

# Gelliondale Wind Farm

## Bat and Avifauna Management Plan DRAFT

**Prepared for Synergy Wind Pty Ltd**

December 2024  
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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

The following table outlines the revisions made to this document.

Version	Date	Description	Prepared By	Reviewed by	Approved by
1.0	28/10/2024	First draft	Robin Leppitt (Senior Zoologist)  Sergio Nolazco Plasier (Senior Zoologist)	Kylie Patrick (Senior Ecologist & Project Manager)	Inga Kulik (Director)
1.1	10/12/2024	Second draft	Inga Kulik		Inga Kulik (Director)

DRAFT

## Authorisation

In making this declaration, I am aware that Section 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed

---

Full name (please print)

Organisation (please print)

Date

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### Acronyms/Abbreviations

<b>BACI</b>	Before-After-Control-Impact
<b>BAM Plan</b>	Bird and Avifauna Management Plan
<b>BUS</b>	Bird utilisation survey
<b>Cwth</b>	Commonwealth
<b>CRM</b>	Collision Risk Model
<b>DEECA</b>	(VIC) Department of Energy, Environment and Climate Action (previously DELWP)
<b>DELWP</b>	(VIC) Department of Environment, Land, Water and Planning (dissolved)
<b>DCCEEW</b>	(Cwth) Department of Climate Change, Energy, the Environment and Water
<b>DTP</b>	(VIC) Department of Transport and Planning.
<b>EPBC Act</b>	(Cwth) <i>Environment Protection and Biodiversity Conservation Act 1999</i>
<b>FFG Act</b>	(VIC) <i>Flora and Fauna Guarantee Act 1988</i>
<b>GWF</b>	Gelliondale Wind Farm
<b>MNES</b>	Matters of national environmental significance under the EPBC Act
<b>OH&amp;S</b>	Occupational Health and Safety
<b>RSA</b>	Rotor swept area (40-210 m)
<b>WTG</b>	Wind turbine generator

*Glossary*

<b>Carrion</b>	The dead and decaying flesh of an animal that serves as a food source for scavengers such as some raptors.
<b>Commissioning</b>	All activities, including turning of turbines, after the components of the wind turbines are installed.
<b>Construction</b>	The period between the commencement of works on site and the commissioning of the last wind turbine, and the commencement of full operation of the wind farm
<b>Full operation/operation</b>	Once all wind turbines are commissioned and can operate simultaneously.
<b>Listed species</b>	Any bird/bat species listed as threatened or migratory under the EPBC Act or listed as threatened under the FFG Act.
<b>Non-listed species</b>	Any bird/bat species not listed as threatened or migratory under the EPBC Act or not listed as threatened under the FFG Act/NC Act.
<b>Suitably qualified bird and bat ecologist</b>	A person who has relevant professional qualifications and at least three years of work experience undertaking bird and bat utilisation surveys in Australia and can give an authoritative assessment and advice on bird and bat utilisation surveys using relevant protocols, standards, methods, and/or literature.
<b>Suitably qualified ecologist</b>	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.

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# 1. Introduction

## 1.1. Background

Synergy Wind Pty Ltd (Synergy) engaged Nature Advisory Pty Ltd to develop a Bat and Avifauna Management Plan (BAMP) for the proposed Gelliondale Wind Farm (GWF). This draft BAMP will accompany the permit application to demonstrate the measures proposed to mitigate the identified collision risk. Any approval conditions will be incorporated into the final BAMP.

The proposed wind farm is located approximately 7 kilometres south-west of Yarram, 3 kilometres west of Alberton, 8 kilometres east of Welshpool, and 167 kilometres south-east of the Melbourne CBD. The site is situated within the Wellington Shire Council and located near the Gippsland Renewable Energy Zone. The GWF will incorporate 13 wind turbine generators (WTG) with a total installed capacity of approximately 80 MW. The site will also support associated utility installations, including an energy storage system, a substation adjacent to an existing 66 kV transmission line, access tracks and underground cables, across approximately 1500 ha of predominantly agricultural land (Figure 1).

The GWF will supply renewable energy to the National Electricity Market (NEM) and contribute to Victoria's electricity supply as the generation mix transitions towards renewable energy, representing an annual carbon dioxide reduction of approximately 320,000 tonnes. The GWF will generate approximately 300,000 MW hours of renewable energy per annum, which can supply energy to over 37,000 households.

## 1.2. Environmental Outcomes

This BAMP aims to achieve the following environmental outcomes:

- Minimise the impacts from the GWF on threatened fauna 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);
- An informed understanding of the turbine collision risk to listed threatened fauna that occurs on-site;
- An informed understanding of how threatened fauna use of the site changes in response to wind farm construction and operation;
- Monitoring for the timely identification of turbine collisions and the timely collection and analysis of data;
- Responsive updates to, and regular validation of, the impact assessment framework for listed fauna regularly recorded on site, using monitoring data to support a robust adaptive management approach to reducing impacts, where possible;
- Where applicable, the development and implementation of tangible, on-ground management actions to promote a long-term collision risk reduction on listed threatened and migratory bird and bat species.

The monitoring program detailed in this BAMP will help achieve these environmental outcomes.

This BAMP specifically addresses the following key species of concern identified during baseline assessments:

- Blue-winged Parrot (EPBC: Vulnerable)
- Swift Parrot (EPBC: Critically Endangered, FFG: Critically Endangered)
- White-throated Needletail (EPBC: Vulnerable & Migratory, FFG: Vulnerable)
- Grey-headed Flying Fox (EPBC: Vulnerable, FFG: Vulnerable)

### 1.3. BAMP structure

This BAMP details the objectives and strategies required and is divided into the following sections:

**Section 2** details the monitoring program, including pre-construction baseline monitoring, operational phase targeted surveys and impact monitoring.

**Section 3** defines impact triggers and procedures for listed and non-listed fauna, mitigation, offsets, and the adaptive decision-making framework for these triggers.

**Section 4** provides species-specific management strategies for Swift Parrot, Blue-winged Parrot, White-throated Needletail and Grey-headed Flying-fox.

**Section 5** describes the reporting and review process.

**Section 6** details the management actions and report timing.

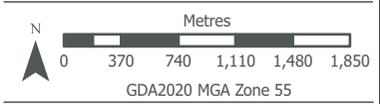
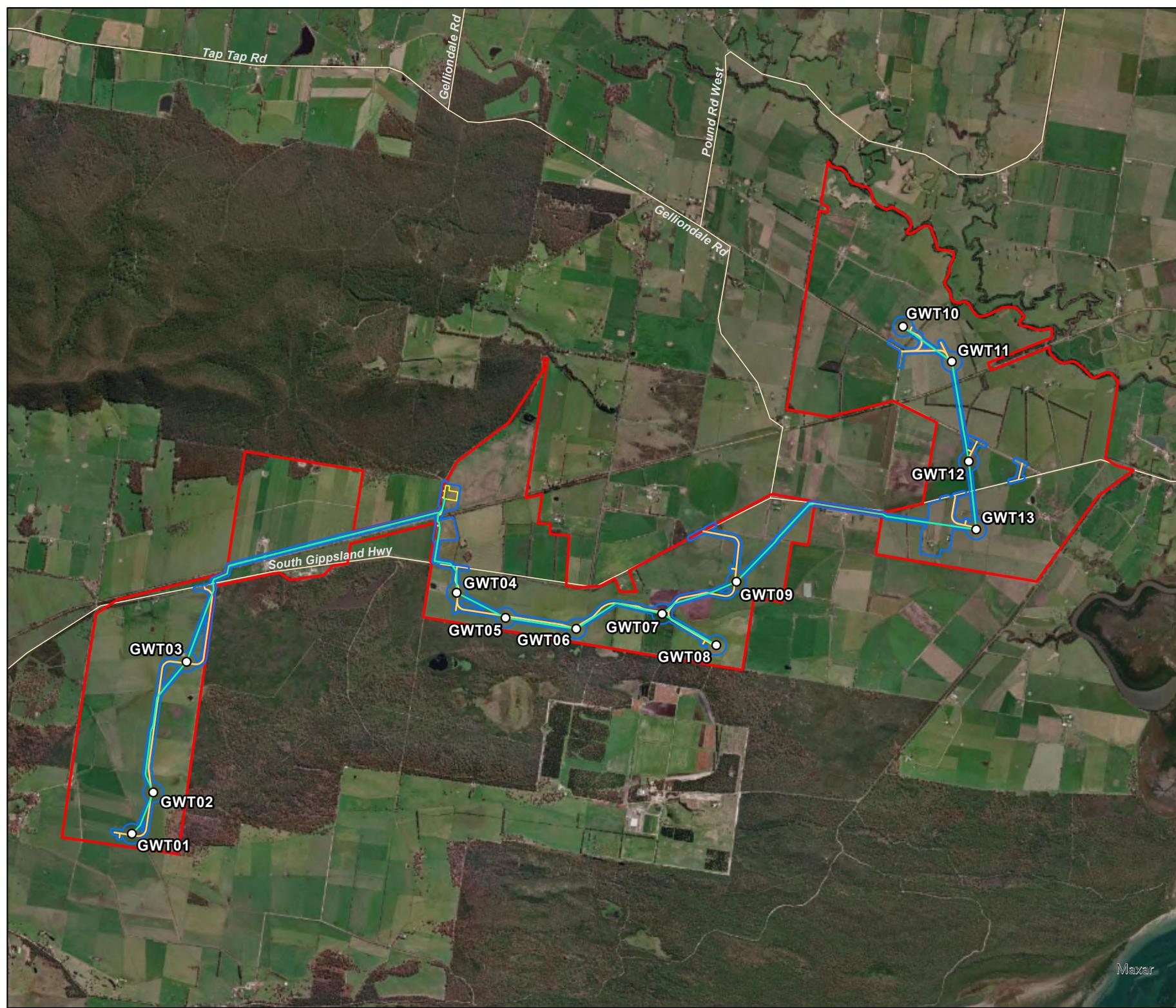
**Section 7** describes the roles and responsibilities for BAMP implementation.

