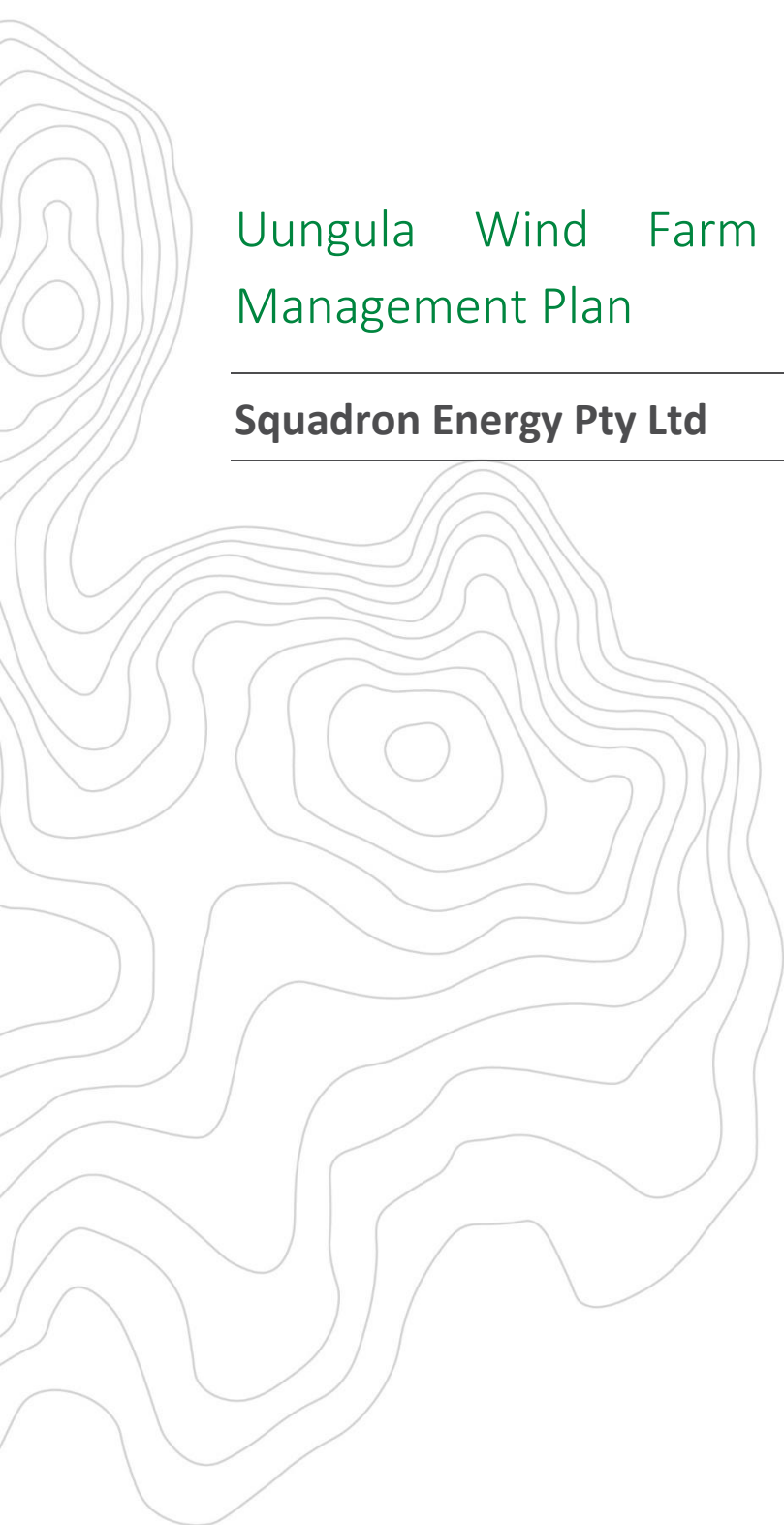




Uungula Wind Farm Bird and Bat Adaptive Management Plan

Squadron Energy Pty Ltd

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Project Manager	Tom Kelly
Prepared by	Caitlin Orr, Tom Kelly
Reviewed by	Aleksei Atkin
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Template 2.8.1

Contents

1. Introduction	1
1.1. Background.....	1
1.2. Requirements of the BBAMP	1
1.2.1. NSW Approval.....	1
1.2.2. EPBC Act Approval	2
1.3. BBAMP Objectives	2
1.4. Consultation during the development of the BBAMP.....	3
1.5. Site description	4
2. Baseline bird and bat information	6
2.1. Pre-approval bird and bat surveys	6
2.1.1. Bird surveys.....	6
2.1.2. Bat surveys.....	6
2.2. Pre-construction bird and bat surveys.....	6
2.2.1. Bird Utilisation Surveys	6
2.2.2. Bat Activity Surveys.....	7
3. Risk Assessment	10
3.1. Introduction to the risk assessment	10
3.2. Data sources used for risk assessment	10
3.3. Risk assessment process	11
3.4. Risk Assessment results	12
3.5. Revision of risk levels	13
4. Operational phase monitoring program	14
4.1. Bird Utilisation Surveys	14
4.2. Bat Activity Surveys.....	14
4.3. Threatened, migratory and at risk bird species flight behaviour and tracking.....	15
4.4. Carcass monitoring program	15
4.4.1. Commissioning phase carcass monitoring program	15
4.4.2. Operational phase carcass monitoring program	15
4.4.3. Search protocol.....	16
4.4.4. Carcass and storage registers	17
4.4.5. Scavenger Rates and Trials	17
4.4.6. Detectability (Observer) trials.....	18
4.5. Incidental carcass protocol	18
4.6. Data analysis and reporting	19
4.7. Personnel involved	19
4.8. Injured bird and bat protocol.....	20

4.9. Monitoring summary for threatened, migratory and at risk bird and bat species.....	20
5. Impact triggers	21
5.1. Impact trigger for listed threatened or migratory species.....	21
5.1.1. Definition of impact trigger for listed threatened or migratory species	21
5.1.2. Impact trigger investigation.....	21
5.2. Impact trigger for non-listed species	22
5.2.1. Definition of impact trigger for non-listed species	22
5.2.2. Impact trigger investigation.....	22
5.3. Impact trigger for Wedge-tailed Eagle.....	23
5.3.1. Definition of impact trigger for Wedge-tailed Eagle	23
5.3.2. Impact trigger investigation.....	23
5.4. Mitigation measures and adaptive management to reduce risk	23
5.4.1. Carrion removal and stock control	23
5.4.2. Feral animal control	24
5.4.3. Minimise raptor perches on turbines	24
5.4.4. Lighting on turbines and buildings.....	24
5.4.5. Impact mitigation measures and additional monitoring	24
5.4.6. Summary of management objectives and associated approval conditions, activities, timing, and performance criteria.....	26
6. Review	28
7. References	29
Appendix A – Bird and Bat Risk Assessment	30
Appendix B – Symbolix Uungula WF BBAMP advice.....	46
Appendix C – Additional compliance requirements for SSD-6687	59

List of Figures

Figure 1: Regional location of the Project.....	5
Figure 2: BUS and BAS site locations.....	9

List of Tables

Table 1: Sections within the BBAMP that respond to Condition of Approval B24 for Uungula Wind Farm	1
Table 2: BCS consultation outcomes in the development of the final UWF BBAMP	3
Table 3: Likelihood criteria	12
Table 4: Consequence criteria.....	12

Table 5: Risk matrix determining risk level (Low, Moderate, High) based on likelihood and consequence	12
Table 6: Bird and bat species with a Moderate or High risk of impact	13
Table 7: Carcass classes and quantities required for scavenger trials	18
Table 8: Operational monitoring of threatened, migratory and at risk species / species groups	20
Table 9: Mitigation and monitoring measures in response to impacts / triggers.....	24
Table 10: Management objectives and associated approval conditions, activities, timing, and performance criteria	26
Table 11: Risk assessment for threatened and at risk bird and bat species	30
Table 12: Additional conditions and compliance requirements (Development Consent SSD-6687)	59

Abbreviations

Abbreviation	Description
BBAMP	Bird and Bat Adaptive Management Plan
BC Act	<i>Biodiversity Conservation Act 2016</i>
BCS	NSW Biodiversity, Conservation and Science Directorate
ELA	Eco Logical Australia Pty Ltd
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DPE	NSW Department of Planning and Environment
LGA	Local Government Area
MW	Megawatt
NPW Act	<i>NSW National Parks and Wildlife Act 1974</i>
NSW	New South Wales
RSA	Rotor swept area
SSD	State Significant Development
UWF	Ungula Wind Farm

1. Introduction

1.1. Background

Uungula Wind Farm (UWF; the Project) is located 14 km east of Wellington, in central west New South Wales (NSW). The NSW Department of Planning and Environment (DPE) granted Development Consent on 11 May 2021. The project was later Modified on 21 April 2022 (Mod 1) and 5 December 2022 (Mod 2). The modified consent provides approval for up to 93 wind turbines, however, the final wind farm design is for a total of 69 wind turbines. The wind turbines will have a maximum height of 230 m, with an expected rotor swept area (RSA) of 66 to 230 m.

