sergio Nolazco Plasier	Andrew Lewis	Inga Kulik
V 2.3	24/11/2025	5th draft	Andrew Lewis		Inga Kulik

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Glossary of terms

BACI	Before-After-Control-Impact
BBAMP	Bird and Bat Adaptive Management Plan
BUS	Bird utilisation survey
Commissioning	All activities, including turning of turbines, after the components of the wind turbines are installed.
Cwth	Commonwealth
CRM	Collision Risk Model
DEECA	(VIC) Department of Energy, Environment and Climate Action (previously DELWP)
DCCEEW	(Cwth) Department of Climate Change, Energy, the Environment and Water
EPBC Act	(Cwth) *Environment Protection and Biodiversity Conservation Act 1999*
FFG Act	(VIC) *Flora and Fauna Guarantee Act 1988*
Full operation	Once all wind turbines have been commissioned and are able to operate simultaneously.
Listed species	Any bird/bat species listed as threatened or migratory under the EPBC Act or listed as threatened under the FFG Act.
MNES	Matters of national environmental significance under the EPBC Act
Non-listed species	Any bird/bat species not listed as threatened or migratory under the EPBC Act or not listed as threatened under the FFG Act.
OH&S	Occupational Health and Safety
NMEP	Normanville Energy Park
RSA	Rotor swept area
Suitably qualified ecologist	A person who has relevant professional qualifications and at least three years of work experience preparing and implementing management plans for the conservation of and habitat improvement for the MNES relevant to the management plan which they are preparing and can give an authoritative assessment and advice on the habitat requirements of that/those MNES using relevant protocols, standards, methods and/or literature.

1. Introduction

1.1. Background, project description and location

Nature Advisory Pty Ltd was engaged by Normanville Energy Park Pty Ltd (the Proponent) to develop a draft Bird and Bat Adaptive Management Plan (BBAMP) to accompany the permit application for the Normanville Energy Park (NMEP). The NMEP is located approximately 50 km south of Swan Hill and 15 km southwest of Kerang in northwestern Victoria within the Gannawarra Shire.

The project will include up to 17 wind turbine generators and associated infrastructure such as an underground transmission line, a substation and temporary construction areas within a project boundary (herein referred to as the 'Project Site', Figure 1). Each wind turbine will have maximum and minimum blade tip heights of 280 metres and 50 metres, respectively. These parameters have been adopted to consider all potential design options.

As this is a draft BBAMP, the contents of this report are subject to change. Conditions required prior to project approval will be incorporated into to the BBAMP for review by the responsible authority.

1.2. Environmental Outcomes

The environmental outcomes that this BBAMP aims to achieve are:

- minimising impacts from the NMEP on bird and bat species, with an emphasis on species listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act), and non-listed species identified as particularly vulnerable to collisions (herein referred to as 'species of concern', see Section 1.3);
- improving understanding of the risk of turbine collision on species of concern on the Project Site;
- improving understanding of changes in behaviour (if any) of bird species of concern due to wind farm construction and operation;
- effective and efficient monitoring for the identification of carcasses from turbine collisions including timely collection and analysis of mortality data;
- providing a pathway for validating and updating impact assessment framework for the species of concern recorded on the Project Site, using monitoring data to support a robust adaptive management approach to reducing impacts, where possible; and
- where required and feasible, develop tangible, on-ground management actions to promote a long-term reduction in the risk of turbine collision impacts on species of concern.

These environmental outcomes will be achieved through a combination of ongoing monitoring (of both bird activity and wind farm impacts) and adaptive management and mitigation.

1.3. Species of concern

This BBAMP specifically emphasises the following species of concern that were recorded during baseline assessments or identified as species that may occur on site and may be vulnerable to collisions:

Birds

- Black Falcon *Falco subniger* (FFG Act: Critically Endangered)
- Wedge-tailed Eagle *Aquila audax audax* (not listed under legislation)
- Waterbirds utilising the nearby Kerang Wetlands Ramsar site (i.e., including non-listed species which contribute to the ecological character of the Ramsar site)

Bats

- Yellow-bellied Sheath-tailed Bat *Saccolaimus flaviventris* (FFG Act: Vulnerable)
- Corben's Loong-eared Bat *Nyctophilus corbeni* (EPBC Act: Vulnerable)

This management plan was written and reviewed by a team from Nature Advisory, comprising Dr Robin Leppitt (Senior Zoologist), Dr Inga Kulik (Project Director), Dr Sergio Nolazco Plasier (Senior Zoologist), Guille Mayor (Senior Ecologist) and Andrew Lewis (Senior Ecologist & Project Manager).

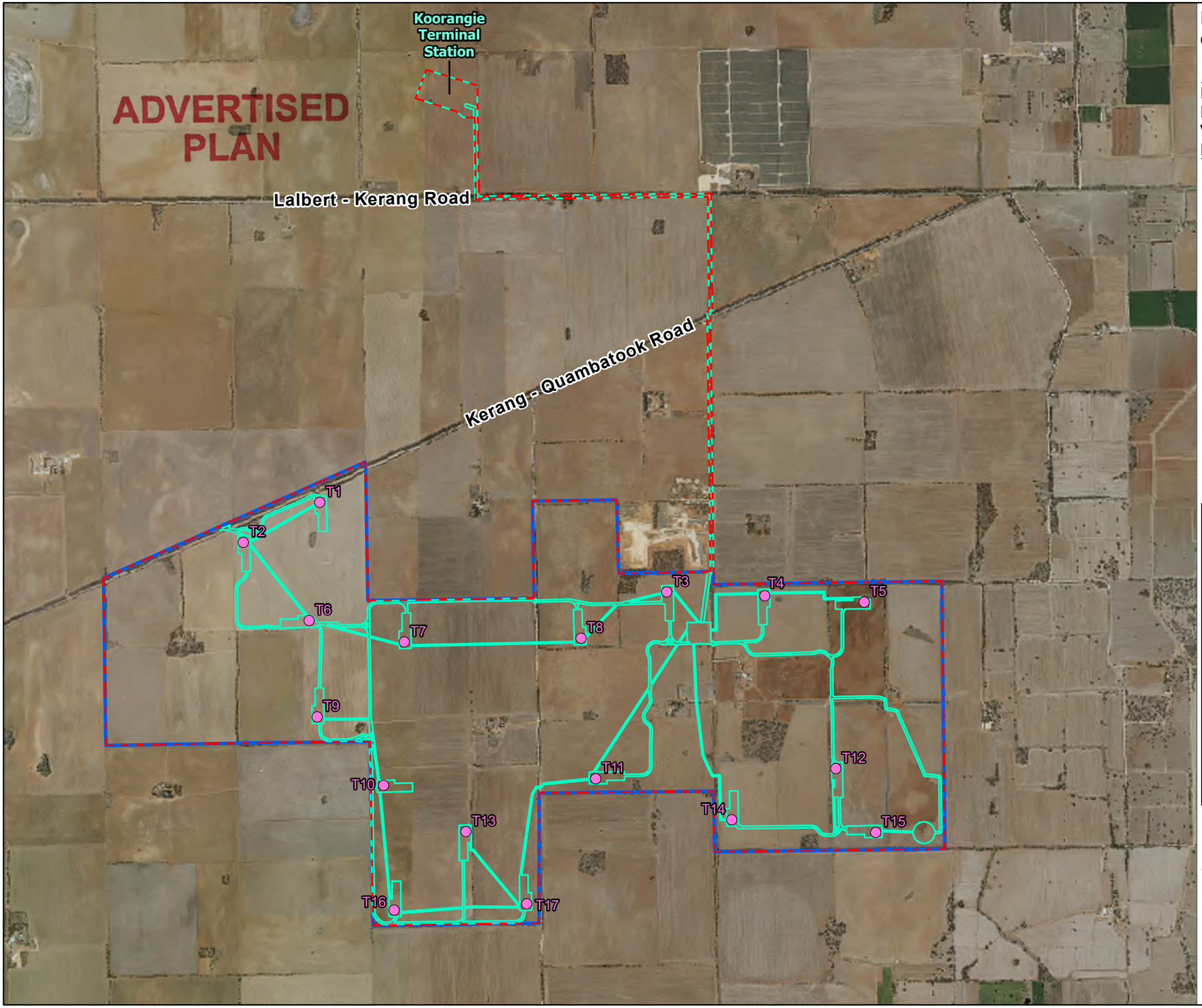

Figure 1: Indicative layout overview

Project No: 22271_09
Project: Normanville Energy Park, VIC
Date: 25/11/2025

- Project Site boundary
- Site boundary
- Proposed turbine - v15-01
- Wind farm development footprint v15-03

N

Metres
0 500 1,000 1,500

GDA 1994 VICGRID94

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2. Pre-construction baseline monitoring program

This section of the plan presents a summary of relevant baseline (pre-construction) surveys carried out at NMEP.

2.1. Baseline (pre-construction) monitoring

Baseline bird and bat investigations have been ongoing at NMEP since 2022. The surveys presented in Table 1 below gathered baseline data to inform future monitoring.