Dr Sergio Nolzco Plasier (Senior Zoologist), Dr Robin Leppitt (Senior Zoologist), Kylie Patrick (Senior Ecologist & Project Manager), and Dr Inga Kulik (Director) prepared this BAMP.

**Figure 1: Study area and wind farm layout - overview**

Project No: 14107\_20  
Project: Gelliondale Wind Farm  
Date: 9/10/2024

- Wind farm boundary
- Turbine
- Application footprint
- Substation
- Electrical cable
- Access track



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## 2. Monitoring Program

This section summarises the baseline (pre-construction) surveys conducted at the GWF to date and describes the methods for the operational phase bird and bat monitoring program once the wind farm is commissioned and operational.

Operational phase monitoring activities include:

- Bird utilisation surveys (Section 2.2.1);
- Bat surveys (Section 2.2.2);
- Targeted monitoring for listed species and species of interest (Section 4); and
- Carcass monitoring and scavenger and searcher efficiency trails (Section 2.2.3).

### 2.1. Baseline monitoring

Table 1 summarises the baseline bird and bat investigations completed to date.

**Table 1: Baseline monitoring completed as of October 2024.**

Type	Detail	When	Who
Overview assessments	Flora and fauna habitat	Autumn 2015; Spring 2015; Winter 2016	Nature Advisory
Bird utilisation surveys (BUS)	Initial BUS	Summer 2015	Nature Advisory
	Seasonal BUS	Spring 2023; Summer 2023; Autumn 2023; Winter 2024	Nature Advisory
Bat utilisation surveys	Acoustic recording	Spring 2023; Summer 2023; Autumn 2023; Winter 2024	Nature Advisory
Migratory shorebirds	Surveys and BirdLife Aust. data analysis	Summer 2015	Nature Advisory
	Updated BirdLife Aust. data analysis	September 2024	Nature Advisory
Targeted surveys	White-throated Needletail	Summer 2021; Autumn 2021; Summer 2022; Autumn 2022	Nature Advisory
	Swift Parrot and Gang Gang Cockatoo	Autumn 2020; Autumn 2021; Winter 2021; Autumn 2024; Winter 2024	Nature Advisory

All methods and results related to the pre-construction ecological surveys completed are detailed in the *Gelliondale Wind Farm Flora and Fauna Assessment* report prepared for Synergy Wind Pty Ltd in October 2024 (report reference: 14107.20 (4.0)).

#### 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 *Appendix 7: Ecological Assessments of the Best Practice Guidelines for the Australian Wind Industry* (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 in habitats representative of those across the GWF site. Post-commissioning surveys will occur at the same locations for two years using the same methodology which is described Section 2.2.1. The comparative analysis will provide descriptive and quantitative analysis on changes in species diversity and abundance from before to after construction.

## 2.2. Operational phase monitoring

### 2.2.1. Bird utilisation surveys

Following two years of pre-construction BUS, post-construction BUS (also known as operational phase BUS) will commence once the wind farm is fully commissioned. Post-construction BUS will occur over two years to replicate the pre-construction surveys. These surveys aim to identify changes, if any, in fauna use of the site compared to the pre-construction period and if any turbines pose a particular risk to listed species.

Relevant details of the post-construction BUS include:

- 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.

### 2.2.2. Microbat surveys

Post-construction microbat surveys will occur, if required, once the wind farm is fully commissioned and during its first year of operation and will replicate the methodology of the initial pre-construction surveys. These surveys aim to identify changes, if any, in microbat use of the site compared to the pre-construction period and if any turbines pose a particular risk to listed 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.
- The bat surveys will provide a context for the carcass searches and elucidate the indirect effects of the wind farm on bat use of the site.
- Bat surveys will specifically concentrate on any impacts to the species of concern identified during pre-construction bat surveys and the bird and bat risk assessment.

### 2.2.3. Carcass monitoring

#### *Purpose of carcass monitoring*

Ongoing monitoring of blade strike mortality at wind farms:

1. 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
2. detect and estimate the general mortality of listed and non-listed fauna, which can be used to understand actual 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.

Implementation of fauna monitoring programs at wind farms in Australia is still developing, and the techniques described here are based on lessons learnt from several such programs already implemented (e.g., Hull et al. 2013), knowledge of experimental design and statistical analysis, and recent feedback from regulatory authorities.

#### *Definition of ‘mortality’*

Mortality is defined as any dead bird or bat detected within the specified search radius (Figure 2). Detection occurs during 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 to collect consistent and useful data on the fatality event (see below).

In the absence of any other cause of death, any carcass or bird feather spot (defined as a clump of five feathers or more), detected beneath an operating turbine will be categorised as a turbine blade collision. Feather spots are assumed to be remains of a bird carcass after scavenging and the scavenger correction factor will not be applied (see Appendix 1).

#### *Overview of approach*

The GWF carcass monitoring program will consist of the following two methods:

1. **Incidental carcass detection** (refer to Section 0); and
2. **Full carcass searches** – to be implemented after all turbines operate and export electricity simultaneously. This program will run for at least two years (refer to Section 0 for more details).

#### *Incidental carcass detection*

A low fauna risk exists during the commissioning phase, once turbine components are installed but not operating. At this stage, the GWF is an active construction site and subject to strict safety requirements which can restrict formal carcass searches. Therefore, during this time:

- There will be increased worker activity on and around turbine hardstands and surrounding areas as commissioning activities are occurring;

The wind farm operator’s approved personnel and contractors will conduct incidental carcass detection around the hardstands;

- Any carcasses detected during this period will be recorded in accordance with the incidental carcass protocol as described below. Awareness training will be provided to the wind farm operator and contractor teams to ensure effective protocol implementation;
- The incidental carcass detection will continue as the primary carcass detection method until the full carcass search program commences, this will ensure impacted birds and bats can be recorded before the implementation of the full carcass search program, despite site access still being limited by construction activities; and
- Incidental carcass detection will continue for the duration of the wind farm’s operation and will occur as per the Carcass Detection Protocol and the Bird and Bat Handling Protocol outlined in Appendix 1.

### *Incidental carcass protocol*

Personnel working at the GWF, during all project stages, may incidentally find carcasses. In response, carcass handling will occur as per the Carcass Detection Protocol and Bird and Bat Handling Protocol outlined in Appendix 1. These protocols will be detailed to construction and operation personnel during site training and induction programs.

### *Formal carcass search program*

The formal carcass search program will commence within three months of the commissioning of all project activities, including turning of turbines/within one month of the completion of reliability tests of all turbines and the wind farm is in full operation and supplying electricity. This post-commissioning monitoring program will be undertaken for a minimum of two years. Following this, a detailed report will be prepared to review the mortality detection program and to provide recommendations in response to any identified issues—see Section 0 for reporting requirements. The regulator will review this report to determine how the monitoring program will continue to be congruent with the identified issues.

The GWF carcass monitoring program aims to provide reliable estimates of fauna mortality rates with an estimate of sampling precision. Several factors, such as carcass scavenging and carcass detectability, can affect mortality rate estimates and will be measured and included in any estimate of overall mortality rates. To account for the effects of these factors, scavenger and detectability trials will be conducted (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 (Appendix 1).

The following informed the design of the carcass search program and associated trials:

- Carcasses of a suitable range of sizes for scavenger and detectability trials are difficult to source and usually involve a combination of carcasses found under operating turbines and those found along roads and other legal sources. Note that it is illegal to source un-cleaned carcasses from poultry producers; and
- Annual scavenger and detectability correction factors will be generated and applied to estimate mortality rates, as there is no evidence in the literature for significant (or detectable) seasonal differences in scavenger activity at Australian wind farms (Symbolix 2020). However, scavenger and detectability trials will be undertaken during short and long grass periods. This precautionary sampling design intends to capture seasonal variability, ensuring more accurate annual mortality estimates. However, detectability, at least for humans, is easier in short grass than in longer grass, therefore detectability trials will capture this variability.

### *Turbine selection*

All 13 turbines will be searched for carcasses. This will maximise the accuracy of the estimated mortality rates.

All turbines will be used for scavenging and detector trials.

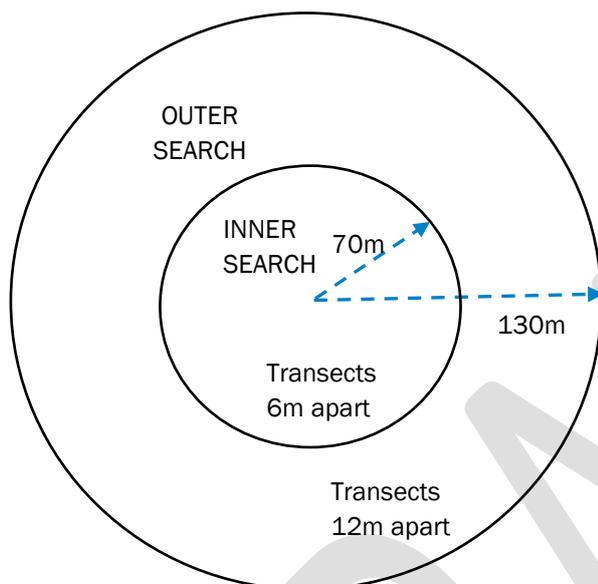
Information collected at each turbine will include the number of carcasses found, location, any relevant details on vegetation and habitats, and any relevant observations indicating risk behaviours involving listed species.