This draft Bird and Bat Adaptive Management Plan (BBAMP) has been prepared for review by the NSW Department of Planning and Environment, and the NSW Biodiversity, Conservation and Science Directorate (BCS).

1.2. Requirements of the BBAMP

The specific requirements of the BBAMP are presented below, extracted from the approval conditions.

1.2.1. NSW Approval

NSW Project approval State Significant Development (SSD) 6687 states that prior to the commissioning of any wind turbines, the Applicant must prepare a BBAMP for the Project in consultation with BCS, and to the satisfaction of the Planning Secretary. The following table details the relevant NSW Approval Condition B24 and outlines which sections of this BBAMP address the specific requirements of each approval condition.

Table 1: Sections within the BBAMP that respond to Condition of Approval B24 for Uungula Wind Farm

Condition Number	Abbreviated Condition Details	BBAMP Section/s
B24. (a)	At least 12 months' worth of baseline data on threatened and at risk bird and bat species and populations in the locality that could be affected by the development.	Section 2
B24. (b)	A detailed description of the measures that would be implemented on site for minimising bird and bat strike during operation of the development, including: - Minimising the availability of raptor perches on wind turbines; - Prompt carcass removal; - Controlling pests; and - Using best practice methods for bat deterrence, including managing potential lighting impacts.	Section 5
B24. (c)	Trigger levels for further investigation of the potential impacts of the Project on specific bird or bat species or populations.	Section 5.1 - 5.2
B24. (d)	An adaptive management plan that would be implemented if the development is having an adverse impact on a particular threatened or at risk bird and/or bat species or populations, including the implementation of measures to: - Reduce the mortality of those species or populations (including detailed consideration of favourable eucalyptus flowering events); or - Enhance and propagate those species or populations in the locality, where feasible.	Section 5.3

Condition Number	Abbreviated Condition Details	BBAMP Section/s
B24. (e)	A detailed program to monitor and report on: - The effectiveness of these measures; and - Any bird and bat strikes on site.	Section 4
B24. (f)	Provisions for a copy of the raw data collected as part of the monitoring program to be submitted to BCS and the Planning Secretary.	Section 4.6

Following the Planning Secretary's approval, the Applicant must implement the BBAMP. This BBAMP fulfils the requirements of Condition B24 of the Project approval, and subject to approval by DPE, will be implemented during the development and operation of the UWF.

Appendix C outlines how the project will comply with a range of additional Development Consent Conditions, including:

- Evidence of Consultation (Condition A9);
- Compliance (Condition A13);
- Community Consultative Committee (Condition A20);
- Revision of Strategies, Plans and Programs (Condition C2);
- Staging, Combining and Updating Strategies, Plans or Programs (Condition C3, C4, C5 & C6);
- Notification of Department (Condition C7);
- Submission of Final Layout Plans (Condition C8);
- Submission of Works as Executed Plans (Condition C9);
- Incident Notification (Condition C10);
- Non-Compliance Notification (Conditions C11, C12 & C13); and
- Access to Information (Condition C16).

1.2.2. EPBC Act Approval

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval EPBC 2013/7026 requires the approval holder to comply with the above Condition 24 of the NSW Project approval and provide a copy of the finalised BBAMP to DCCEEW in accordance with Condition 8 of EPBC 2013/7026 approval. This BBAMP addresses this approval condition in relation to EPBC Act listed bird and bat species.

1.3. BBAMP Objectives

The overall aim of this BBAMP is to provide a program for monitoring potential impacts of the Project on birds and bats and to detail a strategy for managing and mitigating any significant bird and bat impacts arising from the operation of the UWF. The specific objectives of this BBAMP, derived from the conditions of approval, are set out below.

- To provide baseline data on bird and bat populations that could potentially be affected by the development of the UWF site, particularly threatened, migratory and at risk species.
- To implement a monitoring program capable of detecting significant changes to the populations of birds and bats.
- To directly record impacts on birds and bats through a robust carcass monitoring program.

- To define impact trigger levels and document an agreed investigative process that outlines the specific actions to be taken in order to confirm any identified impacts on birds and bats.
- To detail specific mitigation measures and related implementation strategies to mitigate any confirmed significant impacts on birds and bats.
- To detail reporting requirements and the provision of data to relevant statutory authorities.

An adaptive management approach is taken for this BBAMP to allow for flexibility in all components of this plan which may arise following findings of monitoring and/or as more relevant information becomes available. This is particularly important for monitoring and managing impacts from Australian wind farms on birds and bats as the majority of published works are from overseas areas. Impacts and mitigation for Australian windfarms and their unique bats can be better targeted and implemented as more information and experience is gained from other Australian wind farms through ongoing research and monitoring of relevant bird and bat species and their populations.

1.4. Consultation during the development of the BBAMP

Initial consultation with the NSW BCS in relation to this plan was undertaken to ensure the plan was prepared with the relevant guidance and support of the BCS, with BCS providing written acceptance of the plan on 30 October 2023. Table 2 below details the matters raised by BCS in their review and the outcomes of this consultation in preparation of this final version of the plan.

Table 2: BCS consultation outcomes in the development of the final UWF BBAMP

BCS Review Item	Final BBAMP Outcome	Status
Clarification of the number of turbines involved in the carcass monitoring program and on-going turbine risk assessment.	All 69 turbines (100%) will be searched in the carcass monitoring program, and as such, turbine risk assessment not required. Section 1.1 updated accordingly.	Resolved
Extension of operational phase carcass monitoring program and increased number and timing of scavenger and detectability (observer) trials, including the use of detection dogs.	Operational phase carcass monitoring program extended from two to four years and of scavenger and detectability (observer trials) doubled from two to four, including the use of detection dogs, subject to landholder agreement, across variable seasonal and environmental conditions. Section 4 updated accordingly.	Resolved
A specific impact trigger and response should be developed for Wedge-tailed Eagle strikes in the same manner as listed threatened species.	A species-specific impact trigger and response protocol was developed for Wedge-tailed Eagle strikes given the high risk rating for the species. Section 5.3 updated accordingly.	Resolved
Update eucalypt mass flowering event impact mitigation trigger	Mass flowering event trigger expanded to include all eucalypt trees rather than only the dominant tree species (White Box) present across the UWF. Section 5.4.5 updated accordingly.	Resolved

1.5. Site description

The Project is located within the Dubbo Regional Council Local Government Area (LGA) between Wuuluman and Twelve Mile, 14 km east of Wellington, and within the Central-West Orana Renewable Energy Zone (**Figure 1**).

The Project region is dominated by agriculture, however the region includes the Bodangora Wind Farm 7 km north of the Project site, the Wellington Solar Farm 13 km west and Beryl Solar Farm 30 km east of the Project site. The town of Wellington, located approximately 14 km west of the Project, is the nearest population centre with the small village of Goolma located approximately 16 km north of the Project. Lake Burrendong is located to the south of the Project, which is part of the Water NSW bulk water storage complex which drains into the Macquarie River. The majority of the Project site drains into local tributaries feeding ultimately into Lake Burrendong.

The Project site was once dominated by open forest and woodland, which has now been extensively cleared for agricultural use. Open forest and woodland accounts for approximately 79% of Project site. In the cleared areas of the Project site, overall habitat quality for birds and bats is low, however, remnant woodland patches and corridors contain moderate to high quality habitat. Relatively large remnant woodland and forest patches outside, and in places connected to the Project site, further enhance the overall bird and bat habitat value. The bird and bat assemblages recorded within the Project site are typical of the surrounding agricultural landscapes in central west NSW (see **Section 2** below).