Table 1: Baseline (pre-construction) surveys conducted at the NMEP

Survey – field assessments	Date
Birds	
Bird Utilisation Surveys – Nature Advisory	▪ 29 November–2 December 2022 (Spring) ▪ 23–27 May 2023 (Autumn) ▪ 10–15 July 2023 (Winter) ▪ 28 February–4 March 2024 (Summer) ▪ 21 May - 26 May 2024 (Autumn) ▪ 6 July – 13 July 2024 (Winter) ▪ 30 September – 4 October 2024 (Spring) ▪ 20 – 25 January 2025 (Summer)
Targeted Black Falcon surveys	Roaming: ▪ 27-30 June 2023 ▪ 11-15 July 2023 ▪ 19-23 August 2024 ▪ 23-27 September 2024 ▪ 28 October – 1 November 2024 Fixed point: ▪ 14–19 August 2023 ▪ 09–14 October 2023 ▪ 11–15 December 2023
Brolga Level one and Level Two Assessments	Level 1: ▪ Nov 2022 Level 2: ▪ Aug 2023 ▪ Sep 2023 ▪ Oct 2023 ▪ Nov 2023 ▪ Dec 2023

Survey – field assessments	Date
Bats	
Bat Utilisation Surveys – Nature Advisory	▪ 28 November–2 December 2022 (Spring) ▪ 22–26 May 2023 (Autumn) ▪ 10–15 July 2023 (Winter) ▪ 28 February–4 March 2024 (Summer) ▪ 24 May - 25 June 2024 (Autumn) ▪ 8 July – 12 July 2024 (Winter) ▪ 30 September – 4 October 2024 (Spring) ▪ 20 – 25 January 2025 (Summer) **Total bat detector nights: 335**

Before and After Control Impact Design

The pre-construction surveys are designed to be statistically robust, adhering to the guidelines for studies on birds and bats outlined in the *Ecological Assessments* of the *Best Practice Guidelines for the Australian Wind Industry* (Appendix 7 in CEC 2018). Specifically, the BUS is designed for a 'Before and After Control Impact' (BACI) analysis, using quantitative data from both reference (control) and impact (treatment) predetermined locations. Reference sites are at a sufficient distance from the proposed turbine locations to obtain data outside the zone of influence of the turbines. Each fixed point is assessed twice during four daily periods (early morning, late morning, early afternoon, late afternoon), resulting in eight observation periods per site per survey. Fixed points were located in habitats representative of those across the Project Site. Post-commissioning surveys will be conducted at the same locations for two years using the same methodology (see Section 3). The comparative analysis will provide descriptive and quantitative analysis on changes in species diversity and composition from before to after construction.

2.1.1. Species of concern from baseline surveys

A species of concern is defined as a species of conservation significance that is thought to be of high-risk of turbine collision based on data collected during pre-construction surveys. These species are generally listed as threatened under the EPBC Act and/or FFG Act, though non-listed species can also qualify if they are thought to be at particularly high risk to the impacts of concern. Please note that other listed species may be involved with turbine collisions at the NMEP, but as at this stage they are not considered to be of high-risk of turbine collisions, they are covered under the more general framework of the BBAMP (See Section 4.1.1).

Birds

During the baseline surveys, the following bird species of concern were identified as potentially vulnerable to collisions:

- **Black Falcon** (FFG Act: Critically Endangered)

Pre-construction surveys suggest that at least two pairs of Black Falcon regularly use the Project Site with at least two other individuals using the site occasionally (Nature Advisory 2024).

- **Wedge-tailed Eagle** (Not listed under legislation).

Wedge-tailed Eagles were regularly recorded on the Project Site during pre-construction surveys (Nature Advisory 2025). Although not listed as threatened on the Australian mainland, Wedge-tailed Eagles are known to soar at RSA height whilst engaged in ground-focused hunting/scavenging behaviour, increasing the risk of collisions with turbines. As an apex predator, the susceptibility and potential cumulative impacts on Wedge-tailed Eagle populations warrant a more precautionary approach than for other non-threatened species.

- **Waterbirds**

Whilst few waterbirds were recorded during pre-construction surveys, DCCEEW have raised the possibility that waterbirds utilising the nearby Kerang Wetlands Ramsar Site may be at risk from turbine collision if they pass through the Project Site.

The Kerang wetlands were listed by the Ramsar convention under the following criteria:

Criterion 1: The Kerang Wetlands Ramsar site represents a unique example of a wetland within the Murray-Darling Drainage biogeographical region, due to its system of diverse wetlands; five inland and one human-made Ramsar wetland types are represented. The 23 wetlands that make up the Ramsar site vary significantly in size (46 to 984 ha), maximum depths (1 to 8.4 m), salinity levels (fresh to hypersaline) and associations with surface water systems (i.e. Avoca River, Loddon River and Pyramid Creek) within the Murray-Darling Drainage Division. The Ramsar site also contains seven of the 27 wetlands within this drainage division that are more than 500 ha in size.

Criterion 2: The site supports ten fauna species that are listed as threatened at the national level (under the Environment Protection and Biodiversity Conservation Act 1999) and/or the international level (on the International Union for Conservation of Nature and Natural Resources Red List): the Australian painted snipe, Plains wanderer, regent honeyeater, grey falcon, growling grass frog, flat-headed galaxias, Murray cod, Murray hardyhead, and Macquarie perch and silver perch.

Criterion 3: The Ramsar site provides habitat for a diverse range of waterbird species and is important for maintaining the biological diversity of the Murray-Darling Drainage Division. Over 76 waterbird species occur at the site. Between 1980 and 2003, 56 species were recorded at Lake Cullen alone. At the time the site was listed (1982), the largest colonies of Australian white ibis and straw-necked ibis recorded in Victoria were found within the Kerang region, with Middle Lake and Hird Swamp supporting large breeding events.

Criterion 4: The Ramsar site supports several species during the critical life stages of breeding, moulting and migration. For breeding, the site supports significant colonies of pelicans, cormorants, spoonbills and ibis. Migratory waterbirds that utilise the site include the eastern great egret, freckled duck and Latham's snipe; migratory fish include the silver perch, Australian smelt (*Retropinna semoni*) and Murray cod. The site also supports Australian shelducks and musk ducks during the moulting life stage. Finally, the larger and more open lakes within the Kerang Wetlands Ramsar site is known to function as a drought refuge for waterbirds.

Criterion 5: The Ramsar site regularly supports over 20 000 waterbirds, with this threshold being met on ten different occasions between 1980 and 2003. On at least five occasions (years), Lake Cullen alone has supported more than 20 000 waterbirds, with the highest number (over 250 000 waterbirds) occurring in 1987.

Criterion 6: The Kerang Wetlands Ramsar site regularly supports at least 1% of the population of the banded stilt. Between 1982 and 2003, the 1% threshold for the banded stilt (2100 individuals) was met on four occasions (years).

Waterbirds of concern include those utilising the nearby Kerang Wetlands Ramsar site (i.e., including non-listed species which contribute to the ecological character of the Ramsar site).

From these criteria, waterbirds of concern include (but may not be limited to) the following species:

- Australian Painted Snipe *Rostratula australis* (EPBC Act: Endangered, FFG Act: Critically Endangered)
- Australian Pelican *Pelecanus conspicillatus*
- Australian Shelduck *Tadorna tadornoides*
- Australian White Ibis *Threskiornis molucca*
- Banded Stilt *Cladorhynchus leucocephalus*
- Cormorant species *Phalacrocorax/Microcarbo* species
- Freckled Duck *Stictonetta naevosa* (FFG Act: Endangered)
- Great Egret *Ardea modesta* (FFG Act: Vulnerable)
- Latham's Snipe *Gallinago hardwickii* (EPBC Act: Vulnerable)
- Musk Duck *Biziura lobata* (FFG Act: Vulnerable)
- Royal Spoonbill *Platalea regia*
- Straw-necked Ibis *Threskiornis spinicollis*
- Yellow-billed Spoonbill *Platalea flavipes*

Other listed birds

Some other listed species recorded during surveys are not considered at risk of turbine collision due to their behaviours and habitat preferences. For example, the Brown Treecreeper *Climacteris picumnus* (EPBC Act: Vulnerable), Grey-crowned Babbler *Pomatostomus temporalis* (FFG Act: Vulnerable) and Hooded Robin *Melanodryas cucullata* (EPBC Act: Endangered; FFG Act: Vulnerable) typically remain close to the ground or under canopy height. Additionally, the Little Eagle *Hieraaetus morphnoides* (FFG Act: Vulnerable) and Blue-winged Parrot *Neophema chrysostoma* (EPBC Act: Vulnerable) were recorded on one and two occasions respectfully, and whilst these species are known to fly at RSA height, they are believed to be a rare visitor to the area so were not considered further.

Six species were not recorded during baseline surveys but have potentially suitable habitat within the study area. The Square-tailed Kite, Diamond Firetail, Southern Whiteface, Latham's Snipe, White-throated Needletail, and Fork-tailed Swift have the potential to occur at NMEP but due to a lack of high-quality habitat on site, all are considered to be at low-risk of turbine collision.

All these species will be covered under the general framework of the BBAMP which can be adapted as required.

Bats

Baseline studies recorded 12 bat species across the site. During these baseline surveys, the following bat species of concern were identified as potentially vulnerable to collisions

- Yellow-bellied Sheath-tailed Bat *Saccolaimus flaviventris* (FFG Act: Vulnerable)

The following non-listed species were recorded relatively regularly, including at RSA height:

- Southern Free-tailed Bat *Ozimops planiceps*
- Chocolate Wattled Bat *Chalinolobus morio*
- Little Forest Bat *Vespadelus vulturnus*
- Gould's Wattled Bat *Chalinolobus gouldii*

In addition, the Corben's Long-eared Bat *Nyctophilus corbeni* (EPBC Act: Vulnerable) may also occur on site. Calls of Long-eared Bats (*Nyctophilus* spp.) were recorded during baseline studies but there are several species that may occur within the site and these cannot be reliably distinguished based on call data. These species will be covered under the general framework of the BBAMP which can be adapted as required.

3. Post-construction monitoring

3.1. Bird utilisation surveys (BUS)

Post-construction BUS will be conducted at commissioning for a period of two years during four seasons each year to replicate pre-construction surveys. These surveys will provide further information to determine whether the site continues to be utilised by the range of species identified in the pre-construction surveys and whether any turbines pose a particular risk to identified species of concern, as well as any other listed species.

Relevant details of the post-construction BUS are detailed below.

- The timing of the surveys will be agreed with the regulator.
- Surveys will be undertaken at the same survey points and reference points used in the pre-construction surveys, using the same methodology.
- BUS will provide a context for the carcass searches and elucidate the indirect effects of the wind farm on bird use of the site by comparing the bird abundance and diversity recorded during post-construction surveys with the baseline BUS data.

3.2. Bat Surveys

Post-construction microbat surveys will be conducted at commissioning, if required, and during its first year of operation. These surveys will be done in a way that replicates the initial pre-construction surveys. These surveys will seek to demonstrate whether the site continues to be utilised by the range of species identified in the pre-construction surveys and whether any turbines pose a particular risk to threatened species.

Relevant details of the microbat surveys are presented below.

- Surveys will be undertaken at approximately the same survey points and timing used in the pre-construction surveys, using the same methodology.
- Surveys will provide a context for the carcass searches and elucidate the indirect effects of the wind farm on bat use of the site.
- Surveys will specifically focus on the presence of, and potential impacts on, species of concern identified during pre-construction bat surveys and the bird and bat risk assessment.