### *Search protocol*

All searches will be undertaken by qualified ecologists or personnel trained in carcass searches and regularly assessed by the supervising ecologist.

An inner and outer circular search zone has 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 6 metres (Figure 2). 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.

All selected turbines, once operational, will be searched once per month. Each search and carcasses found will be documented in the form provided in Appendix 2.



**Figure 2: Inner and outer carcass search zones underneath the turbines**

#### *Scent dog option*

This section has been added to allow more flexibility for Gelliondale Wind Farm and aligns with industry practice. 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 both 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.

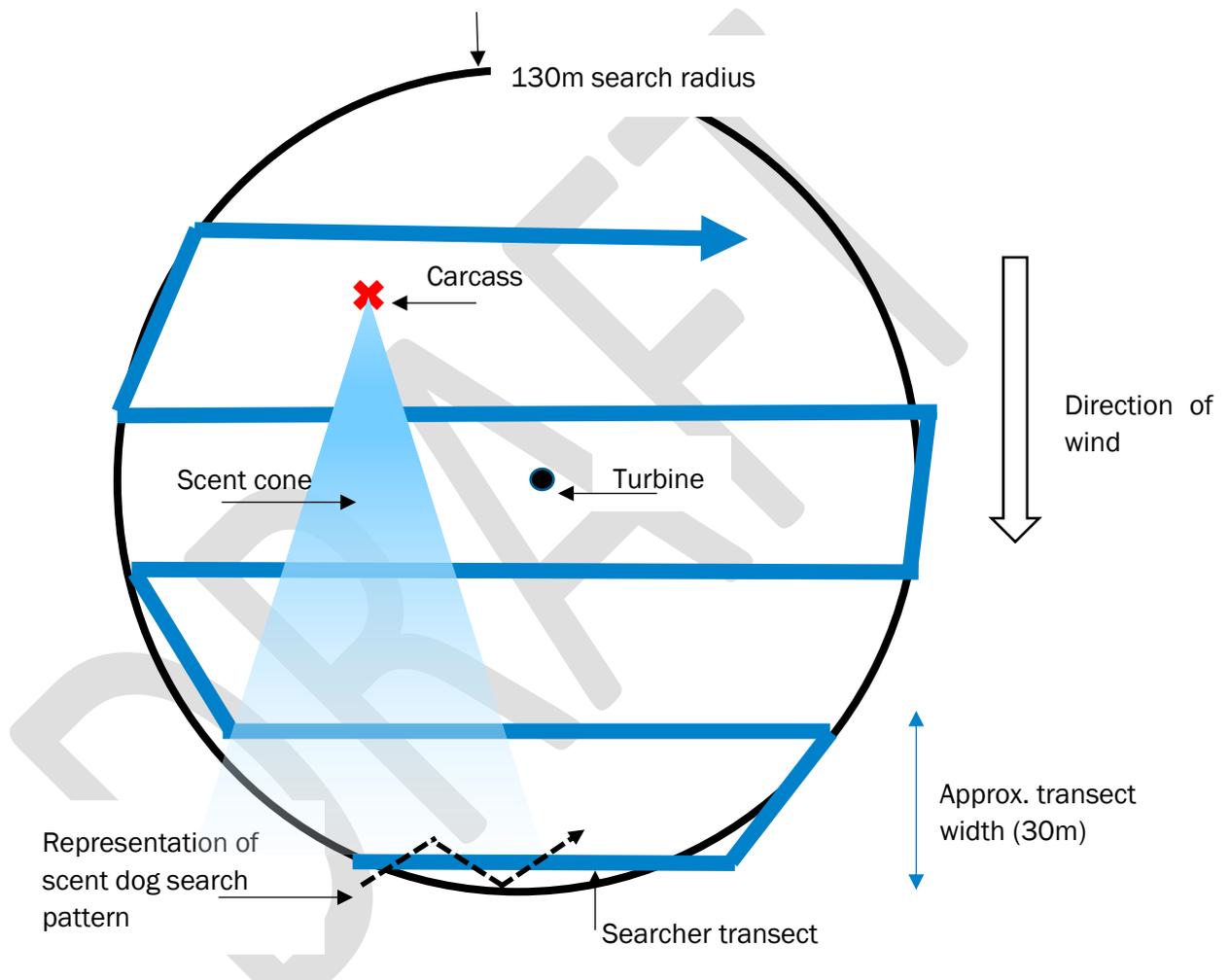
If dogs are used for the searches, a suitable method will be developed in conjunction with their handler. This will generally involve the dogs working on a reference transect line from downwind to upwind. The handler will start down wind of the turbine and walk across the direction of the wind allowing 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. 30 metres). This will ensure all scent cone areas will be encountered (Figure 3). 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 30 metres wide will be adequate to cover an area in moderate wind conditions, this will be reduced to 10 or 20 metres 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.



**Figure 3: Search pattern for scent dog – across the wind turbine search radius**

#### *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;
- Results of scavenger and detectability trials;
- Separate estimated annual mortality rates for all 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.

In addition to the annual reports, an incident report will be prepared and provided to the Commonwealth Department of Climate Change, Energy, Environment and Water (DCCEEW) and DEECA if an EPBC Act-listed species is found dead or injured during carcass searches. If no on-site data is available to estimate mortality rates (e.g., a dead individual of a listed species is found during the first carcass search), mortality rate estimates will be derived from median estimates of searcher efficiency and scavenger loss rates collected from wind farm data across Victoria. The median annual mortality rates will be used as the benchmark to determine whether a specific impact threshold has been reached. Upper and lower confidence bounds and the likelihood that an adaptive management trigger is reached will be also reported.

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

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

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

$$\hat{g}_{ij} \cong a_i r_{ij} p_{ij} \tag{2}$$

- $a_i$  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  $p_{ij}$

## 3. Adaptive Management

This adaptive management section aims to achieve environmental outcomes by establishing effective and timely response measures. The key points include:

- Impact trigger definitions for listed and non-listed species;
- Implementation of an adaptive decision-making framework for these triggers;
- Establishment of a framework that integrates investigations, monitoring, and reporting; and
- Adoption of management measures, including corrective actions and offsets, to ensure environmental outcomes are achieved.

### 3.1. Impact triggers

This section identifies the circumstances that will result in notification, further investigation, and additional mitigation for impact triggers, as well as reporting to DEECA and DCCEEW. The procedure to respond adaptively to impact triggers documented in this section will apply for the duration of the GWF life cycle.

In response to a triggered impact, the cause will be investigated, and more frequent carcass monitoring will occur to determine if the impact is ongoing or a one-off occurrence. Additional mitigation measures, informed by the evidence, may also occur.

The approval holder will be responsible for BAMP implementation with technical support provided by an approved expert.

#### 3.1.1. 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 EPBC Act or FFG Act is found dead or injured within the specified search radius during any mortality search or incidentally during commissioning or operation. Once triggered, the decision-making framework detailed in Figure 4 is applied.

In addition to the standard protocols for listed species, strategies are provided for key species of concern (Section 4) identified during the pre-construction studies (Blue-winged Parrot, White-throated Needletail, Swift Parrot, and Grey-headed Flying-fox).

##### *Operational procedure*

If a listed species **impact trigger** occurs, the decision-making framework detailed in Figure 4 is applied and the following occurs:

1. Immediate reporting to the GWF Site Manager, who will report it to DEECA/DCCEEW within two business days.
2. Immediate investigation (within 10 business days) by an appropriately qualified ecologist to identify any particular risk behaviours that could have led to the collision or could lead to further collisions. This investigation aims to:
  - Determine the actual cause of death/injury.
  - Focus on determining the likelihood of further occurrences (e.g., through engagement with key species experts, undertaking a literature review, assessment of habitat, etc).
  - Identify suitable mitigation measures for immediate implementation.

3. 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.
4. If the cause of the impact trigger is unclear, onsite investigation of risk behaviours and evaluation of likely re-occurrence will be required for up to six weeks. 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.
5. If the onsite investigation suggests that the impact trigger may be a regular occurrence or it is likely to result in a significant impact, species-specific monitoring may be required. During the monitoring period, periodic (three-monthly at first) reports will be provided to DEECA/DCCEEW.
6. Responsive mitigation measures will be promptly developed and implemented as needed in consultation with DEECA/DCCEEW. Examples of mitigation measures may include but are not limited to those outlined in Section 3.2.
7. If mitigation measures are not possible or effective, offsetting measures will be implemented, as outlined in Section 3.3. In some circumstances, both mitigation and offsetting may be required.

All investigations and subsequent decision-making will be undertaken in consultation with DEECA/DCCEEW.

### **3.1.2. 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 two successive searches in two months. Once triggered, an appropriate response is initiated, and reporting requirements outlined in the decision-making framework, as outlined in Figure 5.