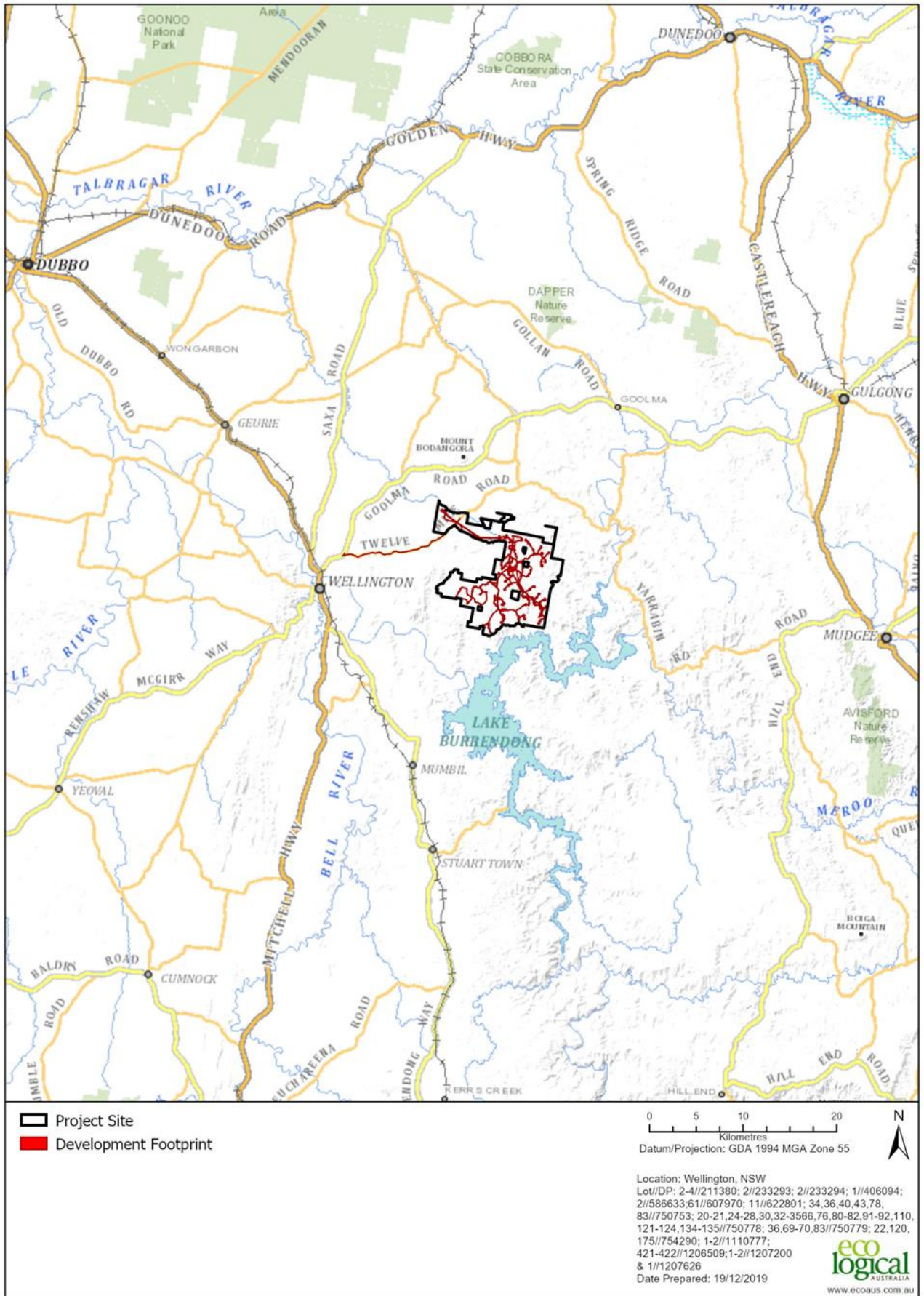


Figure 1: Regional location of the Project

2. Baseline bird and bat information

2.1. Pre-approval bird and bat surveys

2.1.1. Bird surveys

A total of 109 bird species were recorded during pre-approval bird surveys, which included diurnal woodland bird surveys, nocturnal surveys, and Bird Utilisation Surveys (BUS) (ERM 2013). Of the 109 bird species recorded, nine were threatened species listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and three species listed under the Commonwealth EPBC Act.

BUS were undertaken from December 2012 to March 2013 across 40 individual sites. A total of 44 bird species were recorded, including one threatened species listed under the NSW BC Act (*Artamus cyanopterus cyanopterus* Dusky Woodswallow) and one threatened and migratory species listed under the EPBC Act (*Hirundapus caudacutus* White-throated Needletail). The exact altitude of flight heights were not recorded in metres and as such it is not possible to ascertain how many species or individual flights were recorded within the likely RSA (66 to 230 m). Despite this, *Aquila audax* (Wedge-tailed Eagle) was noted as flying up to 500 m high and recorded across 19 of 40 sites, with single large flocks of White-throated Needletail, *Threskiornis spinicollis* (Straw-necked Ibis) and *Phalacrocorax sulcirostris* (Little Black Cormorant) also noted as flying within RSA height. Native species protected under the NSW *National Parks and Wildlife Act 1974* (NPW Act) that are not otherwise classified as threatened or migratory are considered “at risk” if they are known or likely to fly at rotor height.

The threatened, migratory and at risk species recorded during the pre-approval BUS have been assessed within the risk assessment below in **Section 3**.

2.1.2. Bat surveys

Acoustic microbat call detection was undertaken between November 2012 and February 2013 (ERM 2013). A total of 14,934 calls were analysed from which 11 microbat species were positively identified, with a further seven species potentially also present. Two threatened species listed under the NSW BC Act (*Miniopterus orianae oceanensis* Large Bent-winged Bat; *Saccolaimus flaviventris* Yellow-bellied Sheath-tailed Bat) were definitely recorded, with a further four threatened species also potentially present. A single *Pteropus poliocephalus* (Grey-headed Flying-fox) carcass was recorded within the Project site entangled in a barbed wire fence, however, no live individuals were recorded flying over the site during surveys.

The threatened and potentially at risk species recorded during the pre-approval surveys have been assessed within the risk assessment below in **Section 3**.

2.2. Pre-construction bird and bat surveys

2.2.1. Bird Utilisation Surveys

A ‘Before-After-Control-Impact’ (BACI) sampling design incorporating both pre-construction (before) and operational (after – see **Section 4.1**) BUS has been implemented for the UWF (ELA 2021). The BUS method involves a fixed-point 15 minute survey undertaken by one observer, where the abundances of all species visible and/or audible will be recorded along with a range of covariate data including:

- Estimated flight height (metres above observer position)
- Estimated distance from observer
- Bird behaviour (e.g. Flying above canopy; On ground; Nesting).

The above data is recorded digitally using ESRI Survey123 proformas, with the flight paths of key species including raptors and migratory species also recorded via ESRI ArcCollector, to enable real-time georeferenced data collection. A total of eight 'Impact' sites located within or immediately adjacent to the UWF development corridor are surveyed, along with five 'Control' sites located well outside (3-7 km away) of the development corridor to ensure a level of independence in the bird data collected from the 'Impact' sites (**Figure 2**). Where possible, the location of sites was kept consistent with those surveyed during the pre-approval BUS (**Section 2.1.1**).

Pre-construction surveys were completed in autumn 2021, winter 2021, spring 2021 and summer 2022. Each site was surveyed four times across multiple days during each of the four seasonal survey periods, with the timing and order of sites varying between days and seasons. This survey design provides sufficient replicate surveys per season to allow for comparison with operational surveys through statistical analysis in a BACI system (Underwood 1996) and accounting for the range of likely temporal variations in bird species assemblages, richness, and abundance.

A total of 74 bird species were recorded across all BUS sites. Five of the species recorded are listed as threatened under the NSW BC Act, with one of these species also listed as threatened under the Commonwealth EPBC Act and an additional species listed as Migratory. The six listed species recorded during BUS surveys are as follows:

- *Artamus cyanopterus cyanopterus* (Dusky Woodswallow) – Vulnerable (BC Act)
- *Apus pacificus* (Fork-tailed Swift) – Migratory (EPBC Act)
- *Chthonicola sagittata* (Speckled Warbler) – Vulnerable (BC Act)
- *Climacteris picumnus victoriae* (Brown Treecreeper) – Vulnerable (BC Act)
- *Polytelis swainsonii* (Superb Parrot) – Vulnerable (BC Act and EPBC Act)
- *Stagonopleura guttata* (Diamond Firetail) – Vulnerable (BC Act).

The distribution of bird species across both control and impact sites is similar with a total of 61 species recorded at control sites and 54 species recorded at impact sites. A total of eight species were recorded 'at height' within or near to the likely RSA of 66 to 230 m. Birds flying above 60 m were also included in this 'at height' group as a precautionary measure, acknowledging the yet-to-be confirmed turbine dimensions, as well as the variable nature of bird flight heights and the recorders capacity to observe and measure this.

The threatened, migratory and at risk bird species recorded at both Impact and Control sites during the pre-construction BUS have been assessed within the risk assessment below in **Section 3**.

2.2.2. Bat Activity Surveys

Consistent with the BACI sampling design detailed in **Section 2.2.1** above, pre-construction Bat Activity Surveys (BAS) have also been completed at UWF in autumn 2021, winter 2021, spring 2021 and summer 2021/22. Acoustic microbat call detection devices are placed at the same eight 'Impact' sites and five 'Control' sites used for the BUS surveys, with two of the Control sites coinciding with the location of onsite meteorological masts (BUS 3 = mast WEL04; BUS 7 = mast WEL03; see **Figure 2**). This allows for

vertically stratified surveys to be undertaken at these locations, with one detector placed on the ground, whilst the other is hoisted up to approximately 70 m (WEL03) and 110 m (WEL04) on the adjacent mast. Microbat call detection occurs across four nights in each seasonal survey to collect sufficient replicate data.