3.3. Black Falcon targeted survey

A post-construction targeted survey for Black Falcon will be conducted during the first two years of fully commissioned operation by appropriately qualified ecologists replicating the methodology of the pre-construction roaming and fixed-point surveys (Nature Advisory 2025). These surveys will continue data collection on spatial use patterns to investigate the indirect effects of the NMEP on Black Falcon by comparing post-construction and pre-construction survey data.

3.4. Carcass monitoring program

3.4.1. Purpose of carcass monitoring

Ongoing monitoring of mortality from blade strike at operating wind farms typically serves to

(i) provide data that can inform adaptive management of the collision risk (i.e., patterns of mortality related to seasonal changes, local conditions or turbine operating periods), and

(ii) detect and estimate general mortality of listed and non-listed bird and bat species for the wind farm, which can be used to understand actual bird and bat impacts.

Recorded mortality during carcass searches of a listed species may indicate spatial variation in risk levels based on the location and frequency of the carcasses found. Specifically, repeated collisions at the same or adjacent turbines (but not at others) are useful in identifying high-risk turbines or clusters.

3.4.2. Definition of a mortality

Mortality is defined as any dead bird or bat detected within the specified search radius (Appendix 1). Detection can be either during the formal carcass searches (designed to generate an estimate in accordance with a statistically rigorous sampling design) or at other times (incidental observation, often by operational staff). A protocol is triggered whenever a carcass is found, either within the formal searches or incidentally, to collect consistent and useful data on the fatality event.

It will be conservatively assumed that any bird or bat carcass, or bird feather spot (defined as a clump of five feathers or more with no associated carcass), detected beneath an operating turbine has died because of collision with turbine blades, unless there are obvious signs of another cause of death. Feather spots will be assumed to be remains of a bird carcass after scavenging and the scavenger correction factor will not be applied to them (details in Appendix 1).

3.4.3. Incidental carcass detection

During the commissioning phase of the wind farm, once turbine components are installed but not operating, a risk to birds and bats exists. Whilst the chance of collision with stationary structures is minimal compared with operating wind turbines, this risk is not negligible. Noting that active construction sites are subject to strict OH&S requirements, hence it is difficult to schedule formal carcass searches during construction. Therefore, during this time:

- There will be increased worker activity on and around turbine hardstands and surrounding areas as commissioning activities are occurring.
- Incidental carcass detection will be conducted by the Proponent's personnel and contractors who are approved to work within the construction zones that will exist around the hardstands.
- Any carcasses detected during this period will be recorded in accordance with the incidental finds protocol as described below. Awareness training will be provided to the Proponent and contractor teams to ensure that protocol can be implemented effectively.
- The incidental carcass detection will continue as the primary carcass detection method, until the formal carcass search program commences.
- Incidental carcass detection is a core element of the BBAMP to ensure impacted birds and bats can be recorded prior to the implementation of the formal carcass search program, despite site access still being limited by construction activities.

Incidental carcass detection will remain a key element of bat and bird monitoring throughout the lifespan of the project, from construction, through full operation of the wind farm and subsequent decommissioning or recommissioning. In this case, the carcass will be handled according to the Carcass Detection Protocol and the Bird and Bat Handling Protocol outlined in Appendix 1.

Incidental carcass protocol

Personnel working at the Project Site may incidentally find carcasses during construction, commissioning, day-to-day operations, and maintenance activities. In this case, the carcass will be

handled according to the Carcass Detection Protocol and Bird and Bat handling protocol outlined in Appendix 1. All construction and operation personnel will be made aware of this carcass handling protocol as part of their site training and induction.

3.4.4. Formal carcass search program

Given this is a small project, all 17 wind turbines will commence operation simultaneously, therefore no staging of the carcass search program is required. The formal carcass search program will commence within one month of the completion of reliability tests of all turbines and the wind farm is in full operation and supplying electricity. 50% of the turbines (nine) will be searched once per month once operational. This post-commissioning monitoring program will be undertaken for a minimum of two years. After two years of mortality monitoring, a detailed report will be prepared reviewing the mortality detection program and providing recommendations for the future in response to any confirmed issues—see Section 5.2 for reporting requirements. This report will be reviewed with the regulator to determine how the monitoring program will continue in a manner that responds to any confirmed significant impacts on species of concern. It provides an opportunity to focus future monitoring on key impacts detected in the initial two years of carcass searches.

The sampling design of the carcass monitoring program at NMEP aims to provide reliable estimates of both bird and bat mortality rates, together with an estimate of sampling precision. Several factors, such as carcass scavenging and carcass detectability, can affect mortality rate estimates and must be measured and included in any estimate of overall mortality rates. To account for these factors, mortalities will be adjusted using scavenger and detectability corrections as detailed in Appendix 1. Human (or canine) detectability of carcasses is also a potential confounding variable, and protocols have been developed to control this factor in the final mortality estimates (see Appendix 1 for details).

Detailed descriptions of the carcass search methodology, bird and bat handling protocol, and scavenger and carcass detectability trials are presented in Appendix 1.

3.4.5. Turbine selection

A subset of the turbines will be searched for bird and bat carcasses. The target population are the turbines themselves, and the sample population will be 50% of the entire turbine number (i.e., nine out of 17 turbines). It is the turbines that serve as proxy for the wind farm, and not the search area nor the carcass detections. The sample size has been determined based on a feasible proportion of turbines that aim to provide accurate overall mortality rates.

Turbines are initially preselected at random, and all turbines have an equal chance of being selected. However, adjustments might be made by substituting some turbines with nearby ones to avoid accessibility constraints and to ensure an approximately even distribution across the area (i.e., with no visual evidence of clustering). Selected turbines may be also subject to change upon the first survey if on-ground conditions are considered unsafe to cover most of the search radius at a particular turbine. Once turbines have been selected, these will not be changed for the duration of the formal monitoring period. This avoids inflated sampling error due to inconsistent turbine selection, enabling more accurate estimates of bird and bat mortality rates.

In addition to the randomly selected turbines, impact triggers may prompt temporal searches on unselected turbines as described in Sections 5. Note that the results of any turbine searches other than the core nine randomly selected fixed turbines may not be used in the mortality estimates as these depart from the rigorous sampling design.

For each searched turbine, basic information will be recorded, including the number of carcasses, location, and details on vegetation and habitats.

Each turbine that is searched for will have basic information recorded including number of carcasses, location and information on vegetation and habitats.

3.4.6. Estimating annual mortality due to collision

The results of the carcass searches will be analysed to provide information on:

- The species, number, age and sex (if possible) of birds and bats being struck by the turbine blades;
- separate estimated annual mortality rates for birds and all bats (and for listed species with available data), including an estimate of the number of carcasses per turbine per year; and
- any detected spatial or temporal variation in the number of bird and bat strikes.

The search results will be detailed in the first annual report. In addition to cumulative search results, the analysis and mortality estimates will be detailed in the second annual report. The latter will also identify if further investigations or mitigation measures are required. The median annual mortality rates will be reported and will be used as the benchmark to determine significant impacts. Upper and lower confidence bounds will be also reported.

In addition to the annual reports, an incident report will be prepared and provided to the relevant regulatory authorities—Australian Department of Climate Change, Energy, Environment and Water (DCCEEW) and Victorian Department of Energy, Environment and Climate Action (DEECA)—if an EPBC Act listed species is found dead or injured during carcass searches.

Mortalities will be estimated with a Horvitz-Thompson style estimator (Huso 2011), with an extract of the equations provided below.

$$\hat{M}_{ij} \cong \frac{C_{ij}}{(\hat{g}_{ij})} \quad (1)$$

where

- $\hat{M}_{ij}$ is the estimated mortalities at turbine i during search j
- C_{ij} is the number of carcasses found
- $\hat{g}_{ij}$ is the estimate of the detection probability for that search and turbine

For a given turbine, $\hat{g}_{ij}$ is a function of

$$\hat{g}_{ij} \cong a_i r_{ij} p_{ij} \quad (2)$$

- a_i is the fraction of total carcasses within the searched area (note this is *not* the same as the fraction of area searched)
- r_{ij} is the fraction of the carcasses that arrived at turbine i but have not been lost to scavenge or decay before search j
- p_{ij} is the probability that an existing carcass will be detected by the searcher

Therefore, a robust mortality program requires the following components:

- a formal mortality monitoring survey where found carcasses are recorded, to determine C_{ij}
- an estimate of the fall zone of carcasses to determine a_i (this also accounts for potentially only searching a subset of all turbines)
- scavenger trials to estimate r_{ij}
- searcher efficiency trials to estimate p_{ij}

4. Adaptive management

This section aims to establish effective and timely response measures in response to certain scenarios regarding carcass detections and includes:

- Definition of impact triggers for listed and non-listed species;
- Description of an adaptive decision-making framework for these triggers;
- Discussion of the timing and nature of mitigation measures in response to impact triggers; and
- Adoption of management measures, including corrective actions and offsets, to ensure environmental outcomes are achieved.

4.1. Impact triggers

This section identifies the circumstances that will result in notification, further investigation and additional mitigation for impact triggers. If an impact trigger is met, there must be an investigation into the cause of the impact, immediate stepped-up carcass monitoring to determine if the impact is ongoing or a one-off occurrence, and the development of mitigation measures informed by evidence-based studies.

The procedure to respond adaptively to impact triggers documented in this section will be implemented at any time an impact trigger is detected for the life of the project, from the commencement of operations until decommissioning. The aim is to understand how the impact happened or may have happened, and to identify and design targeted mitigation measures. If scientific uncertainty results in an incomplete understanding of whether an unacceptable impact is occurring this will not prevent the implementation of mitigation measures.

Ultimately, the approval holder will be responsible for implementation of the BBAMP and the decision-making that goes with it, with technical support provided by the approved expert. Importantly, a clear basis for informing and consulting with DEECA and DCCEEW is documented and will be followed.

4.1.1. Impact triggers for listed bird and bat species

Definition of impact trigger

An ***Impact Trigger*** for a listed species occurs if a bird or bat (or recognisable parts thereof) listed as threatened and/or migratory under the Commonwealth EPBC Act or Victoria FFG Act is found dead or injured within the specified search radius of turbine during any mortality search or incidentally during commissioning or operation.