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, the decision-making framework detailed in Figure 5 is applied and the following occurs:

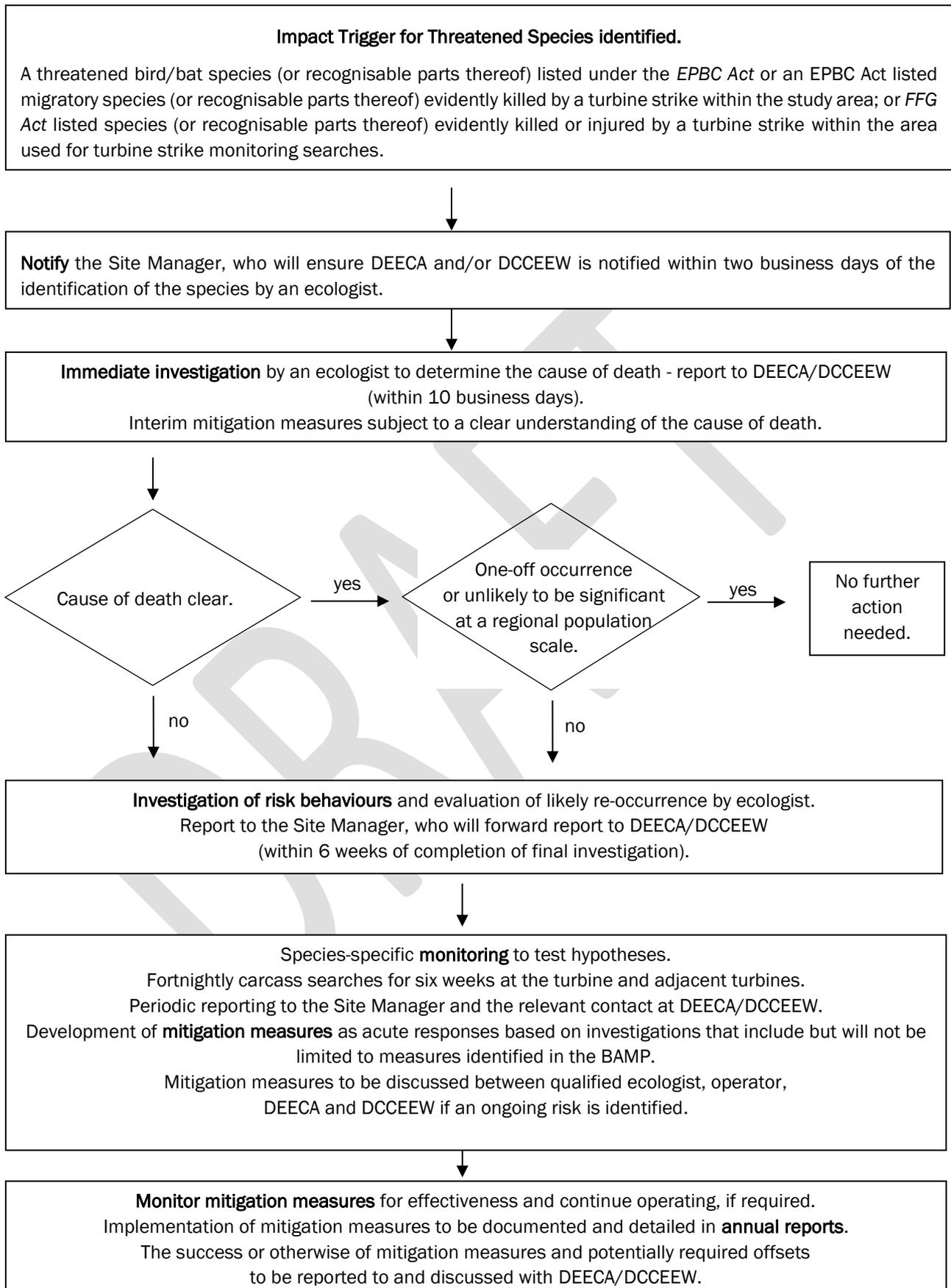
1. DEECA/DCCEEW will be notified within seven business days of recording the event.
2. An appropriate scale to consider population effects (e.g., local, regional, entire population) will be agreed between DEECA/DCCEEW and the wind farm operator on a case-by-case basis with consideration given to the species in question.
3. A report on the investigation will be delivered to DEECA/DCCEEW within three weeks.
4. If the evaluation indicates that the event was a one-off occurrence or is unlikely to have a significant impact at a relevant population scale for the species in question, no further action will be necessary.

5. 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.
6. If further monitoring confirms that impacts are likely to be significant at a relevant population scale, mitigation measures will be required. Potential mitigation measures are outlined in Section 3.2, however species-specific mitigation measures will be determined based on the investigation outcomes.

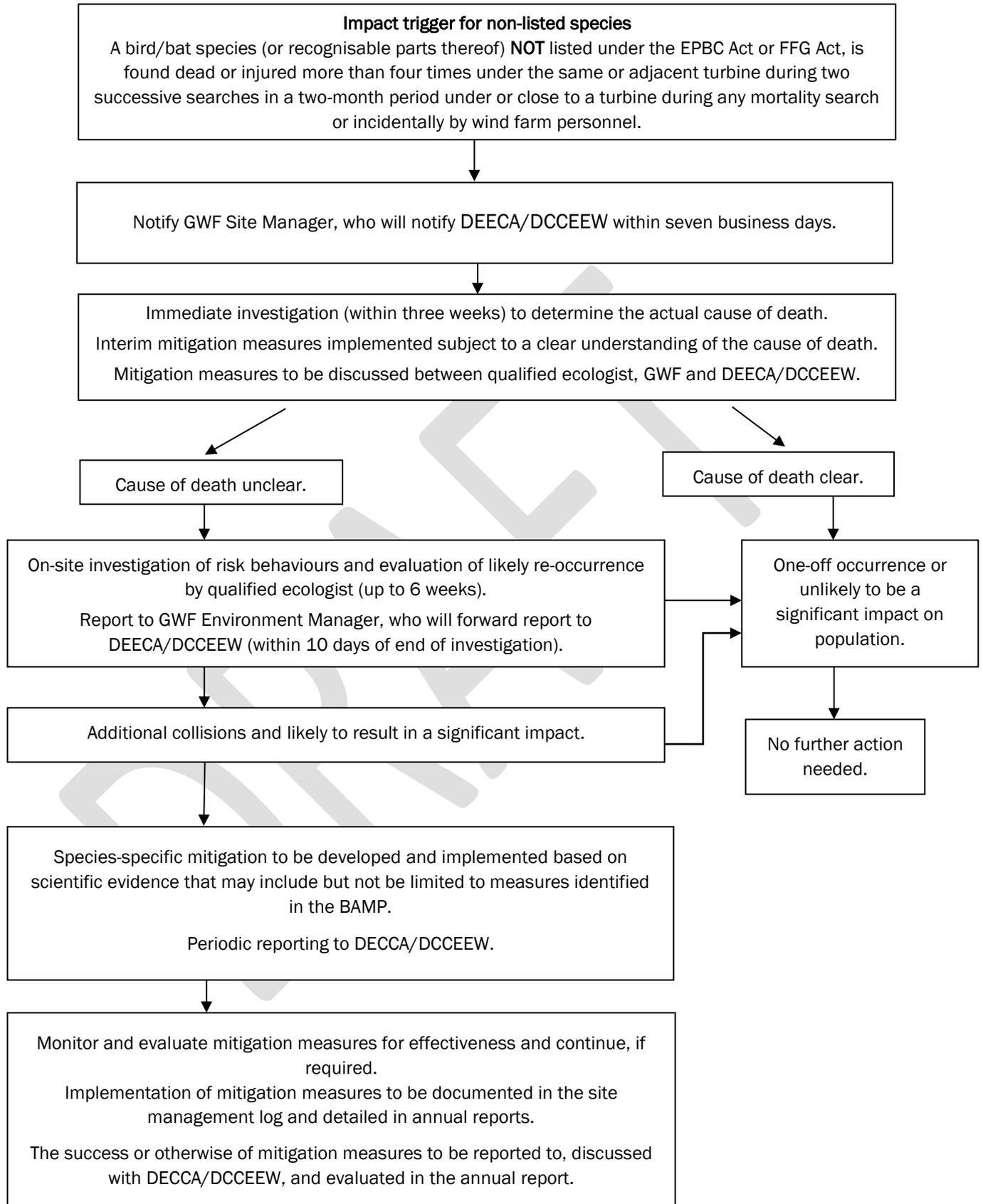
All investigations and subsequent decision-making will be undertaken in consultation with DEECA/DCCEEW.

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**Figure 4: Decision-making framework for identifying and mitigating impact triggers for threatened species.**



**Figure 5: Operational procedure for mitigating impacts for non-listed species.**



### 3.2. Mitigation

Mitigation aims to ensure that the environmental outcomes listed in Section 1.2 will be achieved. Any evaluation of impacts and decisions regarding mitigation and investigations will be undertaken in consultation with DEECA and DCCEEW. Annual reports will detail the effectiveness of mitigation applied and the outcomes of any investigations completed.

Depending on the nature, cause and significance of the impact trigger, mitigation and offsetting may be required. The objective of mitigation and offset measures is to ensure that the GWF does not lead to significant impacts on listed or non-listed bats and/or birds over the life of the wind farm. 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

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

- Habitat modification, vegetation planting/removal;
- Changes in land use practices (including stock management, stock grain-feeding) near turbines, subject to negotiation with landowners;
- Cessation or reduction of cropping/sowing around or near turbines;
- Bird deterrence;
- Increasing turbine and powerline detectability (e.g. visual or audio deterrents);
- Changes to turbine lighting (noting the general requirements below);
- Temporary turbine curtailment for high-risk periods/locations;
- Using ultrasonic deterrents to deter bats at night; and
- Bird protection systems that automatically curtail turbines on approach to reduce raptor fatalities (e.g., Bioseco®, IdentiFlight®).

Immediate mitigation will be implemented (within seven days) if a significant impact is detected and the cause is evident (e.g., a particular land use practice). Further investigation will commence where the cause is not evident. If investigations indicate that the available mitigation is incongruent, offsetting measures will be implemented (Section 3.3).

The final BAMP will include the required investigations and recommended mitigation consistent with the consent conditions of the Planning Permit Approval. Mitigation effectiveness will be assessed using data collected from a monitoring program of appropriate duration and frequency.

#### Preventive management measures

Most mitigation will be triggered by collisions, however the following preventive strategies to avoid and reduce the risk of an impact trigger occurring will be implemented.