A total of 18,803 calls were analysed, from which nine microbat species were positively identified, with a further seven species potentially present. Consistent with the pre-approval microbat surveys (ERM 2013), two threatened species listed under the NSW BC Act (Large Bent-winged Bat and Yellow-bellied Sheath-tailed Bat) were definitely recorded. Two other threatened species, *Nyctophilus corbeni* (Corben's Long-eared Bat) and *Vespadelus troughtoni* (Eastern Cave Bat), were also potentially recorded during the pre-construction BAS.

Call activity was calculated utilising the total number of identifiable microbat calls per night (sunset to sunrise). The overall microbat call activity across the majority of survey sites was regarded as being very low (<50 calls per night) to low (50 – 200 calls per night). Sites WEL03 and WEL04 with detectors located at height on meteorological masts, recorded the lowest average call activity (18.06 calls per night), followed by Impact sites (38.39 calls per night) and Control sites (113.25 calls per night). There were also considerable seasonal differences recorded in call activity with autumn recording the lowest activity (24.95 calls per night), followed by summer (37.48 calls per night), winter (57.90 calls per night) and spring (122.13 calls per night).

The threatened and at risk bat species recorded at both Impact and Control sites during the pre-construction BAS have been assessed within the risk assessment below in **Section 3**.

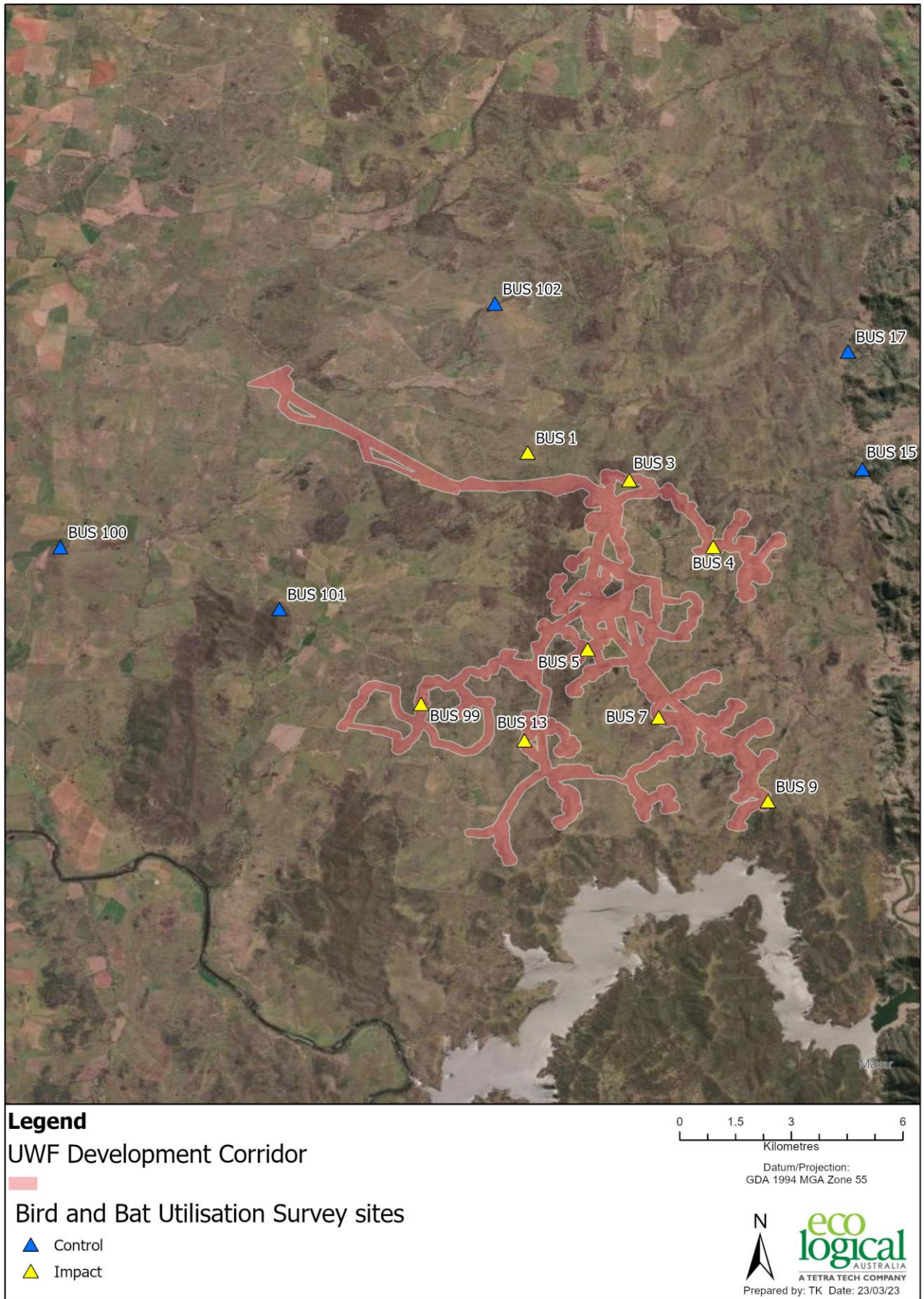


Figure 2: BUS and BAS site locations

3. Risk Assessment

3.1. Introduction to the risk assessment

The aim of this risk assessment is to identify bird and bat species potentially at risk from either collision with wind turbines or disturbance by the construction and operation of the UWF. Through identifying species at heightened risk and considering relevant factors such as their status, ecology, and the nature of known and potential impacts, targeted monitoring and management measures can be developed. The following subsections detail the risk assessment process applied for the UWF and identify the bird and bat species which require consideration in the subsequent sections of this BBAMP.

3.2. Data sources used for risk assessment

The following data sources were used to identify the bird and bat species potentially at risk from the construction and operation of the UWF:

- UWF Ecological Impact Assessment (ERM 2013): data and results including desktop assessment, BUS and woodland bird surveys, microbat surveys, at risk bird species collision risk modelling (CRM) and opportunistic threatened species records. This data source was reviewed to note threatened, migratory and at risk (species recorded flying within the RSA) bird and bat species recorded during surveys and identify previous assessments of the risk the UWF developments proposed to these species.
- UWF bird and bat impact assessment (response to submissions of the Biodiversity, Conservation and Science Directorate – Department of Planning, Industry and Environment) (ELA 2020): literature review, collision risk assessment, bird and bat assessment of likelihood of impact. This data source collated all relevant bird and bat information and assessed the likelihood of impact from the UWF. This information was a key component used to inform the risk assessment.
- UWF pre-construction BUS and BAS (ELA unpublished data): data from pre-construction BUS and BAS. As detailed above in Section 2.2, this data source contains 12-months of bird and bat survey data which was reviewed to update the ELA (2020) assessment, by providing additional data on bird and bat occurrence and behaviour across the UWF Project site. This included updates to the list of threatened, migratory and at risk bird and bat species to be included in the risk assessment.
- Australian bird and bat wind farm collision database (ELA unpublished data): a non-exhaustive internal database maintained by ELA documenting publicly available and internal records of bird and bat mortalities for wind farms across eastern Australia. This data source was reviewed to determine whether the threatened, migratory and at risk species identified for the UWF had any recorded fatalities.
- Bodangora Wind Farm Second Annual BBAMP report (Nature Advisory 2021a): data and results (including bird and bat carcass monitoring) from the initial two year operational period BBAMP implementation. Bodangora Wind Farm sits approximately 7 km north of the UWF with an approximate RSA of 20-150 m. This data source was reviewed to assess the results of impact monitoring at an operational neighbouring wind farm.
- Crudine Ridge Wind Farm carcass monitoring data (ELA unpublished data): carcass monitoring data from the first 10 months of operational period BBAMP implementation.

Crudine Ridge Wind Farm sits approximately 60 km south-east of the UWF with an RSA of 23-160 m. This data source was reviewed to assess the results of impact monitoring at an operational wind farm within the same region as the UWF.

- Sapphire Wind Farm Second Annual BBAMP report (Nature Advisory 2021b): data and results (including bird and bat carcass monitoring) from the initial two year operational period BBAMP implementation. Sapphire Wind Farm sits approximately 380 km north-east of the UWF with an approximate RSA of 74-200 m. This data source was reviewed to assess the results of impact monitoring at an operational wind farm with a similar RSA and suite of threatened and at risk bird and bat species as the UWF.