In addition to the standard operating procedures for listed species, a guild-specific response has been developed for waterbirds that may pass over the Project Site to or from the nearby Kerang Wetlands Ramsar Site. A species specific response has also been developed for Black Falcon.

Operational procedure

If a listed species ***Impact Trigger*** occurs, further investigation will immediately be commenced, and the procedures outlined in Figure 2 will be followed.

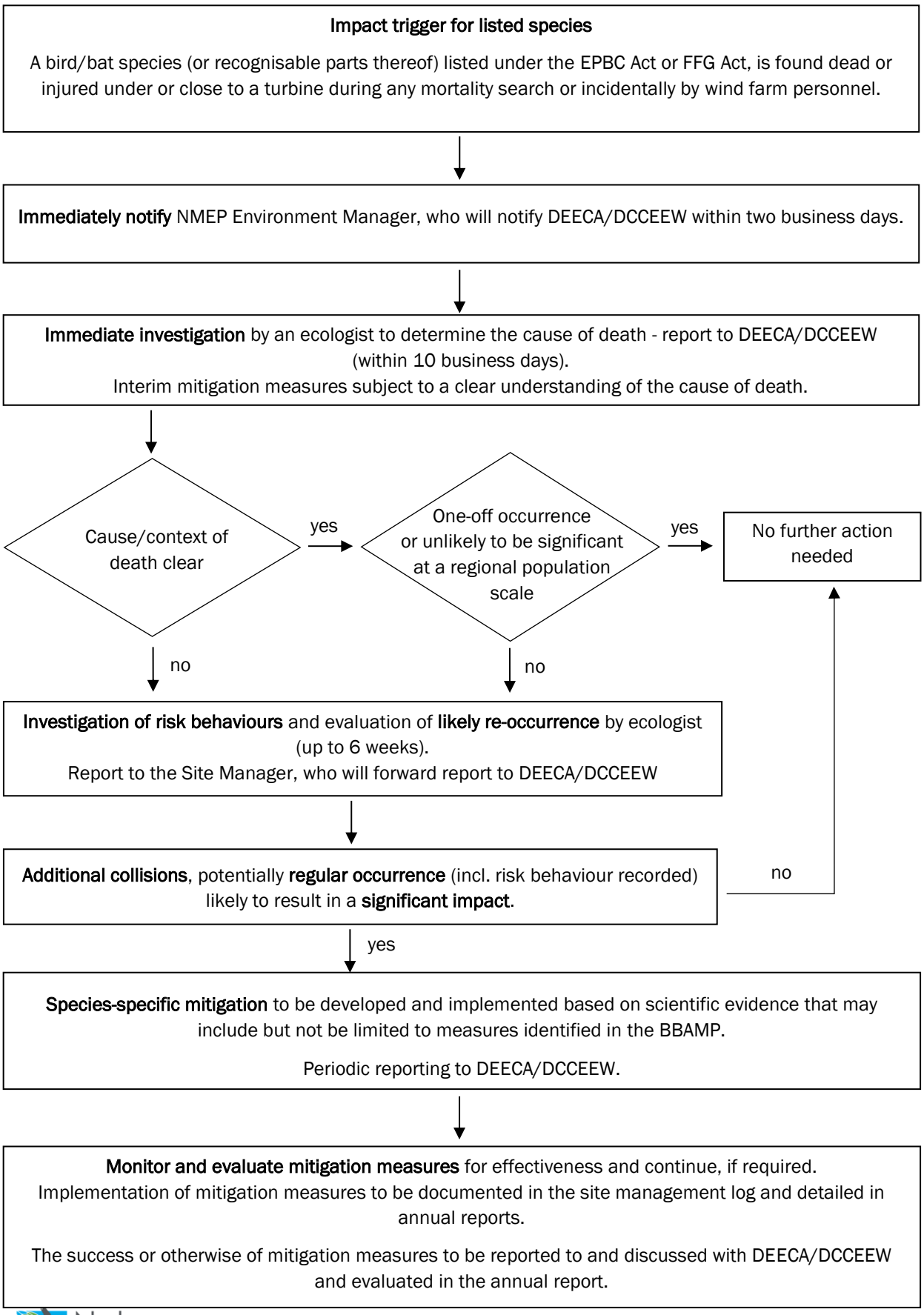
- Immediate reporting of the impact trigger to NMEP Environment Manager, who will report it to DEECA and DCCEEW (as relevant) within two business days of it being recorded.
- Immediate investigation (within 10 business days) by an appropriately qualified ecologist of the on-site occurrence of the affected bird or bat species to identify any particular risk behaviours

that could have led to the collision or could lead to further collisions. An investigation is necessary to determine the actual cause of death/injury. The investigation should focus on determining the likelihood of further occurrences (e.g., through engagement with key species experts, undertaking a literature review, assessment of habitat, etc) and identifying suitable mitigation measures for immediate implementation (see next point).

- The rapid investigation will identify, if possible, the most effective mitigation measure(s) and will ensure that the mitigation is implemented quickly.
- If the fatality is deemed to be a one-off occurrence (e.g., an extremely unlikely occurrence given a species' usual behaviour) or unlikely to result in a significant impact, no further action will be necessary.
- If the cause of the impact trigger is not clear, further onsite investigation of risk behaviours and evaluation of likely re-occurrence will be required over the following weeks (up to six weeks) in consultation with DEECA and DCCEW as relevant. If these investigations suggest that the impact trigger was a one-off or unlikely to result in a significant impact, no further action will be necessary.
- If the onsite investigation suggests that the impact trigger may be a regular occurrence or it is likely to result in a significant impact (i.e. to the species itself and/or to Kerang Wetlands Ramsar site), species-specific monitoring may be required. During the monitoring period, periodic (three-monthly at first) reports will be provided to DEECA.
- Responsive mitigation measures will be developed and implemented as needed and in a timely manner, in consultation with DEECA and DCCEEW as relevant. Examples of mitigation measures may include but are not limited to those outlined in Section 4.2.

If mitigation measures are not possible or effective, offsetting measures will be implemented, as outlined in Section 4.3. In some circumstances, both mitigation and offsetting may be required.

Figure 2: Decision-making framework for identifying and mitigating impact triggers for listed species



4.1.2. Impact triggers for non-listed bird and bat species

Definition of impact trigger

An ***Impact Trigger*** for a non-listed species occurs if a bird or bat (or recognisable parts thereof) is found dead or injured within the specified search radius during any mortality search or incidentally during commissioning or operation more than four times under the same or adjacent turbine during a two-month period. Exceptionally, the ***impact trigger for Wedge-tailed Eagle*** is set at two or more carcasses (or recognisable parts thereof) found under the same or adjacent turbines within a 1km radius within a two month period. For **non-listed waterbirds** of concern, the impact trigger is set at 5 carcasses of the same waterbird species found across the wind farm within a 3-month period.

An impact trigger for non-listed species **will not apply to ravens, magpies or introduced species** such as Eurasian Skylark; however, any detected mortalities for these species will still be reported as part of the annual reporting process

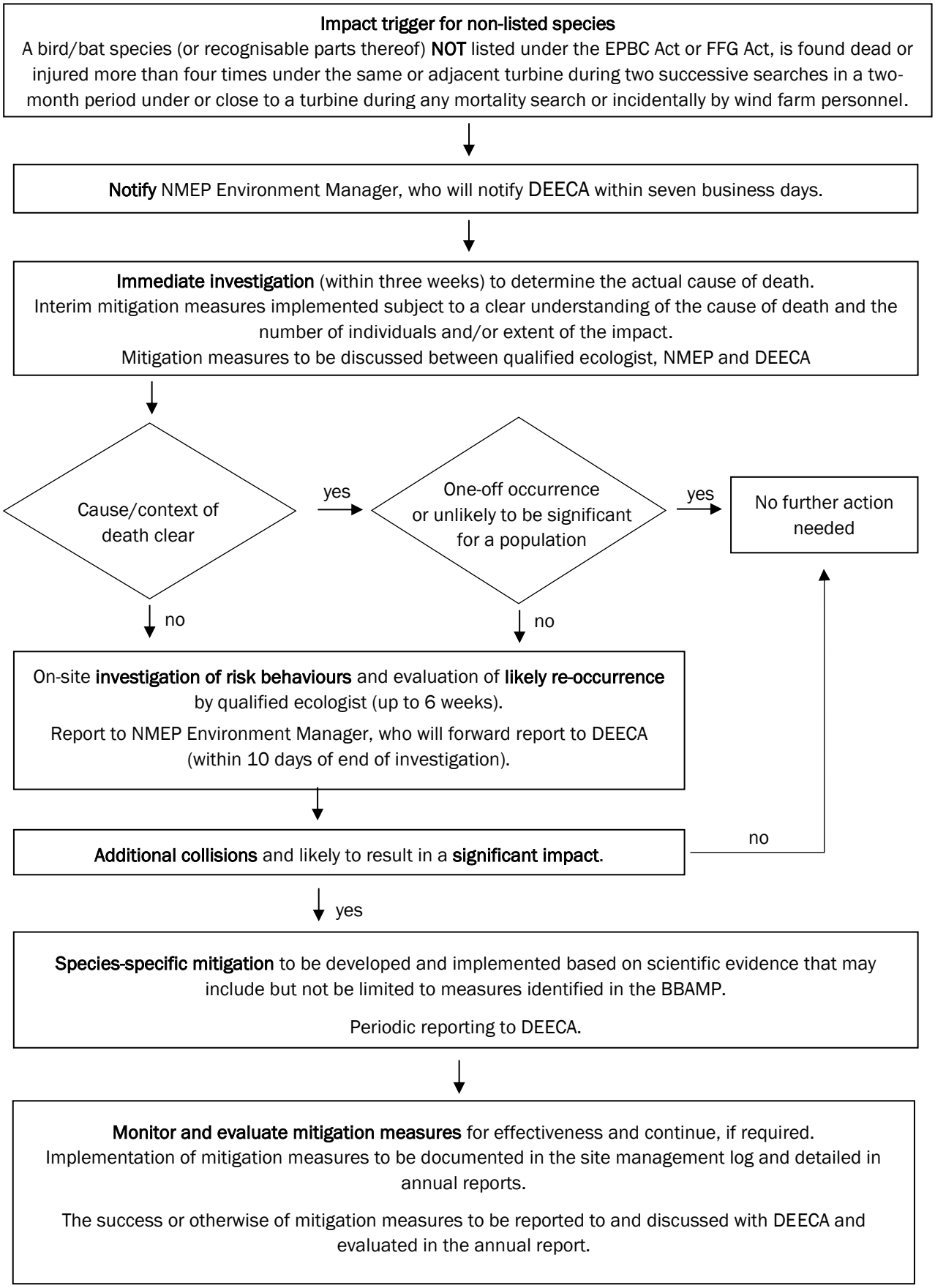
Operational procedure

If a non-listed species ***Impact Trigger*** occurs, further investigation will immediately be commenced, and the procedures outlined in Figure 3 will be followed. DEECA will be notified of the impact trigger within seven business days of recording the event. An appropriate scale to consider population effects (e.g., local, regional, entire population) will be agreed between DEECA and the proponent on a case-by-case basis with consideration given to the species in question.