#### **Carcass removal**

This will reduce the attractiveness of the site to scavenging raptors and reduce the risk of collision with this bird group and other scavengers. Procedures will include:

- A designated Carrion Removal Coordinator will ensure:

- Weekly inspections of the entire wind farm site by on-site personnel are undertaken to locate any deceased animals;
  - The weekly inspections are undertaken via a vehicle or motorbike and searches of the entire wind farm site prioritise the area within 250 metres of turbines; and
  - During lambing season, any lamb carcasses are immediately removed.
- Any incidental finds of birds and bats will follow the Incidental Carcass Protocol (depending on carcass location; Section 0).
  - Any carcasses and/or remains found will be reported immediately to the site manager who will organise for the immediate collection and disposal of the carcass.
  - Carcasses will be disposed of in treed areas, or pits, at least 500 m from the nearest turbine.
  - All carcass occurrence and removal will be recorded in a logbook maintained by site personnel.
  - The annual report will summarise all carcass occurrences and removals for the reporting period.

### ***Lighting avoidance or reduction***

Turbine lighting will be restricted to the requirements defined by the regulatory authority, and facility lighting will be avoided within 500 m of turbines. Minimising lighting will help reduce the bird and bat attraction by reducing insect activity.

### **3.3. Offsetting a significant impact**

In the unlikely event that a significant impact occurs to any EPBC Act-listed species due to GWF operations, offsetting may be required. The EPBC Act Environmental Offset Policy 2012 (DSEWPaC 2012) will guide any required offsetting and will be developed in consultation with, and approved by, DCCEEW.

## 4. Species-specific management strategies

The following management strategies have been developed for the following species of concern:

- Blue-winged Parrot (EPBC Act: Vulnerable)
- White-throated Needletail (EPBC Act: Vulnerable & Migratory; FFG Act: Vulnerable)
- Swift Parrot (EPBC: Critically Endangered, FFG: Critically Endangered)
- Grey-headed Flying Fox (EPBC act: Vulnerable)

These strategies will focus management efforts and improve mitigation effectiveness in response to impact triggers for those species identified as matters of concern, aiming to avoid significant impact at the population level.

### 4.1. Blue-winged Parrot/White-throated Needletail/Swift Parrot Management strategy

#### 4.1.1. Impact triggers and mitigation responses

This species-specific management strategy outlines a hierarchical set of trigger responses to mitigate the impacts of the operational GWF on three bird species of concern, identified during pre-construction surveys: the Blue-winged Parrot (BWP), White-throated Needletail (WTNT), and Swift Parrot (SP). Reporting will follow the requirements in Section 5, as well as incident-specific correspondence and reports to DEECA/DCCEEW, which will require discussion and feedback from the Department.

Whilst this section covers three species together, the management strategy will be applied to each species independently. Whilst the BWP is present in Victoria year-round, the WTNT and SP are migrants.

The WTNT is a summer migrant to Australia, undertaking a trans-equatorial migration to breed in the Northern Hemisphere summer and to feed in the Southern Hemisphere summer. Each year, the WTNTs generally arrive in Australia in October before migrating north in March and April. Numbers peak in Victoria in late summer and early autumn, which, based on advice from DEECA/DCCEEW, coincides with most recorded wind turbine collisions. Any risk-mitigation measures for the WTNT presented in this management strategy will only apply during the times they are likely to be in Victoria, i.e. from November to April.

The SP breed in Tasmania and migrates to the mainland of Australia for the autumn, winter, and early spring months. It lives mostly north of the Great Dividing Range, passing through two areas of Victoria on migration: the Port Phillip district and Gippsland (Emison et al. 1987; Higgins 1999; Kennedy & Tzaros 2005). They could occur occasionally during dispersive movements, particularly when in transit between large, forested areas. This species has only been recorded on two occasions (1991) in the surrounds, and only once on-site during targeted surveys, and is therefore expected not to occur regularly within the study area. The population of SP likely to use the study area is small relative to that using the larger forested blocks north of the Great Dividing Range or interstate. Therefore, this species is likely to experience minimal impact from the proposed wind farm. Any risk-mitigation measures for the SP presented in this BAMP will only apply during the times they are most likely to be in Victoria, i.e. from March to July.

Table 2 details the specific trigger actions in response to avian mortalities involving these three species of concern.

**Table 2: Specific trigger actions in response to BWP/WTNT/SP mortalities at GWF.**

Impact Trigger	Actions	Description	Timing
<p><b>Level 1:</b> A single or several individuals of the species of concern are recorded dead under a turbine within a single event.</p>	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 70 m radius searches of T1 and all turbines within 1 km of it (see Table 3). If one or more carcasses are detected at another turbine within a 1 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 detailed in the “Incident Investigation” action below.	Within 28 days of the mortality.
	Adaptive mitigation and process of assignment and re-assignment of risk	Monthly monitoring over three months at T1 and all turbine locations within a 1 km radius of it (or during the remaining time that the species is expected on site). For <b>BWP</b> and <b>SP</b> this should include the closest woodland habitat (i.e., woodland patches and tree lines). Locations, movements/patterns of the species will be recorded, including the timing and possible reasons for periods of higher risk.	First monthly monitoring within two weeks of the mortality event for three months or the remaining duration of the expected time the species is present on site.
		If, for three consecutive months after the mortality event, or the remaining of the period in which migratory species are expected on site ( <b>WTNT/SP</b> ), 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 other turbines within a 1 km radius will undergo additional 70 m radius searches during monthly carcass surveys. These searches will continue for one year or for the remaining period that migratory species are expected to be present on site ( <b>WTNT/SP</b> ). 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, or for the remaining period that species are expected to be present on site.
Incident Investigation	Submit a report to the Responsible Authority.	Within 28 days of the mortality.	

Impact Trigger	Actions	Description	Timing
		<p>The investigation will seek to assess any relevant attributes associated with the mortality event.</p> <p>The report will include:</p> <ul style="list-style-type: none"> <li>▪ Date and time of mortality,</li> <li>▪ Identify, if possible, wind direction and speed when the bird was struck,</li> <li>▪ Weather conditions,</li> <li>▪ Location of mortality relative to habitat, vegetation, and water sources,</li> <li>▪ Analysis of any other mortality on the site.</li> <li>▪ Conclusions of investigation regarding risk to the species and likelihood of further mortalities on site,</li> <li>▪ Recommendations for future actions to mitigate impacts on the species, and</li> <li>▪ Options for other mitigation including deterrents</li> </ul>	
<p><b>Level 2:</b> Second strike (a single or several individuals of the species of concern are recorded dead under a turbine assigned as “high risk” under Trigger 1) during a subsequent search.</p>	<p>Label the turbine as a “high risk – impact trigger level one (T2)” turbine.</p>	<p>This event activates the species-specific management strategy as follows.</p>	<p>Immediately following mortality.</p>
	<p>More frequent carcass searches to assess the extent of the impact, minimise the chances of scavenging and maximise carcass detections</p>	<p>An additional 70 m radius searches of T2 and all turbines within 1 km of it (see Table 3). If one or more carcasses are detected at another turbine within a 1 km radius, the management strategy outlined in this table will apply independently.</p>	<p>Within a week of the mortality.</p>
		<p>The findings of the searches will be recorded and reported to DEECA/DCCEEW as detailed in the “Incident Investigation” action below.</p>	<p>Within 28 days of the mortality.</p>
	<p>Adaptive mitigation and process of assignment and re-assignment of risk</p>	<p>Monthly monitoring over three months at T2 and all turbine locations within a 1 km radius of it (or during the remaining time that the species is expected on site). For <b>BWP</b> and <b>SP</b> this should include the closest woodland habitat (i.e., woodland patches and tree lines).  Locations, movements/patterns of the species will be recorded, including the timing and possible reasons for periods of higher risk.</p>	<p>First monthly monitoring within two weeks of the mortality event for three months or the remaining duration of the expected time the species is present on site.</p>

Impact Trigger	Actions	Description	Timing
		<p>If, for three consecutive months after the mortality event, or the remaining of the period in which migratory species are expected on site (<b>WTNT/SP</b>), no additional fatality events occur at the T2 turbine, and it is concluded that the turbine does not pose a high risk to the listed species, no further mitigation actions will be required.</p>	<p>Within three consecutive months from the date of the mortality.</p>
		<p>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 other turbines within a 1 km radius will undergo additional 70 m radius searches during monthly carcass surveys. These searches will continue for one year or for the remaining period that migratory species are expected to be present on site (<b>WTNT/SP</b>). If no further mortalities are found over this period, the turbine will be reassigned again as 'low risk.' New technological advances will be considered for implementation and testing as they become available for applications involving small-sized and fast-flying species. These advancements may include smart curtailment systems using optical or radar technologies. One such supplier is currently developing and enhancing its smart curtailment system to be applicable for this type of species, although it is still in progress and not yet evaluated. Implementation is expected as soon as reasonably possible, considering effectiveness, equipment procurement, and installation timeframes.</p> <p>If no further mortalities are found over this period, the turbine will be reassigned again as 'low risk.'</p>	<p>For one year from the date of the mortality, or for the remaining period that species are expected to be present on site.</p>
	<p>Incident Investigation</p>	<p>Submit a report to the Responsible Authority.</p> <p>The investigation will seek to assess any relevant attributes associated with the mortality event.</p> <p>The report will include:</p> <ul style="list-style-type: none"> <li>▪ Date and time of mortality,</li> <li>▪ Identify, if possible, wind direction and speed when the bird was struck,</li> </ul>	<p>Within 28 days of the mortality.</p>