3.3. Risk assessment process

A total of 16 threatened and/or migratory bird and three threatened bat species, as well as ten at risk bird and four at risk bat species / species groups have been assessed (see **Appendix A**). The following information was collated for each species:

- Conservation status: all bird and bat species listed under the NSW BC Act and/or Commonwealth EPBC Act recorded at the UWF were assessed.
- Habitat present at UWF: breeding and/or foraging habitat.
- Seasonality and movement behaviour: sedentary, migratory, or nomadic, as well as typical flight and foraging behaviour.
- Number of records and number of individuals recorded at UWF: includes data from pre-approval and pre-construction surveys, along with opportunistic records.
- Recorded flight height: flight height recorded during BUS and BAS. All bird and bat species recorded flying within the RSA (66-230 m) or approaching RSA heights (>60 m) were assessed.
- Recorded fatalities at Australian wind farms: data from ELA internal database, with greater relevance applied to fatalities recorded at Bodangora, Crudine Ridge and Sapphire Wind Farms.
- Nature of potential impact: direct impacts from turbine collision, barotrauma and habitat clearing, and indirect impacts from habitat disturbance, exclusion, and movement restriction.

The above information for each species was then used to undertake the risk assessment utilising a risk matrix (**Table 5**) guided by AS/NZS ISO 31000 – Australian Standards for Risk Assessment (Standards Australia 2009), Australian Wind Energy Association Interim Standards for Risk Assessment (AusWEA 2005) and Onshore Wind Farms – interim guidance on bird and bat management (DAWE 2021). The matrix considers the likelihood of a potential impact occurring (**Table 3**) as well as the consequence should the impact occur (**Table 4**). The overall level of risk is determined by the combined likelihood and consequence of an impact occurring on a given bird or bat species as shown in the risk matrix (**Table 5**) below. The risk matrix should be considered a guide rather than a predictive tool, recognising that bird and bat behaviours are varied and complex, as can be their response to both natural and human-induced impacts.

Table 3: Likelihood criteria

Likelihood	Criteria
Highly Unlikely	It is very improbable that a potential impact could occur (<10%)
Unlikely	It is less probable than not that a potential impact could occur (<50%)
Potential	It is equally probable that a potential risk could or could not occur (50%)
Likely	It is more probable than not that a potential impact could occur (>50%)
Highly Likely	It is very probable that a potential impact could occur (>90%)

Table 4: Consequence criteria

Consequence	Criteria
Low	Loss of individuals with no significant impact on local population
Moderate	Loss of individuals which may cause significant impact on local population
High	Loss of individuals which may cause significant impact at a species population scale

Table 5: Risk matrix determining risk level (Low, Moderate, High) based on likelihood and consequence

Likelihood	Consequence		
	Low	Moderate	High
Highly Unlikely	Low	Low	Moderate
Unlikely	Low	Moderate	High
Potential	Low	Moderate	High
Likely	Moderate	Moderate	High
Highly Likely	Moderate	High	High

3.4. Risk Assessment results

Of the 33 threatened, migratory and at risk bird and bat species assessed, 17 species recorded a *Low* risk level, 13 species recorded a *Moderate* risk level and 3 species recorded a *High* risk level. The three *High* risk species, *Aquila audax* (Wedge-tailed Eagle), *Falco cenchroides* (Nankeen Kestrel) and *Aurolonchus australis* (White-striped Freetail Bat), all share common traits which elevates their risk to impacts from wind farm developments (**Table 6**). All three species are present year-round and were abundantly recorded across the UWF Project site, including at heights within the RSA. These species also have relatively high numbers of recorded fatalities at Australian wind farms, including the nearby Bodangora and Crudine Ridge Wind Farms, as well as the Sapphire Wind Farm which has a similar RSA to that planned for the UWF. Given the elevated *Moderate* and *High* risk rating for the 16 species listed in **Table 6** below, suitable monitoring (**Section 4**) and mitigation measures (**Section 5**) have been proposed as part of the BBAMP. The full risk assessment is presented in **Appendix A**.

Table 6: Bird and bat species with a Moderate or High risk of impact

Species	Risk level	Species	Risk level
Australian Raven <i>Corvus coronoides</i>	Moderate	Regent Honeyeater <i>Anthochaera phrygia</i>	Moderate
Brown Falcon <i>Falco berigora</i>	Moderate	Spotted Harrier <i>Circus assimilis</i>	Moderate
Fork-tailed Swift <i>Apus pacificus</i>	Moderate	Swift Parrot <i>Lathamus discolor</i>	Moderate
Gould's Wattled Bat <i>Chalinolobus gouldii</i>	Moderate	White-throated Needletail <i>Hirundapus caudacutus</i>	Moderate
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	Moderate	Yellow-bellied Sheath-tail Bat <i>Saccolaimus flaviventris</i>	Moderate
Inland Free-tailed Bat <i>Ozimops petersi</i> ; Southern Free-tailed Bat <i>Ozimops planiceps</i> ; Ride's Free-tailed Bat <i>Ozimops ridei</i>	Moderate	Nankeen Kestrel <i>Falco cenchroides</i>	High
Large Bent-winged Bat <i>Miniopterus orianae oceanensis</i>	Moderate	Wedge-tailed Eagle <i>Aquila audax</i>	High
Little Forest Bat <i>Vespadelus vulturnus</i>	Moderate	White-striped Freetail Bat <i>Austronomus australis</i>	High
Little Red Flying-fox <i>Pteropus scapulatus</i>	Moderate		

3.5. Revision of risk levels

Consistent with the adaptive management approach of this BBAMP, the risk level for each bird and bat species assessed in **Appendix A** will be revised and updated as necessary during annual reporting in the operational phase of the BBAMP implementation.

4. Operational phase monitoring program

The UWF operational phase monitoring program has been designed for implementation during the initial four year operation of the UWF. Whilst the methodology and schedule of monitoring is detailed explicitly in the following sections, the monitoring program will be implemented within the broader adaptive management framework of this BBAMP. The main objectives of the monitoring program are to assess both direct and indirect impacts and identify any requirements for adaptive management and/or mitigation. The monitoring program comprises the following components:

- Monitoring of bird utilisation and bat activity (BUS and BAS) throughout the initial phase of operations, to be analysed comparatively to pre-operational data.
- Recording of threatened, migratory and at risk bird species flight behaviour and activity.
- A statistically robust operational phase carcass search monitoring program to detect birds and bats that collide fatally with turbines, in order to estimate overall bird and bat mortality rates at the UWF.
- Implementation of a carcass search program, commencing during the commissioning phase of the development once 50% of the turbines are able to operate simultaneously and export electricity to the grid.

Section 4.1 through to **Section 4.4** describe the survey methodologies to be implemented once the Project becomes operational.

4.1. Bird Utilisation Surveys

Operational phase BUS will be undertaken utilising the same sites and methods used for the pre-construction surveys (see **Section 2.2.1**). BUS surveys will be completed across all four seasons in Year 1 to Year 4 of operations. Data from operational phase BUS will be compared to pre-construction and where applicable, pre-approval data to assess the extent and likely causes of any changes in bird species composition or activity recorded during the initial operational phase. The requirement for any additional BUS will be determined in conjunction with State and Commonwealth agencies following the completion of the Year 4 annual report.

4.2. Bat Activity Surveys

Operational phase BAS will be undertaken utilising the same sites and methods used for the pre-construction surveys (see **Section 2.2.2**). BAS surveys will be completed across all four seasons in Year 1 to Year 4 of operations. Data from operational phase BAS will be compared to pre-construction and where applicable, pre-approval data to assess the extent and likely causes of any changes in bat species composition or activity during the initial operational phase. The requirement for any additional BAS will be determined in conjunction with State and Commonwealth agencies following the completion of the Year 4 annual report.

4.3. Threatened, migratory and at risk bird species flight behaviour and tracking

The behaviour and flight path of all threatened, migratory and at risk bird species observed during monitoring and opportunistically, will be recorded via spatially enabled digital software such as ESRI Field Maps. The following data will be recorded for each observed bird:

- Species
- Flight start and end time
- Minimum and maximum flight height
- Count of individuals
- Age class of individuals (e.g. juveniles, adults)
- Flight behaviour e.g. soaring, diving.

4.4. Carcass monitoring program

A monthly carcass monitoring program will be implemented at UWF in order to determine the direct impact of turbine strike on bird and bat species and calculate the estimated annual number of individuals that collide fatally with turbines (mortality rate) over an annual period. Collection of carcass monitoring data is important to inform adaptive management that may be implemented to reduce collision risk, monitor impacts to threatened, migratory and at risk species and trigger the requirement for additional monitoring and/or management intervention.

The carcass monitoring program has been designed to generate a statistically robust dataset that can derive estimates of both bird and bat mortality rates, along with monitoring precision. This is achieved by accounting for scavenging and observer detectability factors which can reduce the quantity of bird and bat carcasses recorded during monitoring. Experimental trials form part of the monitoring program so that 'correction factors' can be applied to the estimated annual mortality rate.