A report on the investigation will be delivered to DEECA within three weeks. If the evaluation indicates that the event was a one-off occurrence or is unlikely to be a significant impact at a relevant population scale for the species in question, or to Kerang Wetlands Ramsar site, no further action will be necessary (as outlined in Figure 3). If the event is deemed to be a potentially regular occurrence or likely to be a significant impact at a relevant population scale for the species in question, species-specific monitoring may be required (Figure 3).

If the cause of the impact trigger is not clear, further onsite investigation of risk behaviours and evaluation of likely re-occurrence will be required over the following weeks (up to six weeks) in consultation with DEECA and DCCEW as relevant. If these investigations suggest that the impact trigger was a one-off or unlikely to result in a significant impact, no further action will be necessary. However, if further monitoring confirms that impacts are likely to be significant at a relevant population scale for the species in question, and/or to Kerang Wetlands Ramsar site, mitigation measures will be required. Potential mitigation measures are outlined in Section 4.2, however specific mitigation measures will be determined based on the species involved and outcome of investigations. Any evaluation of impacts and decisions regarding mitigation and/or offsets required will be undertaken in consultation with and agreement from DEECA.

Figure 3: Decision-making framework for identifying and mitigating impact triggers for non-listed species



4.2. Mitigation and management measures

The objective of mitigation and offset measures after impact triggers or as preventive measures is to ensure that the NMEP does not lead to significant impacts on listed or non-listed bats and/or birds, or other listed matters including Kerang Wetlands Ramsar site, and that the environmental outcomes set out in Section 1.2 are achieved. This approach aims to pursue a neutral net impact of the project on birds and bats, especially threatened species, in accordance with the Victorian *Planning Guidelines for Development of Wind Energy Facilities* (DTP 2023).

Mitigation measures deemed necessary will be developed and implemented and guided by the results of monitoring outcomes, mortality estimates, and/or impact triggers. A list of potential mitigation measures is provided in Appendix 2.

A monitoring program will be implemented to assess the effectiveness of ongoing mitigation measures to evaluate their success or failure with regular reporting and consultation with DEECA.

Preventive management measures

The following preventative management measures will be applied to reduce the risk of an impact trigger occurring.

Carcass removal

The presence of animal carcasses (e.g., dead livestock) can attract scavenging birds such as some species of raptor. Carcasses will be removed from the Project Site as soon as they are detected to reduce the chances of scavenging raptors colliding with turbines. The following carcass removal procedures below will be adopted:

- The NMEP operational staff will designate a Carcass Removal Coordinator who is responsible for overseeing carcass removal.
- Any carcasses found will be removed safely and quickly away from turbines and then disposed of.
- Carcass occurrence and removal will be recorded by the Carcass Removal Coordinator and incorporated into the annual report.

Lighting avoidance or reduction

Lighting can attract insects, which are prey for microbats and some species of birds. To reduce features within the wind farm that may attract additional birds or bats, there will be no turbine lighting unless specifically required by regulatory authorities or included as a condition of the Planning Permit Approval, and facility lighting will be avoided within 500 m of turbines to the extent possible. If lighting is found to or thought to contribute to collisions, further alterations to lighting may be developed.

4.3. Offsetting a significant impact

In the unlikely event that a significant impact occurs to any EPBC Act listed species, offsetting will be investigated and implemented. Offsets will be implemented in accordance with EPBC Act Environmental Offset Policy 2012 (DSEWPaC 2012). Any offset will be developed in consultation with, and approved by, DCCEEW.

5. Species-specific management strategies

At instruction from DCCEEW, a guild-specific response has been developed for the following bird group that may pass over the Project Site from the nearby Kerang Wetlands Ramsar Site:

Waterbirds of concern (see Section 2.1.1 for a list of species)

At instruction from DEECA, a species-specific response has been developed for:

Black falcon

Species-specific management strategies provide a more detailed and targeted response in the event of an impact trigger. Additional strategies may be developed for other species if operational monitoring data indicate an elevated collision risk or a significant increase in their presence on site.

5.1. Waterbirds management strategy

A framework for responding to an impact trigger involving a listed waterbird of concern (i.e., migratory and/or threatened) is outlined in Table 2 (for a list of species, see Section 2.1.1). This framework will be applied independently to individual species as required.

Table 2: Response framework in the event of an impact trigger involving a listed waterbird at NMEP.

Impact Trigger	Actions	Description	Timing
Level 1: The carcass or carcasses of a listed waterbird is recorded dead under a turbine within a single event	Label the turbine as a "high risk – impact trigger level one (T1)" turbine.	This event activates the species-specific management strategy as follows.	Immediately following mortality.
	More frequent carcass searches to assess the extent of the impact, minimise the chances of scavenging and maximise carcass detections	An additional, non-recurring 120 m radius carcass search will be undertaken at T1 and all turbines within 1.5 km of it. If one or more carcasses are detected at another turbine within a 1.5 km radius, the management strategy outlined in this table will apply independently.	Within a week of the mortality.
		The findings of the searches will be recorded and reported to DEECA/DCCEEW, as relevant, as detailed in the "Incident Investigation" action below.	Within 28 days of the mortality.
	Adaptive management and process of assignment and re-assignment of risk		
		If, for three consecutive months after the mortality event no additional fatality events occur at the T1 turbine, and it is concluded that any previous fatality was an isolated incident and that the turbine does not pose a high risk to the listed species, no further mitigation actions will be required.	Within three consecutive months from the date of the mortality.
		If, following an investigation by a qualified ecologist, the fatality is unlikely to be a one-off event or if an ongoing impact is likely to be significant for the species, the T1 turbine and all other turbines within a 1.5 km radius (including those not initially selected for formal carcass searches) will undergo 120 m radius searches during monthly carcass surveys. These searches will continue for one year. If no further mortalities are found over this period, the turbine will be reassigned again as 'low risk.'	For one year from the date of the mortality.
	Incident Investigation	Submit a report to the Responsible Authority.	Within 28 days of the mortality.
		The investigation will seek to assess any relevant attributes associated with the mortality event.	

Impact Trigger	Actions	Description	Timing
		The report will include: ▪ Date and time of mortality, ▪ Identify, if possible, wind direction and speed when the bird was struck, ▪ Weather conditions, ▪ Location of mortality relative to habitat, vegetation, and water sources, ▪ Analysis of any other mortality on the site. ▪ Conclusions of investigation regarding risk to the species and likelihood of further mortalities on site, and ▪ Recommendations for future actions to mitigate impacts on the species.	
Level 2: A second carcass or carcasses of the same listed waterbird species are detected under a turbine assigned as "high risk" under Trigger 1) during a subsequent search.	Label the turbine as a "high risk – impact trigger level two (T2)" turbine.	This event activates the species-specific management strategy as follows.	Immediately following mortality.
	More frequent carcass searches to assess the extent of the impact, minimise the chances of scavenging and maximise carcass detections	An additional, non-recurring 120 m radius carcass search will be undertaken at T2 and all turbines within 1.5 km of it. If one or more carcasses are detected at another turbine within a 1.5 km radius, the management strategy outlined in this table will apply independently.	Within a week of the mortality.
		The findings of the searches will be recorded and reported to DEECA as detailed in the "Incident Investigation" action below.	Within 28 days of the mortality.
	Adaptive management and mitigation	Targeted monitoring of the species activity will include locations, flights at RSA, movement patterns and nesting activity, along with the timing and possible reasons for periods of higher risk.	Monthly for three months, starting within two weeks of the mortality event.
		Mitigation measures, if required and agreed, are to be implemented in consultation with DEECA/DCCEEW, as relevant, and adapted according to the affected species.	Implementation within four weeks of the mortality event, with mitigation measures remaining in place for one year.
		If, following an investigation by a qualified ecologist, the fatality is suggested to be part of an ongoing impact and is significant for the species, the T2 turbine and all other turbines within a 1.5 km radius (including those not previously selected for carcass searches) will be included in an additional round of 120 m radius searches during monthly carcass surveys. These searches will continue for one year.	For one year from the date of the mortality. For migratory species, it only applies during the migratory period when the species is present.

Impact Trigger	Actions	Description	Timing
		Technological advances, such as proven smart curtailment systems using optical or radar technologies, will be considered for implementation (e.g., Bioseco®, IdentiFlight ®). These systems may complement or replace ongoing mitigation measures.	
	Incident Investigation	Submit a report to the Responsible Authority.	Within 28 days of the mortality.
		The investigation will seek to assess any relevant attributes associated with the mortality event.	
		The report will include: ▪ Date and time of mortality, ▪ Identify, if possible, wind direction and speed when the bird was struck, ▪ Weather conditions, ▪ Location of mortality relative to habitat, vegetation, and water sources, ▪ Analysis of any other mortality on the site. ▪ Conclusions of investigation regarding risk to the species and likelihood of further mortalities on site, and ▪ Recommendations for future actions to mitigate further impacts on the species.	
Level 3: A third carcass or carcasses of the same listed waterbird species are detected under a turbine assigned as "high risk" under Trigger 2) during a subsequent search.	Label the turbine as a "high risk – impact trigger level three (T3)" turbine.	This event activates the species-specific management strategy as follows.	Immediately following mortality.
	More frequent carcass searches to assess the extent of the impact, minimise the chances of scavenging and maximise carcass detections	An additional, non-recurring 120 m radius carcass search will be undertaken at T3 and all turbines within 1.5 km of it. If one or more carcasses are detected at another turbine within a 1.5 km radius, the management strategy outlined in this table will apply independently.	Within a week of the mortality.
		The findings of the searches will be recorded and reported to DEECA/DCCEEW, as relevant, as detailed in the "Incident Investigation" action below.	Within 28 days of the mortality.
	Adaptive management and mitigation	Monthly carcass searches for three months at T3 and all turbines within 1.5 km. Unchanged unless additional turbines not previously selected are identified; these will be added during the three-month period.	Targeted activity monitoring monthly for three months, starting within two weeks of the mortality event.