Impact Trigger	Actions	Description	Timing
		<ul style="list-style-type: none"> <li>▪ Weather conditions,</li> <li>▪ Location of mortality relative to habitat, vegetation, and water sources,</li> <li>▪ Analysis of any other mortality on the site.</li> <li>▪ Conclusions of investigation regarding risk to the species and likelihood of further mortalities on site,</li> <li>▪ Recommendations for future actions to mitigate impacts on the species, and</li> <li>▪ Options for other mitigation including deterrents</li> </ul>	
<p><b>Level 3:</b> Third strike (a single or several individuals of the species of concern are recorded dead under a turbine assigned as “high risk” under Trigger 2) during a subsequent search.</p>	<p>Label the turbine as a “high risk – impact trigger level one (T2)” turbine.</p>	<p>This event activates the species-specific management strategy as follows.</p>	<p>Immediately following mortality.</p>
	<p>More frequent carcass searches to assess the extent of the impact, minimise the chances of scavenging and maximise carcass detections</p>	<p>An additional 70 m radius searches of T3 and all turbines within 1 km of it (see Table 3). If one or more carcasses are detected at another turbine within a 1 km radius, the management strategy outlined in this table will apply independently.</p>	<p>Within a week of the mortality.</p>
	<p>Adaptive mitigation and process of assignment and re-assignment of risk</p>	<p>The findings of the searches will be recorded and reported to DEECA/DCCEEW as detailed in the “Incident Investigation” action below.</p>	<p>Within 28 days of the mortality.</p>
		<p>Monthly monitoring over three months at T3 and all turbine locations within a 1 km radius of it (or during the remaining time that the species is expected on site). For <b>BWP</b> and <b>SP</b> this should include the closest woodland habitat (i.e., woodland patches and tree lines). Locations, movements/patterns of the species will be recorded, including the timing and possible reasons for periods of higher risk.</p>	<p>First monthly monitoring within two weeks of the mortality event for three months or the remaining duration of the expected time the species is present on site.</p>

Impact Trigger	Actions	Description	Timing
		<p>If, for three consecutive months after the mortality event, or the remaining of the period in which migratory species are expected on site (<b>WTNT/SP</b>), no additional fatality events occur at the T3 turbine, and it is concluded that the turbine does not pose a high risk to the listed species, no further mitigation actions will be required.</p>	<p>Within three consecutive months from the date of the mortality.</p>
		<p>If, following an investigation by a qualified ecologist, the fatality is suggested to be part of an ongoing impact and likely significance for the species, the T3 turbine and other turbines within a 1 km radius will undergo additional 70 m radius searches during monthly carcass surveys. These searches will continue for two years or for the periods that migratory species are expected to be present on site within two years (<b>WTNT/SP</b>). New technological advances will be considered for implementation and testing as they become available for applications involving small-sized and fast-flying species. These advancements may include smart curtailment systems using optical or radar technologies. One such supplier is currently developing and enhancing its smart curtailment system to be applicable for this type of species, although it is still in progress and not yet evaluated. Implementation is expected as soon as reasonably possible, considering effectiveness, equipment procurement, and installation timing.</p> <p>If no further mortalities are found over this period, the turbine will be reassigned again as ‘low risk.’</p>	<p>For two years from the date of the mortality.</p>
		<p>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 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.</p>	<p>Within four consecutive months from the date of the mortality.</p>
	<p>Incident Investigation</p>	<p>Submit a report to the Responsible Authority.</p>	<p>Within 28 days of the mortality</p>

Impact Trigger	Actions	Description	Timing
		<p>The investigation will seek to assess any relevant attributes associated with the mortality event.</p> <p>The report will include:</p> <ul style="list-style-type: none"> <li>▪ Date and time of mortality,</li> <li>▪ Identify, if possible, wind direction and speed when the bird was struck,</li> <li>▪ Weather conditions,</li> <li>▪ Location of mortality relative to habitat, vegetation, and water sources,</li> <li>▪ Analysis of any other mortality on the site,</li> <li>▪ Conclusions of investigation regarding risk to the species and likelihood of further mortalities on site,</li> <li>▪ Recommendations for future actions to mitigate impacts on the species, and</li> <li>▪ Options for other mitigation including deterrents.</li> </ul>	

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**Table 3: Turbines within a 1000-meter radius of each turbine.**

Turbine	Turbines within 1000m
GWT-01	GWT-02
GWT-02	GWT-01
GWT-03	No turbines
GWT-04	GWT-05
GWT-05	GWT-04, GWT-06
GWT-06	GWT-05, GWT-07
GWT-07	GWT-06, GWT-08, GWT-09
GWT-08	GWT-07, GWT-09
GWT-09	GWT-07, GWT-08
GWT-10	GWT-11
GWT-11	GWT-10, GWT-12
GWT-12	GWT-11, GWT-13
GWT-13	GWT-12

## 4.2. Grey-headed Flying-fox management strategy

This species-specific management strategy sets out a hierarchical set of trigger responses to mitigate the impacts of the operational GWF on the Grey-headed Flying-fox (GHFF), based on a precautionary principal approach. Reporting will follow the requirements in section 5, as well as incident-specific correspondence and reports to DEECA/DCCEEW, which will require discussion and feedback from the Department.

### 4.2.1. Targeted monitoring

Because the GHFF is expected to appear sporadically and unpredictably at the Project site, monitoring is anticipated to be challenging and indirect. The presence of this species is influenced by fruiting and flowering events, especially the flowering of Sugar Gum in SW Victoria, which is known to attract these bats to the region. Given these factors and the distance of the Project site from permanent camps, establishing an effective regular monitoring program is not feasible. Instead, the monitoring program will be based on an alternative strategy as follows, and during the first two operational years of the wind farm.

- **Habitat surveys:** Undertake annual habitat suitability assessments in and around the wind farm site (e.g., presence of flowering gums, or other fruiting trees, presence of water).
- **Species database monitoring:** Annual reviews of relevant databases, including the National Flying-fox monitoring viewer<sup>1</sup> to get up-to-date information on camp locations and numbers.
- **Community engagement:** Regular discussions with wind farm personnel, landholders, and DEECA/DCCEEW regarding the species presence, and assess its potential increase in prevalence within the site and its surroundings. This information will guide the qualified ecologist in scheduling field visits to confirm its presence, estimate numbers, and potentially map flight paths within the wind farm layout to identify areas prompt for collisions.

### 4.2.2. Impact triggers and mitigation responses

Specific trigger actions in response to GHFF mortalities will be implemented as follows. Reporting will follow the requirements in Section 5, as well as incident-specific correspondence and reports to DEECA/DCCEEW, which will require discussion and feedback from DEECA/DCCEEW.

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<sup>1</sup> <https://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf>

**Table 4: Specific trigger actions in response to GHFF mortalities at GWF.**

Impact Trigger	Actions	Description	Timing
<p><b>Impact Trigger:</b> A single or several GHFF are recorded dead under a turbine within a single event (i.e. over the length of one search period or as incidental).</p>	Carcass search	Immediately increase the frequency of carcass search monitoring of all wind turbines.	Every three days for one month after the mortality.
	Investigation	Investigate the location, presence, and timing of flying fox activity to understand the factors that may have led to the collision and whether they are still occurring (e.g., weather pattern, location, food availability, active camps, etc.).	Immediately following the mortality.
	Monitoring and risk categorisation	If, for three consecutive months, no additional fatality events occur at the 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.	For three consecutive months following the mortality.
	Post- investigation (ongoing impact identified)	Targeted monitoring will be undertaken immediately to increase understanding of species movements/patterns at specific locations.	TBD
		Implement specific mitigation based on targeted monitoring observations (e.g., consistent 'at risk' presence is observed at a particular location, or multiple collision events occur at a turbine). Mitigation will be implemented as soon as reasonably possible depending on equipment procurement and installation timing. Mitigation may include, but not be limited to, increasing nighttime low wind-speed cut-in speed and/or targeted turbine curtailment or temporary shutdown. Alternative deterrent mitigation measures will also be implemented and trialed on-site as proven technologies become available, depending on equipment procurement and installation timing.	TBD (informed by targeted monitoring).
Mitigation effectiveness	If mitigation proves effective, or there are no additional mortalities at the turbine for two years, turbines will revert to default operations. The latter will involve a gradual process; for example, turbines could return to their default cut-in speeds. If no further mortality is detected during a month of intensive (tri-weekly) carcass searches and following monthly searches for the remainder of 12 months, the turbine will resume normal operation. This transition will be contingent upon no further mortality being detected after	For two years from the date of the mortality. Monthly carcass searches for 12 months.	

Impact Trigger	Actions	Description	Timing
		<p>resuming normal operations for the remainder of the full carcass monitoring period. Additionally, if the mortality event occurred during the final year of planned carcass monitoring, an extra year of monthly monitoring will be implemented for the turbine(s) involved in the event.</p>	
		<p>If mitigation proves ineffective at reducing collisions, intensified mitigation measures, and/or additional mitigation will be considered and implemented, in consultation with DEECA/DCCEEW, which may include the use of remote sensing technologies such as radar, thermal imaging, etc. During this period, the wind farm operator will:</p> <ul style="list-style-type: none"> <li>▪ Monitor and review mitigation effectiveness.</li> <li>▪ Regularly consult with DEECA/DCCEEW on findings and the feasibility of mitigation.</li> <li>▪ Follow the reporting protocols and lines of responsibility in Sections 5, 0 and 7 of this BAMP.</li> </ul>	TBD

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## 5. Reporting and review

This section of the plan outlines the reporting arrangements for this BAMP. Further to the schedule detailed in Table 5, the wind farm operator, in consultation with the qualified ecologist and/or the regulator, may convene reporting and reviewing meetings as required.