4.4.1. Commissioning phase carcass monitoring program

The carcass monitoring program will initially commence during the commissioning phase of the development, once approximately half of the turbines (at least 34 of the 69 turbines) are commissioned and able to be operated simultaneously. Once this program has commenced, the commissioning phase carcass monitoring program will be progressively expanded to include additional turbines as they are commissioned across the wind farm. This program will continue monthly until all turbines have been commissioned, at which time the operational phase carcass monitoring program will commence (see **Section 4.4.2**).

4.4.2. Operational phase carcass monitoring program

Once all turbines have been commissioned (69) and are able to be operated simultaneously, the initial four year operational phase carcass monitoring program will commence. The operational phase carcass monitoring program is proposed to be carried out in Year 1 to Year 4 of UWF full operations. After the completion of this initial operational monitoring phase, the Year 4 annual report will review the program and assess any requirement for ongoing monitoring in conjunction with State and Commonwealth agencies.

4.4.3. Search protocol

Carcass searches sample bird and bat turbine collision mortality and aims to quantify the total collision mortality of a species or species group. In order to determine an adequate survey design for the UWF balancing precision and searcher effort, Symbolix (2021) were engaged to assess a range of survey scenarios and provide statistical justification as to the most suitable survey design (see **Appendix B**). The survey design chosen that maximises precision whilst balancing searcher effort is as follows:

- 69 turbines (100%) searched monthly to a radius of 60 m.

All turbines will have the following associated data recorded:

- Location (easting, northing).
- ID number and distance to nearest turbine.
- Predominant broad vegetation type of surrounding vegetation (250 m radius).
- Predominant Plant Community Type (PCT) of surrounding vegetation (250 m radius).
- Presence and distance to key habitat features such as dams or other surface water, and hollow-bearing trees (HBTs).

Mortality resulting from turbine collision is defined as any dead bird or bat or feather clump (a clump of five or more feathers) located within the search zone, unless there are obvious signs of another cause of death. Searches are to be undertaken by qualified and trained ecologists or by other personnel trained and supervised by ecologists. Given the steep terrain in which some turbines are situated, it is noted that a portion of the 60 m search radius for some turbines may not be safely accessible. In such instances, this will be recorded for the relevant turbine(s) and binoculars and/or drone may be used to visually scan inaccessible areas.

The use of trained detection dogs during the carcass searches will be undertaken four times in the initial four year operational monitoring period. The use of detection dogs is subject to landholder agreement and the availability of suitably trained and experienced detection dog operators. Detection dogs have been successfully used for carcass monitoring across existing Australian wind farms and have advantages with regards to detection efficiency and accuracy (Stark and Muir 2020). To account for seasonal variation including, typical changes in ground cover (and hence observer detectability) and bird and bat species presence across the site, it is intended that the four detection dog carcass search events will be undertaken once across each season (i.e. autumn, winter, spring and summer). However, should specific environmental conditions (e.g. high ground cover, mass eucalypt flowering event) eventuate during the initial four year monitoring period, the proposed seasonal use of detection dogs may be altered accordingly in consultation with BCS. The results from searches undertaken by detection dogs will be compared with the results of human searches in the second annual monitoring report, and a correction factor applied to human results where differences occur, to ensure an accurate estimate of strike rates per turbine.

Bird and bat carcasses located during monitoring will be recorded digitally using geo-referenced data collection software (such as ESRI ArcCollector) with the following data to be recorded:

- GPS location along with distance (m) and compass bearing from the turbine.
- Time and date.
- Turbine ID number.

- Species, age, and sex (where identifiable).
- Signs of injury and/or predation.
- Estimated carcass age.
- Groundcover type and height.
- Immediately surrounding broad vegetation type.
- Current weather conditions and any extreme or unusual weather events since the time of estimated death.
- Photographs (to be provided to qualified ecologist for identification, if required, within two business days).

All recorded carcasses will be:

- Removed from search zone to prevent re-counting and scavenging.
- Handled only by permitted staff (e.g. Project ecologist, trained UWF site personnel) using hand protection (e.g. rubber gloves).
- Packed into a plastic bag, wrapped in paper, and put into a secondary plastic bag.
- The bag will be clearly labelled and placed in the onsite storage freezer.

4.4.4. Carcass and storage registers

A carcass register will be maintained to document all bird and bat carcasses recorded both during monitoring and opportunistically across the UWF. A storage register will also be maintained to document the contents of the onsite storage freezer, with all carcasses to be labelled prior to being placed in the storage freezer. The registers will be held on a secure online platform (such as Microsoft Excel Online) so that both UWF personnel and Project ecologists can access and update the register as required. Carcasses would then be utilised for positive species identification, and for donation to museum collections.

4.4.5. Scavenger Rates and Trials

Scavenger Trials will involve the placement of bird and bat carcasses within the search zone of turbines, to quantify the rate of carcass removal. The metric calculated is survival function, which determines the probability that a carcass will 'survive' in the field past a given time which, when estimated, provides a mean and confidence interval on time to scavenge of a given carcass. Placed carcasses will be paired with a motion-sensitive and colour/infra-red compatible remote camera positioned directly on the carcass. The utilisation of remote cameras allows for an accurate recording of the time and species responsible for scavenging each placed carcass. The trial period will take place across 30 days, after which the cameras will be retrieved for analysis and any remaining carcasses (or part thereof) removed. Carcasses and cameras will be checked twice weekly throughout the duration of the trial. It is intended that Scavenger Trials will be undertaken concurrently with Detectability Trials (see **Section 4.4.5**) and monthly monitoring to re-position carcasses if necessary, and also to maximise efficiency and resources.

The turbines used for the Scavenger Trial will be a subset of the turbines monitored each month and will represent the range of surrounding broad vegetation types and adequate spatial distribution across the site. Scavenger Trials will be undertaken on four occasions during the initial four year operational monitoring phase, with two trials to be undertaken in winter / early-spring and the other two trials to be undertaken in summer / early-autumn, to account for seasonal variation.

To account for potential variation in scavenger rates based on carcass size, three different carcass sizes will be used for each trial, microbat / small bird, medium bird, and large bird. The carcass quantities per size class required to obtain a reasonable measure of average scavenging rates are detailed in **Table 7** below (see Figure 1 in Appendix B Symbolix 2021).

Table 7: Carcass classes and quantities required for scavenger trials

Trial	Microbat / small bird	Medium bird	Large bird
Winter	10	10	10
Summer	10	10	10

4.4.6. Detectability (Observer) trials

Observer detectability is another factor which needs to be accounted for in calculating annual mortality rates, given the inherent limitations which exist with regards to target species (e.g. small and well-camouflaged fauna) and the environment of the UWF (e.g. dense groundcover). Detectability Trials aim to quantify the probability that a searcher will detect a carcass in their search zone, whilst undertaking the prescribed carcass search protocol (**Section 4.4.1**).

Four Detectability Trials will be undertaken in the first four years of full operations, two during winter / early-spring and two during summer / early-autumn, consistent with the timing of Scavenger Trials. The carcass classes and quantities used will also be consistent with those used for the Scavenger Trials (**Table 7**). Given this, and to maximise efficiencies in timing and resources, detectability trials will be undertaken concurrently with the Scavenger Trials and monthly carcass searches. It is important however, that the Detectability Trials are completed in one day, being the first day of the Scavenger Trial and prior to the setup of remote cameras to monitor the carcasses. This will minimise the opportunity for the carcasses to be scavenged and ensure the validity of the trial. To achieve the most applicable result, only personnel who have carried out monthly searches at UWF will be involved in the Detectability Trials.

A maximum of three carcasses (e.g. one carcass of each class size) will be placed within the search zone of a given turbine. A carcass controller (a third party independent from the monthly carcass searches) will throw each carcass into the air, allowing it to land in a manner somewhat consistent with a bird/bat which has collided with a turbine. The carcass controller will collect details on the coordinates, species, timing and groundcover of each placed carcass.

Should insufficient quantities of carcasses be available for the trial, substitute carcasses for these trials will be of similar size, colour and general appearance of the target species group (i.e. mice as substitute for microbats).

4.5. Incidental carcass protocol

UWF personnel may find carcasses within the site during normal operational activities, with this protocol to be relayed to all Project staff as part of the site-specific induction. In the event of an incidental carcass find, the carcass should be photographed immediately, its coordinates and/or precise location noted, and relevant trained and authorised staff notified. Only trained and authorised staff are to handle carcasses and carcass handling and storage is to be implemented consistent with the protocol detailed in **Section 4.4.2**. The carcass is to be collected and transferred to the onsite storage freezer, packed in

accordance with the requirements detailed in **Section 4.4.1**, and the Project ecologist notified within two business days.

4.6. Data analysis and reporting

At the conclusion of each monthly carcass monitoring event, a brief email report will be sent from the Project ecologist to relevant UWF and/or Squadron personnel, outlining the survey results. Results provided in the monthly email report will include the species and quantity of carcasses located, impact trigger information and any other ecologically significant matter (e.g. presence of Feral Pests). In preparing the monthly report, the Project ecologist will also ensure the carcass and storage registers have been updated.