Impact Trigger	Actions	Description	Timing
		Targeted monitoring of the species activity will include locations, flights at RSA, movement patterns and nesting activity, along with the timing and possible reasons for periods of higher risk.	
		Mitigation measures will be implemented to effectively address significant impacts in consultation with species experts and DEECA/DCCEEW, as relevant, and adapted to the affected species. These measures may include, but are not limited to, smart curtailment systems (e.g., Bioseco®, IdentiFlight®).	Implementation within four weeks of the mortality event. Additional or alternative technological mitigations will be implemented as soon as reasonably possible, considering factors such as effectiveness, equipment procurement, and installation timeframes. Some measures may require indefinite operation (i.e., for the lifetime of the Project), subject to consultation with DEECA.
		An assessment of population-level impacts will be conducted to evaluate the effectiveness of the applied mitigation measures and the estimated impact over the current year. The results will be presented and discussed with DEECA/DCCEEW, as relevant, to determine if a new set of actions is necessary, which may include curtailment or temporary shutdowns if evidence indicates that a significant impact at the population level is anticipated and no effective measures are granted.	Within four consecutive months from the date of the mortality.
	Incident Investigation	Submit a report to the Responsible Authority.	Within 28 days of the mortality
		The investigation will seek to assess any relevant attributes associated with the mortality event.	
		The report will include: ▪ Date and time of mortality, ▪ Identify, if possible, wind direction and speed when the bird was struck, ▪ Weather conditions, ▪ Location of mortality relative to habitat, vegetation, and water sources,	

Impact Trigger	Actions	Description	Timing
		▪ Analysis of any other mortality on the site, ▪ Conclusions of investigation regarding risk to the species and likelihood of further mortalities on site, and ▪ Recommendations for future actions to mitigate further impacts on the species.	

5.2. Black Falcon Management Strategy

5.2.1. Black Falcon monitoring

After operations commence, monthly monitoring of diurnal raptor flight movements and breeding activity (during the breeding season, i.e., late autumn to late spring; Debus 2023) is required to determine whether operating turbines affect the behaviour of Black Falcon in particular. This raptor monitoring can be incorporated into the initial two-year monthly carcass monitoring program and will initially operate for the first two years of operational monitoring.

Monitoring will involve searching for flying diurnal raptors from the turbine search sites during searches (one scan every minute or so of searching) and incidental recording of raptors when moving between search sites.

Information recorded will include, as a minimum:

- Date, location and duration of observation period
- Time and duration of flight
- Flight height
- Distance from observer
- Count
- Sex, age, moult of birds (where discernible)
- Other occasional behaviours including feeding, territorial displays, fighting and perching.

Flight paths will be plotted as accurately as possible on large-scale aerial photographs or satellite imagery of the site.

All nesting sites found during this operational monitoring within the Project Site will be recorded, and revisited monthly, including those identified during pre-construction surveys. It is known that nests may be occupied for multiple years, if they remain intact (Debus 2023). Active nests used by Black Falcon for breeding will be monitored monthly during the breeding period (autumn to late spring) by qualified ecologists to record breeding activity and outcomes.

The monitoring program may identify nesting sites and activity around turbines that indicate a higher collision risk in certain areas or in proximity to specific turbines. To prevent reaching an impact trigger, preventive mitigation measures are recommended, especially given the Critically Endangered status of this diurnal raptor under the FFG Act.

5.2.2. Impact triggers and mitigation responses

Specific trigger actions in response to Black Flacon impact trigger will be implemented as follows. Reporting will follow the requirements in Section 6, as well as incident-specific correspondence and reports to DEECA, which will require discussion and feedback.

Impact trigger: A single Black Falcon is recorded dead or injured, or a feather spot of this species is found under a turbine or turbines within a single event (i.e., over the length of one search period or incidentally).

Actions for impact trigger will comprise the following.

- Immediate investigation and monitoring of location, numbers and timing of the species activity (Figure 2: Decision-making framework for identifying and mitigating impact triggers for listed species) to understand the factors which led to the collision and whether they are still occurring (e.g., individuals flying at RSA between or close to turbines, nesting nearby, weather pattern, location, timing, tractor activity, fire).

If following this investigation by the suitably qualified ecologist, the fatality is not deemed to be a one-off occurrence, or an ongoing impact is likely to be significant for the species, targeted monitoring will recommence to increase understanding of species movements/patterns, including the timing and possible reasons for periods of higher risk.

- Implement mitigation measures as soon as reasonably possible depending on likely effectiveness, equipment procurement and installation timeframes. Mitigation measures include but are not limited to:
    - Investigate options and education of relevant stakeholders to minimise grain spillage to prevent attracting prey species to the Project Area, avoid stock being fed grain underneath and within 250m of turbines, and avoid birthing of stock underneath or within 250m of turbines.
    - Manage roadkill within the project area to void attracting black falcon to the site.
    - Manage (by ripping) rabbit warrens to reduce prey availability.
    - Offsetting by protecting and/or enhancing critical habitat elsewhere or supporting research and breeding programs could be considered.
    - Installing nest platforms to promote breeding in areas away from the wind farm.

The following steps will be undertaken following the implementation of any of the above mitigation measures:

- Monitor and review effectiveness of mitigation measures.
- Consult with DEECA regularly on findings and when evaluating mitigation measures for their suitability.
- Follow the reporting protocols and lines of responsibility in Sections 6-8 of this draft BBAM Plan.

6. Reporting and review

This section of the plan outlines the main reporting arrangements for this BBAMP. Specific reporting guidelines may also be discussed in their respective sections, and therefore further clarification should be sought in those sections if sufficient detail is not provided below. Review meetings may be required after reports are submitted and therefore the actual date of these meetings will be determined in a responsive manner.

Standard BBAMPs undertake monitoring for a minimum of two years after the commencement of wind farm operations. This BBAMP outlines a two-year program. This management plan is adaptive, in that results in one year may influence monitoring in the following year. A review of results and impacts will be undertaken after the first year to inform any requirements for change to the second year of monitoring.

New technologies may also become available that are more time or cost efficient to implement or more effective. The scope of any changes to monitoring would be developed in consultation with DEECA and be subject to their approval.

The first annual report will be prepared after twelve months of monitoring. This will focus on presenting the results from each year of carcass monitoring. Matters to be addressed in the annual reports include but will not be limited to the following.

- Summary of post-construction carcass search results, including scavenger and detectability trials and total survey days
- Discussion of any apparent seasonal or yearly variation in the number of bird or bat strikes within the first year
- Summary of bird utilisation surveys, microbat surveys, and targeted monitoring
- Summary of any additional targeted monitoring surveys that were required (if relevant) as part of mitigation measures or species-specific monitoring in response to impact triggers
- Changes to and final protocol of the methodology, for example, alterations to duration and frequency and areas sampled
- Once available, this report will be presented to a review meeting with the Regional Manager at DEECA (or their delegate) and the Responsible Authority. The results of the carcass searches (including the scavenger and observer efficiency trials) will be reviewed and refinements to the monitoring program (if necessary) will be agreed
- Raw data and the annual report will be submitted to DEECA and the Responsible Authority within three months of completion of 12 months of mortality monitoring.

The **second annual report** will comprehensively analyse two years of monitoring and will include but will not be limited to the following.

- Detailed monitoring methods (including list of observers, dates and times of observations)
- Summary of post-construction carcass search results, including scavenger and detectability trials and total survey days
- Overall mortality estimates for birds and bats, including estimates by size classes and for specific species where statistically possible, analysed by a suitably qualified statistician, and detected numbers for all species recorded during the carcass searches

- Any other mortality recorded on site but not during designated carcass searches (i.e., incidental records by site personnel, etc.)
- Comparison of bird utilisation surveys with pre-construction surveys, and a summary of microbat and targeted monitoring
- Summary of any additional targeted monitoring surveys that were required (if relevant) as part of mitigation measures or species-specific monitoring in response to impact triggers
- A discussion of the results, including the following:
    - Whether the level of mortality was ecologically significant or affected listed species of birds or bats (including species of concern to DEECA). If a Population Viability Assessment (PVA) exists for the affected species, it will be used in consultation with species experts to provide an objective and quantifiable approximation of the consequences of impacts
    - Any differences between years that may have arisen due to wet and dry conditions
    - Any recommendations for reducing mortality, if necessary
    - Any mitigation or offset measures implemented, and the success or otherwise of these measures.
- Raw data and the annual report will be presented to the Regional Manager at DEECA (or their delegate) and the Responsible Authority within three months of completion of the 24-month monitoring period.

Following completion of two years of monitoring, results will be reviewed by DEECA and the Responsible Authority to determine if further monitoring and reporting are required. If it is deemed the program should continue as is, the methodology and scope will be similar to that outlined in this report. If changes are required, an amended method will be developed in consultation with and approval of DEECA.

If an impact trigger is detected, NMEP will notify DEECA via email within two working days for listed species and seven working days for non-listed species of the impact trigger being recorded, in line with Section 8 of this BBAMP.

7. Report timing

Management actions, survey details and report timelines for post-construction bird and bat impact monitoring are summarised in Table 3.

Table 3: Timeline for surveys and reporting to DEECA and the Responsible Authority after commissioning of turbines at the NMEP.