**Table 5: GWF BAMP reporting and review.**

Report Type	Timing	Detail	Who
First annual report	Within 3 months of the first year of mortality monitoring.	<p>This will present the results from carcass monitoring and will include, but not be limited to, the following.</p> <ul style="list-style-type: none"> <li>▪ Summary of post-construction carcass search results, including scavenger and detectability trials and total survey days.</li> <li>▪ Discussion of any identified seasonal or yearly variation in the number of bird or bat strikes within the first year.</li> <li>▪ Summary of bird utilisation surveys, microbat surveys, and targeted monitoring.</li> <li>▪ Summary of any additional targeted monitoring surveys required (if relevant) as part of mitigation measures or species-specific monitoring in response to impact triggers.</li> <li>▪ Changes to protocols and methods (e.g., changed duration, frequency, and areas sampled).</li> <li>▪ Raw data will be amended to the annual report.</li> </ul> <p><b>Submitted to:</b> DEECA/DCCEEW and the Responsible Authority.</p>	Qualified ecologist, in consultation with the wind farm operator
		<p>Once available, this report will be presented at a review meeting with the Regional Manager at DEECA/DCCEEW (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.</p>	Qualified ecologist Wind farm operator DEECA/DCCEEW Responsible Authority
Second annual report	Within 3 months of the second year of mortality monitoring.	<p>This will present the results from carcass monitoring and will include, but not be limited to, the following:</p> <ul style="list-style-type: none"> <li>▪ Detailed monitoring methods (including a list of observers, dates, and times of observations).</li> <li>▪ Summary of post-construction carcass search results, including scavenger and detectability trials and total survey days.</li> </ul>	Qualified ecologist, in consultation with the wind farm operator

Report Type	Timing	Detail	Who
		<ul style="list-style-type: none"> <li>▪ 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.</li> <li>▪ Any other mortality recorded on site but not during designated carcass searches (i.e., incidental records by site personnel, etc.).</li> <li>▪ Comparison of bird utilisation surveys with pre-construction surveys, and a summary of microbat and targeted monitoring.</li> <li>▪ 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.</li> <li>▪ A discussion of the results, including the following:                             <ul style="list-style-type: none"> <li>– Whether the level of mortality was ecologically significant or affected listed species of birds or bats (including species of concern to DEECA/DCCEEW). If a Population Viability Assessment 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.</li> <li>– Any differences between years that may have arisen due to wet and dry conditions.</li> <li>– Any recommendations for reducing mortality, if necessary.</li> <li>– Any mitigation or offset measures implemented, and the success or otherwise of these measures.</li> </ul> </li> <li>▪ Raw data will be amended to the annual report.</li> </ul> <p><b>Submitted to:</b> DEECA/DCCEEW and the Responsible Authority.</p>	
Impact trigger notification	Within 2 working days for listed species; or 7 working days for non-listed species	<p>If an impact trigger is detected, GWF will notify via email of the impact trigger being recorded, as per Section 3 of this BAMP.</p> <p><b>Submitted to:</b> DEECA/DCCEEW.</p>	Wind farm operator
Investigation reports	Within 3 weeks of investigation conclusion	<p>Following the investigation, a report will be prepared that will aim to:</p> <ul style="list-style-type: none"> <li>▪ Determine the actual cause of death/injury.</li> <li>▪ Focus on determining the likelihood of further occurrences (e.g., through engagement with key species experts, undertaking a literature review, assessment of habitat, etc).</li> <li>▪ Identify suitable mitigation measures for immediate implementation.</li> </ul> <p><b>Submitted to:</b> DEECA/DCCEEW and the Responsible Authority.</p>	Qualified ecologist, in consultation with the wind farm operator

Following the completion of two years of monitoring, results will be reviewed by DEECA and DCCEEW 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 and DCCEEW.

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## 6. Management actions

Management actions and survey details for post-construction bird and bat impact monitoring are summarised in Table 6.

**Table 6: Timeline for surveys and reporting to DEECA/DCCEEW and the Responsible Authority after turbine commissioning at GWF.**

Management action	Details	Report timing	Responsible
Carcass searches	All turbines (i.e., 13) 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/DCCEEW. Continuation of searches after two years would depend on the extent of significant impacts on bird and bat populations of concern.	Annual reports.	Qualified ecologist
Scavenger trials	Experimental trials in each of the first two years to determine the scavenging rate when the grass is long and when the grass is short.	Annual reports.	Qualified ecologist
Detectability trials	Experimental trials twice in the first two years to determine the detection rate.	Annual reports.	Qualified ecologist

## 7. Roles and responsibilities

Table 7 identifies all stakeholders involved in the implementation and oversight of this BAMP and their respective responsibilities.

**Table 7: GWF BAMP implementation – roles and responsibilities.**

Organisation	Responsible for
Synergy Wind Pty Ltd (wind farm operator)	Implementation of all aspects of this BAMP and related decision, with technical support provided by a qualified ecologist
Qualified ecologist	Provide advice on and oversee BAMP implementation.
	Prepare all technical reports for DEECA/DCCEEW.
	Assist in the development and implementation of mitigation and consult with DEECA/DCCEEW on the suitability and feasibility of management approaches.
DEECA and DCCEEW	Review reports from the wind farm operator arising from the routine (e.g., annual reports or reports of listed species impacts) or impact trigger response reporting.
	Provide feedback to the operator on BAMP implementation and wind farm operations.
	Participate in discussions about proposed mitigation and comment on their suitability and effectiveness.
Minister for Planning (responsible authority)	Determine the acceptability of impact mitigation and offset measures.
	Review reports from the wind farm operator arising from the routine (e.g., annual reports or reports of listed species impacts) or impact trigger response reporting.

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## Appendices

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## Appendix 1: Carcass search protocol

A qualified ecologist, or personnel trained in carcass searches, will undertake the searches. A supervising ecologist will oversee the searches, and a scent dog may be employed where appropriate.

Based on applying the Hull and Muir model (2010) to the GWF 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. This has been used to determine the inner and outer circular search zones, as follows:

- The **inner zone** targets the detection of carcasses of bats and small to large-sized birds. The zone is a circle with a 70m radius from the turbine and transects are spaced every 6m (Figure 2).
- The **outer zone** targets the detection of carcasses of medium to large-sized birds. The zone is a circle between 70m and 130m radius circles from the turbine. Search transects are spaced at 12m and carried out from the edge of the inner zone to the edge of the outer zone (Figure 2).

All turbines once operational will be searched once per month. Each search and carcasses found will be documented in the form provided in Appendix 2.

### Scent dogs

Trained scent dogs may be employed, where deemed appropriate, to assist with carcass searches due to their superior detection capability (Bennett 2015). Their use will depend on the availability of trained dogs and their handlers familiar with the area and with the appropriate skills to undertake the searches. The 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.

The method used when using dogs will generally involve:

1. The dogs will work on a reference transect line from downwind to upwind.
2. The handler will start downwind of the turbine and walk across the direction of the wind allowing the dog to freely zigzag across the searcher's transects, using whistle commands to control how far the dog moves to each side of the transect (i.e., 30 metres). This will ensure all scent cone areas will be encountered (Figure 3).
3. 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.
4. Carcasses found outside the defined search area will be recorded and collected as an incidental find.
5. 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 30 metres wide will be adequate to cover an area in moderate wind conditions, this will be reduced to 10 or 20 metres in conditions with no wind or strong wind.
6. 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.
7. 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.

8. GPS data will be made available to regulators on request.

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

#### *Search regime*

All turbines will be searched out to 130 metres once per month. The order of turbines searched will be randomised between searches.

To maximise 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 monitoring program. Pulse searches entail searching in the same way the ‘inner zone’ (out to 70 metres) again two to three days after the initial search. This will maximise the detectability of most species of concern.

After the initial 12-month pulse search period, the requirement for another 12 months of pulse searches will be reviewed in the first annual report depending on the species and number of carcasses found.

#### *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 Carcass Search Data Sheet (Appendix 2):

- Position of the carcass relative 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 collision;
- 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 to the Australian Museum (Australian Centre for Wildlife Genomics) for DNA analysis.

The carcass will be handled according to the following standard protocol:

1. The carcass will be removed from the turbine site;
2. Personnel will wear appropriate PPE (e.g. rubber gloves) *Note – the carcass handler will adhere to all health and safety protocols detailed by their respective organisations;*
3. Personnel will place the carcass into a plastic bag, then into a second plastic bag;
4. A copy of the completed Carcass Search Data Sheet will be placed in the second plastic bag;
5. The double-bagged carcass will be transferred to a designated carcass freezer (at the Project Site office) for storage. This freezer will not be used for anything other than animal carcass storage.
6. The carcass will be stored for a second opinion on the species identity, if necessary, and for use in scavenger and detectability trials.

The wind farm operator is required to have a permit under the Victorian *Wildlife Act 1975* 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 turbine commissioning.

Any carcasses not required for searcher efficiency and scavenger trials will be retained for 12 months before disposal.

### *Bird and bat handling protocol*

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 report the find to the Project's site manager, 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 (Table A1-1). For injured native animal collection, contact Wildlife Victoria.

All persons who handle injured or dead animals must wear gloves and adhere to health and safety protocols detailed by their respective organisations. Particular care<sup>2</sup> 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).

**Table A1-1: Vet and wildlife carer details for the local region**

Name	Phone	Location/Address	Bats?
Gippsland Veterinary Group	(03) 5682 2757	15 Court Street, Foster	Yes
Yarram Veterinary Centre	(03) 5182 1225	40 Commercial Rd, Yarram	No
Moonshadow Flying-fox and Microbat Rescue and Rehabilitation Centre	0429 930 138	Sale	Yes
Wildlife Victoria (24 hours)	1300 094 535	Victoria	Yes

This protocol is valid for two years after commissioning and will be reviewed after this time. Any changes will be incorporated into future BAMP reviews and updates.