Statistical analysis of carcass monitoring results will be undertaken to provide an estimate of bird and bat mortality resulting from turbine collision. Overall mortality estimates will be provided for birds, bats, and where necessary, individual species. Statistical estimates of total mortality will be undertaken via the combined use of carcass monitoring data and scavenger and detectability trial data. Estimates will also take into account the limitations of the data inputs, with regards to the select area and number of turbines searched as part of the monitoring program.

Results will be presented alongside their relevant confidence intervals and any applicable standard error. Analyses will also aim to identify any spatial, temporal, morphological or other species-specific trends evident within the data. This will ensure that any high risk species and/or turbines are identified so that adaptive management and mitigation measures can be implemented. In accordance with Condition B24(f) of the NSW Development Consent, all raw data collected as part of the monitoring program will also be submitted to BCS and the Planning Secretary.

The results will be detailed in an annual report, to be submitted to relevant State and Commonwealth agencies within three months of the completion of Year 1 to Year 4 operations. The annual report will present the results of monitoring undertaken, and include details of any adaptive management, trigger response or mitigation measures implemented in the previous 12 month reporting period. The Year 4 annual report will present a detailed analysis of the initial four year operational phase monitoring program and discuss the requirement for any further monitoring, adaptive management and/or mitigation.

4.7. Personnel involved

UWF will ensure that it engages suitably qualified and trained people to supervise and implement this BBAMP. BUS and BAS are to be undertaken by qualified and trained ecologists. Carcass searches will also be undertaken by qualified and trained ecologists or by other personnel trained and supervised by trained ecologists.

UWF site management will be trained by the Project ecologist in key components of the implementation of this BBAMP. Such components include the Incidental Carcass and Injured Bird and Bat Protocols, monitoring, notification and reporting requirements, and impact triggers. The Incidental Carcass and Injured Bird and Bat Protocols will also be relayed to all Project staff as part of the site specific induction.

4.8. Injured bird and bat protocol

All Project staff who locate birds and bats are to report the find to the UWF site manager immediately. Consistent with the Incidental Carcass Protocol, only trained and authorised staff are to handle wildlife. The coordinates and/or specific location of the injured animal is to be recorded and risks to the animal and staff assessed. If it is deemed safe to proceed then the animal should be collected in a towel or cloth bag then placed immediately into a dark place (e.g. ventilated cardboard box or wildlife carrier) for transfer to a wildlife carer or veterinarian listed below:

- Wellington Veterinary Hospital, 7086 Mudgee Road, Wellington (02) 6845 2872
- Mudgee Veterinary Hospital, 104 Market Street, Mudgee (24 hours) (02) 6372 2105
- WIRES 1300 094 737.

4.9. Monitoring summary for threatened, migratory and at risk bird and bat species

Table 8: Operational monitoring of threatened, migratory and at risk species / species groups

Species / Species group	General monitoring methodology	Targeted monitoring methodology
Microbats	Carcass monitoring and BAS during Year 1 to Year 4 of operations	Detection dog trial
Migratory birds	Carcass monitoring and BUS during Year 1 to Year 4 of operations	Flight behaviour and tracking
Nomadic nectivorous birds and flying-fox	Carcass monitoring and BUS during Year 1 to Year 4 of operations	Detection dog trial, flight behaviour and tracking, mass flowering response surveys (subject to landholder agreement and the availability of suitably trained and experienced detection dog operators)
Raptors and other at risk bird species	Carcass monitoring and BUS during Year 1 to Year 4 of operations	Flight behaviour and tracking

5. Impact triggers

Bird and bat impacts which themselves represent an unacceptable level of risk or, if continued, are likely to lead to an unacceptable level of risk, have been identified as impact triggers. This section of the BBAMP defines impact triggers for both listed threatened or migratory species, non-listed species and the Wedge-tailed Eagle. The notification requirements, process for investigation and the implementation of mitigation strategies following an impact trigger is also detailed.

5.1. Impact trigger for listed threatened or migratory species

5.1.1. Definition of impact trigger for listed threatened or migratory species

An impact trigger for listed threatened or migratory species occurs if a species listed as threatened (Vulnerable, Endangered or Critically Endangered) or migratory under the NSW BC Act or Commonwealth EPBC Act is found dead or injured beneath or adjacent to a turbine.

5.1.2. Impact trigger investigation

Should a listed threatened or migratory species impact trigger occur, the following response process will be undertaken:

- Immediate notification of relevant UWF and Squadron personnel who will notify the Project ecologist (if not already aware) and State and Commonwealth agencies within five working days.
- Increase carcass monitoring to fortnightly for an initial period of six weeks. If additional carcasses are recorded, monitoring is to continue until a time that is agreed upon between Squadron, the Project ecologist, relevant agencies, and other relevant parties. Where the impacted species is a threatened microbat, the use of detection dogs should be considered, if available.
- Implement targeted monitoring within five working days at the impact turbine and any subsequent turbines where impacts are recorded, along with locations where the target species has been previously sighted. Targeted monitoring methodology and timing should be specific to the impacted species, however, monitoring should continue for a minimum of three consecutive days.
- Within 20 working days of the completion of targeted monitoring, a report will be prepared for State and Commonwealth agencies confirming the likely cause of death and any likely contributing factors or circumstances. The report will also detail the results of targeted monitoring and increased carcass monitoring.
- Accounting for the outcomes of the targeted monitoring and report, as well as any other relevant recently available information (e.g. data from other wind farms, scientific literature), the risk assessment for the species will be updated. The updated risk assessment will re-assess the risk level for the species and determine whether the impact trigger has resulted in a significant impact to the species or is likely to result in a significant impact if repeated.
- If the risk assessment determines a significant impact has occurred or is likely to occur through repeated impact triggers, additional species-specific monitoring and mitigation will

be required and will be determined by Squadron and the Project ecologist in consultation with State and Commonwealth agencies and other relevant parties.

5.2. Impact trigger for non-listed species

5.2.1. Definition of impact trigger for non-listed species

An impact trigger for non-listed species occurs if four or more carcasses from the same species are recorded at the same turbine in two successive searches.

This impact trigger does not apply to the following common and abundant native bird species recorded at UWF, or any introduced bird species:

- Australian Magpie
- Australian Raven
- Eastern Rosella
- Galah
- Grey Butcherbird
- Little Corella
- Noisy Miner
- Red-rumped Parrot
- Pied Butcherbird
- Pied Currawong
- Sulphur-crested Cockatoo.

5.2.2. Impact trigger investigation

Should a non-listed species impact trigger occur, the following response process will be undertaken:

- Immediate notification of relevant UWF and Squadron personnel who will notify the Project ecologist (if not already aware) and State and Commonwealth agencies within five working days.
- Instigate a desktop investigation within five working days to confirm the cause of death and any likely contributing factors or circumstances. Review existing monitoring data for the species and consult with State and Commonwealth agencies and other relevant parties to determine whether any additional monitoring is warranted.
- Once any required monitoring is complete, a report will be prepared for State and Commonwealth agencies within 20 working days. The report will include an updated risk assessment that will re-assess the risk level for the species and determine whether the impact trigger has resulted in a significant impact to the species or is likely to result in a significant impact if repeated.
- If the risk assessment determines a significant impact has occurred or is likely to occur through repeated impact triggers, additional species-specific monitoring and mitigation will be required to be undertaken in consultation with State and Commonwealth agencies and other relevant parties.

5.3. Impact trigger for Wedge-tailed Eagle

5.3.1. Definition of impact trigger for Wedge-tailed Eagle

An impact trigger for Wedge-tailed Eagle occurs if three or more Wedge-tailed Eagles are found dead or injured beneath or adjacent to a turbine during the same monitoring year (e.g. during Year 1 of operational phase monitoring, rather than a calendar year (i.e. January to December)). The impact trigger threshold of three Wedge-tailed Eagles during the same monitoring year has been adopted for this BBAMP based on the UWF CRM undertaken for the species which predicted an upper limit of 2.4 Wedge-tailed Eagle strikes per year (ERM 2013).

5.3.2. Impact trigger investigation

Should a Wedge-tailed Eagle impact trigger occur, the following response process will be undertaken:

- Immediate notification of relevant UWF and Squadron personnel who will notify the Project ecologist (if not already aware) and State agencies within five working days.
- Instigate a desktop investigation within five working days to confirm the cause of death and any likely contributing factors or circumstances. Review existing monitoring data for the species and consult with State agencies and other relevant parties (e.g. species / raptor experts) to determine whether any additional monitoring is warranted.
- Accounting for the outcomes of the desktop investigation and any required monitoring, a report will be prepared for State agencies within 20 working days. The report will include an updated risk assessment utilising monitoring data along with expert and State agency consultation, as well as any other relevant recently available information (e.g. data from other wind farms, scientific literature). The updated risk assessment will re-assess the risk level for the species and determine whether the impact trigger has resulted in a significant impact to the species or is likely to result in a significant impact if repeated.