Report title	Details	Report timing	Responsible
Carcass searches	50% of the turbines (nine) will be searched every month, initially for a minimum of two years. The methodology will be subject to a review after a year with any refinements to the method implemented in consultation with and with the approval of DEECA. Continuation of searches after two years would depend on the extent of significant impacts on bird and bat populations of concern in conversation with DEECA.	Incorporated into annual reports.	Qualified ecologist
Impact trigger reports (incl. species of concern)	Impact triggers for listed species outlined in Section 4.1.1 require immediate notification (and action) to DEECA and relevant authorities as per Figure 2.	Inform DEECA within 2 business days of a listed species impact trigger. Initial report to DEECA within 10 days of impact trigger.	Proponent
	Impact triggers for non-listed species outlined in Section 4.1.2 require reporting (and action) to DEECA and relevant authorities as per Figure 3.	Inform DEECA within 7 business days of a non-listed species impact trigger. Initial report to DEECA within three weeks of impact trigger.	Proponent
First year report	Comprehensive report of surveying methods and results (given mid-collection), a summary of carcass search results, operational BUS, microbat and targeted monitoring. Review of methodology and results to inform ongoing monitoring. Discussion may include recommendations.	Where significant changes are required for carcass monitoring methods, these will be immediately notified, and revisions prepared in consultation with DEECA. Full reporting will be provided three months after one year of monitoring.	Proponent

Report title	Details	Report timing	Responsible
Second year report	Comprehensive report of two years of surveying methods and results, including annual mortality estimates, comparisons between operational and pre-construction BUS and a summary of microbat and targeted monitoring. Discussion will include (but not limited to) any significant impacts and implications for future monitoring, if required, including the frequency and duration of further surveys on target species or fauna groups.	Where significant changes are required for carcass monitoring methods, these will be immediately notified, and revisions prepared in consultation with DEECA. Full reporting will be provided three months after two years of monitoring.	Proponent

8. Roles and responsibilities

This section identifies all stakeholders involved in the implementation and oversight of this BBAMP and their respective responsibilities.

8.1. Proponent/Project owner

The proponent/project owner will be responsible for implementation of all aspects of this BBAMP and the decision-making that goes with it, with technical support provided by a qualified ecologist.

8.2. Qualified ecologist

The qualified ecologist will be retained by the proponent to provide advice on and oversee the implementation of this BBAMP, as well as prepare all reports for DEECA and assist in the development of mitigation measures and their implementation, as well as consultations with DEECA on suitable measures.

8.3. DEECA

DEECA will receive reports from the proponent arising from the routine (e.g., annual reports or reports of listed species impacts) or impact trigger response reporting. It will also be responsible for participating in conversations reviewing proposed mitigation measures, and ultimately working with the proponent to ensure what is done is to its satisfaction.

8.4. Minister for Planning

The Responsible Authority (Minister for Planning) will ultimately determine the acceptability of impact mitigation and offset measures and will receive all reporting (both routine and impact trigger response reporting).

9. References

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Appendix 1: Carcass search protocol

Searches will be undertaken by qualified ecologists or personnel trained in carcass searches, with potential use of scent dogs if available, all under the regular oversight of the supervising ecologist.

The search area beneath each turbine has been determined as the area to find bats and bird carcasses with turbines of this size (Hull & Muir 2010). Based on applying the Hull and Muir model to the NMEP turbine model, 95% of bat carcasses are expected to be found within 74m of the turbine, and carcasses of medium to large birds are expected to be reasonably evenly distributed out to 122m. Carcasses of very large birds (e.g., Wedge-tailed Eagle) may be found a little further out, but 95% are expected to be within 130m of the turbine.

50% of the turbines will be searched once per month once operational. Each search and carcasses found will be documented in the form provided in the Onshore Wind Farm Guidance under Australia's national environment law (available at: https://consult.dcceew.gov.au/onshore-wind-farm-guidance).

Human searcher option

Given this, inner and outer circular search zones have been designated. The inner zone targets the detection of carcasses of bats and small to medium and large sized birds. In the inner zone, a circle is formed with a 70m radius from the turbine and transects are spaced every 6m (Figure 1). The outer zone will comprise the zone between the 70m and 130m radius circles. Although they may be recorded in the inner zone, the outer zone will ensure the adequate detection of carcasses of medium to larger sized birds, which can fall further away from turbines. Search transects in the outer zone are spaced at 12m and carried out from the edge of the inner zone out to the edge of the outer zone.

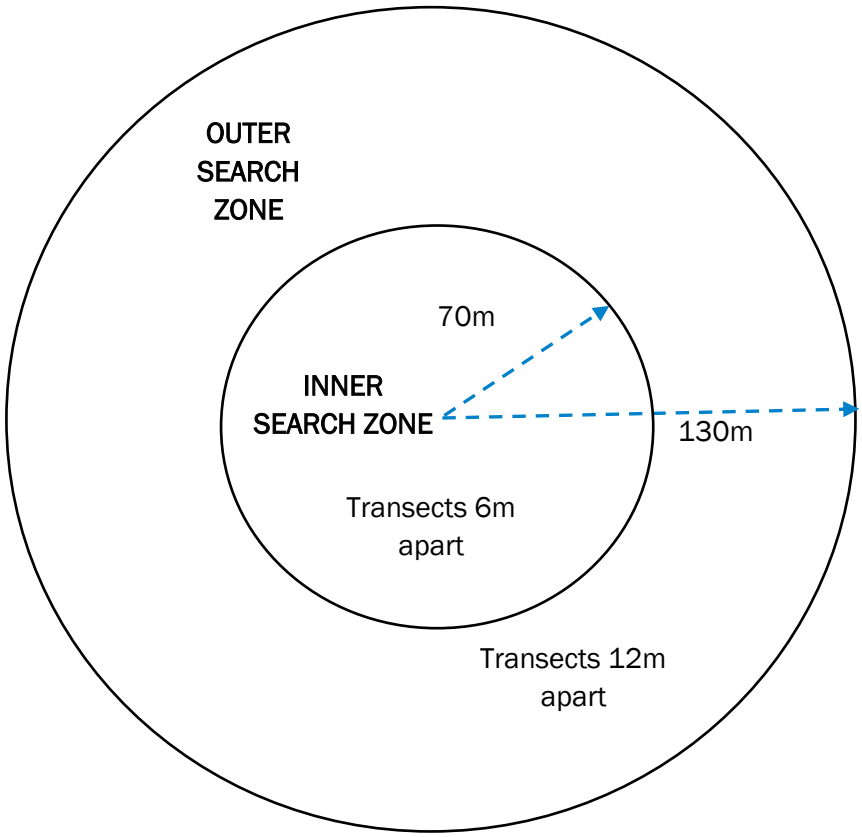

Figure 1: Inner and outer carcass search zones underneath the turbines

Scent dog option

Trained dogs could also be used to undertake the carcass searches. Trained dogs are preferred over humans for undertaking carcass searches due to their detectability capacities (Bennett 2014). However, this will depend upon the availability of trained dogs and dog handlers familiar with the territory and with the appropriate skills to undertake the searches. Searching protocol will be based on a minimum detection ability where dogs must maintain at a searcher efficiency of 50% or greater during efficiency trials. If both humans and dogs are used, this factor will be corrected in the searcher efficiency trials as outlined below.

If dogs are used for the searches, a suitable method will be developed in conjunction with their handler. This will generally involve the dogs working on a reference transect line from downwind to upwind. The handler will start down wind of the turbine and walk across the direction of the wind allowing the dog to freely zig zag across the searcher's transects, using whistle commands to control how far the dog moves to each side of the transect (i.e., 20 metres). This will ensure all scent cone areas will be encountered (Figure 2). The dog does not 'look' for carcasses but finds them via scent. Therefore, it does not need to cover as much ground as if it were looking with its eyes. It only needs to cover enough ground to encounter all possible 'scent cones' within the search radius. Carcasses found outside the defined search area will be recorded and collected as an incidental find.

The scent cone is the area downwind of the target, in this case a carcass, in which the scent will drift with the wind. So, if the wind is strong; the scent will drift further but in a narrower scent cone, and if the wind is light, the scent cone will be wider but will not drift as far. In the case of strong wind, then transects will need to be narrow to ensure scent cone areas are encountered. Whereas transects of approximately 20 metres wide will be adequate to cover an area in moderate wind conditions, this will be reduced in conditions with no wind or strong wind.

A GPS collar will be fitted to the dog which will allow the handler to track movements in real time and allow the handler to ensure the entire search area has been effectively covered by the dog. Search areas will be loaded onto GPS prior to commencing searches to allow the handler to see the exact borders of the area and the dog's movements within it. GPS data will be made available to regulators on request.

Dog handler(s) must have demonstrated capacity to identify bird and bat species of south-east Australia.

Search regime

50% of the turbines will be searched out to 130 metres once per month. The order of turbines searched will be randomized between searches.

To maximize detectability, particularly for species prone to quicker scavenging than larger ones such as small birds and bats, a secondary 'pulse' search will be undertaken every month during the first year of the monitoring program. After this search period, the requirement for another 12 months of pulse searches will be reviewed in the first annual report depending on the species and numbers of carcasses found.

Pulse searches entail searching in the same way the 'inner zone' (out to 70 metres) again after the initial search. This ensures most species of concern are unlikely to be missed during a search round and helps to promptly identify any collisions at the start of wind farm operations, enabling efficient and timely responses if needed.