### *Scavenger rates and trials*

Ascertaining the rate at which carcasses are removed by scavengers can help develop a 'correction factor' that informs the estimate of the Project's impacts on birds and bats (mortality rate). Scavengers include ground-based animals, such as feral cats, foxes, dogs, and pigs (more likely to detect carcasses by scent), as well as aerial scavengers such as birds of prey and ravens (more likely to detect them visually). The scavenger trials described below are designed to ascertain the scavenging rate, usually expressed as the average carcass duration in the field.

The scavenger trial design is a necessary compromise between high numbers of trials and practicality whilst ensuring a statistically valid trial design without altering either the behaviour of scavengers or the number of birds that may collide with turbines. The second-year report will provide the first estimate based on real, site-specific data, of the precision of the estimates of the various parameters required to estimate mortality rate, including scavenging rate and searcher efficiency.

This protocol defines scavenged carcasses as follows:

<sup>2</sup> Bats and human health (<https://www.qld.gov.au/health/condition/infections-and-parasites/viral-infections/bats-human-health> accessed October 2024).

- **Intact carcass** is defined as a carcass that does not appear to have been scavenged by a vertebrate scavenger, and;
- **Partially eaten carcass** is any skeletal or flesh remains found. Feather and fur spots will be defined by their presence and the absence of any other remains (a feather spot being a cluster of five or more feathers).

Intact or partial carcasses and feather/fur spots will be recorded as a 'find.' However, the scavenger correction factor will not be applied to fur and feather spots as these most likely represent the remains of carcasses after they have been scavenged and not to do so would significantly bias mortality estimates upwards.

Scavenger trials will be undertaken twice per year during the first two years of monitoring. Two trials will account for different vegetation conditions, principally related to significant seasonal differences in grass height (Table A1-2). Conducting two scavenger trials at seasonally contrasting times accounts for occasional seasonal changes in carrion use by some scavenger species. Previous studies have found that Red Foxes are reliant on rabbits and carrion in agricultural and forested areas (e.g., Brunner et al. 1975, Catling 1988, Molsher et al. 2000). Feral cats show uniform use of carrion throughout the year, whereas fox prey type is dependent on availability (Catling 1988). Catling (1988) found that foxes ate more carrion in winter/spring compared with summer/autumn, when they fed on adult rabbits. However, Molsher et al. (2000) found that there was no overall significant difference between seasons for carrion use by foxes. Seasonal differences only occurred in other prey types (not carrion), such as dead young stock, invertebrates, and reptiles, as these are only available at certain times of the year. Given these uncertainties, conducting two scavenger trials at seasonally contrasting times is considered appropriate.

Scavenger trials for large raptors will only be conducted once per year due to lack of availability of suitable carcasses for a technically sound trial. Experience from other wind farms indicates a low level of scavenging of these carcasses and an elevated level of detectability that is consistent across the year during all seasons as larger carcasses are easier to find in long vegetation.

**Table A1-2: Timing for scavenger trials**

Grass height	Timing
Short	Autumn and winter
Long	Spring

Each scavenger trial will be undertaken by a trained person to determine the rate of loss by scavengers. The search area for scavenger trials will be limited to 70m from the base of the turbine (the inner search zone) and will be located at the previously randomly selected operating turbines that are searched regularly.

To identify potentially different scavenging rates, three categories of carcass will be used (Table A1-3). If insufficient large birds (raptor size) can be sourced, the data will be substituted with data from previous grouped studies undertaken on other wind farms. For each scavenger trial thirty carcasses will be randomly placed under different turbines. This will represent a minimum of 10 carcasses in each size class per trial (two trials per year).

**Table A1-3: Number of replicates for each scavenger trial**

Microbat	Medium-sized birds	Large birds (large raptor size)
10	10	10

Infrared cameras are used to monitor scavenging activity. These are more accurate than traditional human checks as they show the exact day and time the carcass was removed and by which scavenger.

Infrared motion detector cameras will be installed within 1-2 metres of each carcass and will operate for thirty days (if the carcass remains), with an initial check after the first 5 days. The images will be downloaded and analysed.

Additional information on scavenger trials is provided below.

- The timing of searches is based on experience and regulatory approval at several other wind farms where trials have shown almost all carcasses have been scavenged within ten days. More frequent monitoring than that proposed herein will not significantly affect the estimated scavenging rate or impact on mortality estimates.
- A mix of carcass sizes (if available) will be obtained for use in the trials. Where carcasses of a species group cannot be found, a similar-sized and coloured substitute (i.e., mice substituted for bats, pest birds collected from control programs Common Myna/Common Starling substituted for medium-sized birds) will be used to reduce bias by visual predators.
- Latex gloves will always be worn while handling carcasses to minimise contact with human scent, which may alter predator responses around carrion and to minimise disease risk to the handler.
- At each trial site, one carcass (or more) will be placed randomly within the 70-metre search area. Carcasses will be thrown in the air and allowed to land on the ground to simulate at least some of the fall and allow for ruffling of fur or feathers.
- Carcasses used in the trials will have their coordinates recorded to ensure that they are not confused with an actual collision mortality.
- Comprehensive notes will record evidence remaining at sites where carcasses have been scavenged (e.g., scavenger scats, bones, feathers, animal parts and type of scavenging if visible, such as tearing, pecking, complete removal of carcass, partial removal of carcass, bird, or mammal predator evidence).

- Notes will be taken on the state of carcasses in each search.

#### *Detectability (searcher efficiency) trials*

The best use of available carcasses is to conduct the detectability trials concurrently with the scavenger trials during the first day of placing the carcasses. As humans are reliant on visual cues to determine carcass location, the two seasonal visibility categories of low and long grass cover will be compared. Two trials, one in short and long grass periods will be undertaken for the first two years of monitoring.

To account for searcher variability in detecting carcasses, only personnel who have carried out monthly searches at the project site will participate in the detectability (searcher efficiency) trials. Detection efficiency (i.e., the percentage of carcasses detected by each searcher) will then be incorporated into later analyses that derive mortality estimates. Table A1-4 summarises the number of carcasses to be employed in each trial. The carcass controller (i.e., a person not involved in monthly carcass searches) will throw each carcass into the air and allow it to land on the ground to simulate at least some of the fall and the potential ruffling of fur and feathers. The searchers will not be aware of the timing of this trial. Even if searchers become aware of the trial, for example, due to an increased number of carcasses, this would not impact on the searcher efficiency results as searches will be undertaken in the same manner. The carcass controller will note the placement of carcasses (via GPS) and is free to decide where and how many are deployed under each turbine. However, all carcasses will be located within the inner 70-metre search zone.

**Table A1-4: Number of replicates per season for detectability trials**

Season	Microbat	Medium-sized birds	Large birds (large raptor size)
Spring - long grass	10	10	10
Autumn to winter - short grass	10	10	10

Analysis of past trials from other wind farms indicate a large confidence interval on the estimate of searcher efficiency, even for a high number of trials (plus or minus 10% even with 50 replicates; Symbolix 2020). This means that only relatively large seasonal changes in detection (~20-30% or more) will be resolvable from normal background variation. Sampling will be undertaken during the two periods that represent the greatest change in vegetation cover (therefore visibility) over two years. Statistical confidence analysis indicates that this will result in a reasonably precise detectability estimate after one year, and optimal precision after two.

Any substitute carcasses for these trials will be of both comparable size, colour and form to the species being represented or species of concern (e.g., brown mice rather than birds should be substituted for bats as birds do not have the same body shape, colour and appearance).

#### *References*

- Bennett, E 2015, *Observations from the Use of Dogs to Undertake Carcass Searches at Wind Facilities in Australia*. In: Hull, C., Bennett, E., Stark, E., Smales, I., Lau, J., Venosta, M. (eds) *Wind and Wildlife*. Springer, Dordrecht. [https://doi.org/10.1007/978-94-017-9490-9\\_7](https://doi.org/10.1007/978-94-017-9490-9_7)
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Symbolix 2020, *Post Construction Bird and Bat Monitoring at Wind Farms in Victoria*, Melbourne. Public report, 13th Wind Wildlife Research Meeting 2020.

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**Appendix 2: Carcass datasheet; to be used for any carcass finds (formal or incidental)**

Gelliondale Wind Farm – MORTALITY MONITORING PROGRAM: CARCASS DATA-SHEET				
Fill out all details above the heavy line for each site searched. All details below the line are required if a carcass is found.				
Collector:	Date:	Start time:	Finish time:	
Turbine identifier:				
Temperature:	Wind direction/speed:	Humidity:		
Search purpose (e.g. scavenger trial):	If scheduled search; search completed: Yes / No			
On-site works in the last 5 days:				
Weather conditions in the last 5 days:				
Comments:				
<b>Carcass details</b>	Time:	Coordinates:	Substrate:	
Distance from tower(m):	Bearing from tower (deg):			
Species common name:				Sex/age? :
Scientific name:				
Photo taken*	Yes / No			
Carcass condition: Intact, Scavenged, Feather spot:	Describe:			
Signs of injury:				
Estimated age of the carcass (✓):	<24 hrs	1-3 days	> 3 days	Other
Other notes: (incl. presence of stock)				
Post carcass find actions: <ol style="list-style-type: none"> <li>1. Place carcass in sealable plastic bag then place in a second sealable bag and take to freezer at the site office.</li> <li>2. Send a copy of this completed form to the site manager within seven days of the date of the carcass find.</li> <li>3. Complete one form per carcass found.</li> <li>4. *Attach photo to this form</li> </ol>				