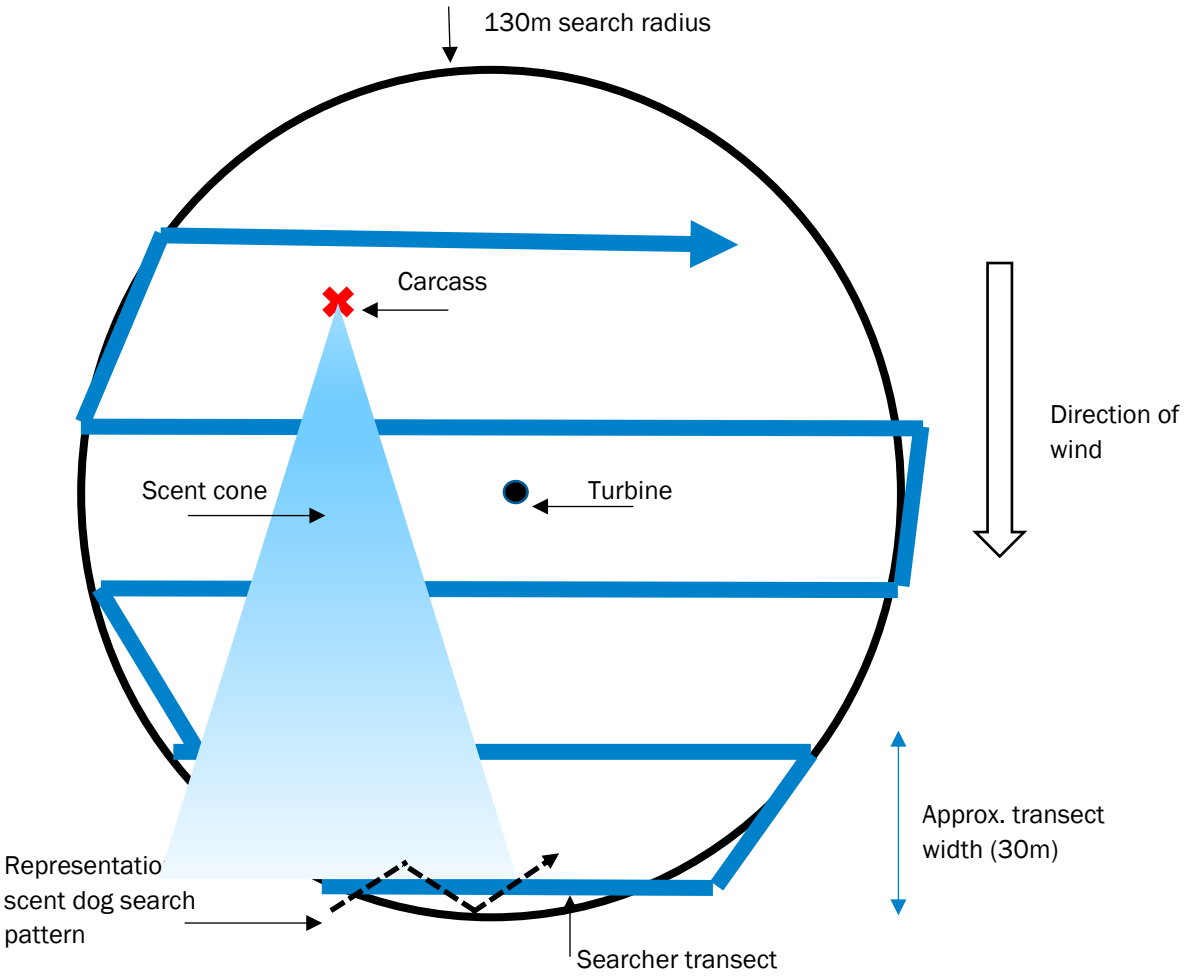

Figure 2: Search pattern for scent dog – across the wind turbine search radius

Carcass detection protocol

This carcass detection protocol applies to both incidental carcass finds and the formal carcass search program. If a carcass is detected (a 'find') the following variables will be recorded in the Mortality Survey Data template provided by in the Onshore Wind Farm Guidance under Australia's national environment law (available at: https://consult.dcceew.gov.au/onshore-wind-farm-guidance). Included in this form or as additional notes, the following information will be recorded:

- Position of carcass in relation to the turbine i.e. distance in metres and compass bearing of the carcass from the base of the turbine;
- substrate and vegetation;
- species, age, number, sex (if possible), signs of injury and estimated date of strike;
- weather (including recent extreme weather events, if any), visibility, maintenance of the turbine and any other factors that may affect carcass discovery; and
- if the species is not able to be immediately identified (e.g., an incidental find, and there is not an ecologist on site), photographs must be provided to the qualified ecologist immediately for

identification purposes. The ecologist must reply within two business days, for the possible reporting of an impact trigger. If carcass identification is not possible and there is a suspicion it may be a listed species or species of concern, samples will be sent for DNA analysis.

Bird and bat handling protocol

Carcasses will be handled according to standard procedures, as follows:

- The carcass will be removed from the turbine site to avoid re-counting;
- the carcass will be handled by personnel wearing rubber gloves, packed into a plastic bag, then placed in a second plastic bag;
- the clearly labelled by including a copy of its completed Carcass Search Data Sheet in the second plastic bag to ensure that its origin can be traced later, if required; and
- the double-bagged and wrapped carcass will be transferred to an on-site freezer (at the Project Site office) for storage. The carcass will be available for a second opinion on the species identity, if necessary, and for use in scavenger and detectability trials. The freezer will only be used for holding carcasses and not for other uses.

It will be necessary for the wind farm operator to obtain from DEECA a permit under the *Wildlife Act 1975* (Vic) to handle and keep native wildlife (even dead wildlife) as part of the monitoring program. An application for this permit will be submitted in a timely manner to ensure approval has been obtained prior to commissioning of the turbines. An application for this permit will be submitted in a timely manner to ensure approval has been obtained prior to commissioning of the turbines. Collected carcasses will be retained for 12 months prior to disposal.

In addition to carcass handling, the protocol also covers the response to injured wildlife encountered on site. All on-site staff and monitoring personnel will be advised of the correct procedure for assisting injured wildlife. Construction and Operations personnel who find injured wildlife will be required to report the find to the Project's Responsible Officer, who will organise recovery of, and treatment for the animal. If safe to do so, place the animal immediately into a dark place, e.g., box or cloth bag for transfer to the nearest wildlife carer or veterinarian. Alternatively, Wildlife Victoria (1300 094 535) will be contacted and informed of any injured wildlife. A member of that organisation will be required to collect any wildlife injured.

Contact details of local veterinary staff and wildlife carers are provided in Table 1 to ensure that if injured wildlife is found and cannot readily be released back to the wild, they are treated accordingly and in a timely manner.

All persons who handle injured or dead animals must wear gloves and understand the applicable OH&S requirements. Special care[1] will be taken to avoid bat borne viruses (i.e., Australian Bat Lyssavirus and Hendra Virus), and only people with appropriate vaccinations will handle bats (living or deceased).

The Injured Bird and Bat Protocol is valid for two years after commissioning and will be reviewed after this time frame. If it requires change this will be included in an amended BBAMP.

[1] Infectious diseases: guidelines and advice (https://www.health.vic.gov.au/public-health/infectious-diseases-guidelines-and-advice, accessed April 2022)

Table 1: Vet and wildlife carer details for the local region

Name	Phone	Location/Address	Bats (Y/N?)
Erin O'Bree – Wildlife Rescue	0408 122 863	Swan Hill, VIC	Yes
Border Veterinary Services	03 5452 2094	Kerang, VIC	No
Cohuna Veterinary Clinic	03 5456 2666	Cohuna, VIC	No
Border Vet Clinic	03 5453 3159	Barham, NSW	No

Scavenger rate and detectability (searcher efficiency) trials

This BBAMP does not propose project-specific scavenger trials or searcher efficiency trials and instead adopts the findings of the Symbolix report *Post construction bird and bat monitoring at wind farms in Victoria* (2020) as summarised in Table 2 and 3.

Table 2: Searcher Efficiency

Observer/Searcher	Species Type	Searcher Efficiency	Confidence Interval
Human	Bird	88%	[85%, 91%]
Human	Bat	52%	[44%, 61%]
Dog	All (Bird or Bat)	84%	[80%, 88%]

Table 3: Carcass loss to scavenge

Category	Average number of days to be scavenged	Confidence Interval
Large birds (Wedge-tailed Eagle)	287 days	[130.1, 634.5]
Other birds	5.68 days	[4.75, 6.79]
Bats	2.69 days	[2.11, 3.43]

The results of the Symbolix report will be used in the analysis of on-site mortality data to correct for searcher efficiency and scavenger removal rates. Estimates of carcass removal by scavengers (expressed as the average carcass duration) will correct for scavenging effects on carcass detection. As there is no evidence for significant seasonal variation in scavenger activity, general scavenger and detectability correction factors will be applied instead of seasonal estimates.

References

Bennett, E 2014, Observations from the use of dogs to undertake carcass searches at wind farm facilities in Australia. *Wind and Wildlife* 1: 113–123.

Hull CL and Muir S 2010, Search areas for monitoring bird and bat carcasses at wind farms using a Monte-Carlo method. *Austr. J. Env. Management* 17: 77-87.

Symbolix 2020, Post Construction Bird and Bat Monitoring at Wind Farms in Victoria, Melbourne. Public report, 13th Wind Wildlife Research Meeting 2020.

Appendix 2: Mitigation measures

Mitigation measures deemed necessary will be developed and implemented and guided by the results of monitoring outcomes, mortality estimates, and/or impact triggers. These mitigation measures may include but not limited to the following:

- Habitat modification, vegetation planting/removal (e.g., perches, stags, fire exclusion, reduced grazing);
- If any land use practice engaged in by landowners is found to contribute to an increase in trigger events, landowners may be engaged with to negotiate potential changes in practice and/or to promote awareness. Changes in land use practices (e.g. including timing of cropping/sowing, stock management, stock grain-feeding, lamb tail docking) near turbines, would be subject to negotiation with landowners;
- Deterrence measures (including acoustic or visual deterrents, including ultrasound for bats);
- Changes to lighting of turbines (noting the general requirements below);
- Temporary or targeted turbine curtailment for high-risk periods/locations (e.g., during cropping/sowing if this is found to coincide with an increase in trigger events, or during the day nearby active nests of the targeted species, based on on-site monitoring and if determined necessary by a qualified ecologist);
- Temporary curtailment during farming activities that attract raptors (e.g., stubble burning or tractor operations that flush prey; Moloney et al. 2019), particularly if a Black Falcon impact trigger is activated (see Section 4.1.1). Turbine shutdowns may be arranged when such activities occur within 1 km of turbines, or another distance if supported by site-specific data.
- Feathering turbines, to limit blade rotation when turbines are not generating electricity (e.g. potentially applied during high-risk periods to a turbine that is found through monitoring to have a high risk to microbats). This measure has been shown to significantly reduce microbat fatalities, particularly since microbats exhibit heightened activity at low wind speeds (Arnett et al. 2013; Whitby et al. 2024); and
- Bird protection systems that automatically curtail turbines on approach to reduce raptor fatalities, either as turbine-specific solutions (e.g., Bioseco®, Szurlej-Kielanska and Pilacka 2022) or as multi-turbine network systems (e.g., IdentiFlight®, Duerr et al. 2023).