If the risk assessment determines a significant impact has occurred or is likely to occur through repeated impact triggers, additional species-specific monitoring and mitigation will be required and will be determined by Squadron and the Project ecologist in consultation with State agencies and other relevant parties.

5.4. Mitigation measures and adaptive management to reduce risk

Mitigation measures are required as part of an adaptive management framework to prevent, avoid, and reduce potential risks to bird and bat species from the operation of the UWF. The following subsections detail mitigation measures that will be implemented as standard to prevent and avoid risk, or, can be implemented to reduce risk following the identification of associated impacts.

5.4.1. Carrion removal and stock control

The removal of carrion (e.g. dead livestock, birds, bats and native mammals such as Kangaroos and Wallabies) is required in order to prevent scavenging from at risk bird species including the Australian Raven and Wedge-tailed Eagle. Prompt carrion removal will also reduce the likelihood of feral animals including Red Foxes and Feral Pigs remaining resident within the Project site. The removal of all carrion (excluding bird and bat carcasses which will be documented in the carcass register – **see Section 4.4.2**) should be documented in a carrion removal register maintained by UWF site personnel.

Where possible, and pending landholder agreement, lambing should be restricted to paddocks more than 200 m from operational turbines to reduce the risk that raptors and feral animals are attracted to the area. Where possible, grain feeding of stock should also be restricted to paddocks more than 200 m from operational turbines to reduce the risk of parrots being attracted to the area. The implementation of these mitigation measures will require close coordination with landholders through discussion and notification of feeding areas, planned lambing paddocks and seasons, and annual BBAMP implementation program.

5.4.2. Feral animal control

The reporting and control of feral animals including Red Fox, Feral Cat and Feral Pigs is required to reduce scavenging of bird and bat carcasses across the Project site. Control of European Rabbits and Brown Hare is also required to minimise risk of raptor turbine collision with these feral species, which make up a large proportion of the diet for Wedge-tailed Eagles in particular (Debus 2019).

5.4.3. Minimise raptor perches on turbines

The design of turbines utilised at the UWF will minimise the availability for raptor perches through use of smooth and rounded surfaces where possible.

5.4.4. Lighting on turbines and buildings

Lighting on turbines and other UWF infrastructure should be kept to a minimum to avoid attracting birds, bats, and insects. Specific measures to reduce potential impacts of lighting include the following:

- Use of red lights as opposed to white or yellow lights.
- Synchronise any flashing lights required for aviation safety.
- Baffle and direct area lights downward towards the ground.

5.4.5. Impact mitigation measures and additional monitoring

Mitigation measures are proposed in response to the impact triggers detailed in **Section 5.1 to 5.3** for both threatened and non-threatened bird and bat species and Wedge-tailed Eagle. Additional monitoring may also be required following impact triggers or environmental events which increase the potential for impacts on threatened, migratory and at risk bird and bat species. **Table 9** below details the triggers / impacts and their associated mitigation and monitoring measures to be considered for implementation in response. Should such an impact or trigger event arise, the appropriate response will be agreed to by UWF in consultation with State and Commonwealth agencies, the Project Ecologist and any other relevant parties e.g. species experts.

Table 9: Mitigation and monitoring measures in response to impacts / triggers

Impact	Trigger	Mitigation / Monitoring Measures
Listed species mortality or injury	Any threatened or migratory species listed under NSW BC Act or Commonwealth EPBC Act found dead or injured beneath a turbine.	Targeted monitoring of the impacted species including increased carcass searches (including the use of detection dogs where possible), site wide / local population assessment, breeding status assessment including roost / nest searches and update risk

Impact	Trigger	Mitigation / Monitoring Measures
		assessment in consultation with agencies and other relevant parties (e.g. species experts). Should the risk assessment result in an updated risk level and consider that a significant impact on the species is likely, specific mitigation measures are to be implemented including targeted monitoring to determine habitat utilisation patterns within the site and locality (e.g. radio / satellite tracking), implementation of deterrents and monitoring of efficacy (e.g. noise, visual) and turbine curtailment in response to high-risk environmental factors (e.g. low wind speed, periods of high species activity).
Non-threatened species mortality	Four or more carcasses from the same species are recorded at the same turbine in two successive searches.	Targeted monitoring of the impacted species including increased carcass searches (including the use of detection dogs where possible), site wide / local population assessment, breeding status assessment including roost / nest searches and update risk assessment in consultation with agencies and other relevant parties (e.g. species experts). Should the risk assessment result in an updated risk level and consider that a significant impact on the species is likely, specific mitigation measures are to be implemented including targeted monitoring to determine habitat utilisation patterns within the site and locality (e.g. radio / satellite tracking), implementation of deterrents and monitoring of efficacy (e.g. noise, visual) and turbine curtailment in response to high-risk environmental factors (e.g. low wind speed, periods of high species activity).
Wedge-tailed Eagle mortality	Three or more Wedge-tailed Eagles are found dead or injured beneath or adjacent to a turbine during the same monitoring year	Targeted monitoring of the impacted species including increased carcass searches, site wide / local population assessment, breeding status assessment including nest searches and update risk assessment in consultation with agencies and other relevant parties (e.g. species experts). Should the risk assessment result in an updated risk level and consider that a significant impact on the species is likely, specific mitigation measures are to be implemented including targeted monitoring to determine habitat utilisation patterns within the site and locality (e.g. radio / satellite tracking), implementation of deterrents and monitoring of efficacy (e.g. noise, visual) and turbine curtailment in response to high-risk environmental factors (e.g. periods of high species activity).
Significant decline in species richness of bird and/or bat utilisation post-construction	Statistical analysis determines a significant decline ($p < 0.05$) in total bird and/or total bat species richness post-construction across all Impact sites, but without a similar decline across all Control sites.	Disaggregate the data and analyse key species and potential drivers. Review relevant carcass monitoring and opportunistic data. Undertake targeted surveys if necessary. Update risk assessment for relevant species in consultation with agencies and other parties (e.g. species experts, neighbouring wind farm operators).

Impact	Trigger	Mitigation / Monitoring Measures
Significant decline or increase in abundance of <i>Moderate or High</i> risk level threatened, migratory or at risk bird and bat species	Statistical analysis determines a significant decline or increase ($p = <0.05$) in <i>Moderate or High</i> risk level threatened, migratory or at risk bird and/or bat species abundance post-construction across Impact sites, without similar changes being recorded across Control sites.	Disaggregate the data and analyse potential drivers. Review relevant carcass monitoring and opportunistic data. Undertake targeted surveys if necessary. Update risk assessment for relevant species in consultation with agencies and other parties (e.g. species experts, neighbouring wind farm operators).
Eucalypt mass flowering event	Mass flowering (>25% of eucalypt trees in flower) recorded across the Project site; and Regent Honeyeater, Swift Parrot or Grey-headed Flying-fox recorded onsite or within 50 km of the Project site during mass flowering event.	Consultation with relevant agencies and other parties (e.g. species experts) to be undertaken once mass flowering (>25% of eucalypt trees in flower) recorded across the Project site. The requirement for additional monitoring is to be agreed upon and can include rapid 5-minute bird surveys, including call playback for Regent Honeyeater, targeting areas of flowering eucalypt trees and dusk / early evening Grey-headed Flying-fox fly out / fly in surveys.
Mouse plague	Mouse plague coincides with increased average monthly mortality (>100% increase) of any raptor species.	Increase carcass monitoring to fortnightly for six weeks. Undertake site wide / local population and breeding status assessment. Mouse control measures may be implemented at turbine pads where increased mortality has been recorded.
Threatened or at risk bird nest close to turbine	Confirmed active nest of threatened or at risk bird species within 200 m of operational turbine.	Active nest trees including hollow-bearing trees to be surveyed during turbine micro-siting and avoided where possible. Conduct risk assessment through targeted monitoring and consultation with relevant agencies / parties, including BCS. Consider relocating nest and/or tree once breeding event has concluded.

5.4.6. Summary of management objectives and associated approval conditions, activities, timing, and performance criteria

Table 10 below summarises the management objectives and associated Project approval condition, management activities, timing, and performance criteria for the key components of the BBAMP.

Table 10: Management objectives and associated approval conditions, activities, timing, and performance criteria

Management Objective	Management activities / controls	Timing	Performance Criteria
Baseline data Condition B24 (a)	Complete baseline BUS and BAS.	Autumn 2021 – Summer 2022	BUS and BAS completed prior to the commencement of construction.
Mitigation measures and adaptive management Condition B24 (b) (d)	Carriion removal and stock control. Feral animal control. Minimise raptor perches on turbines. Lighting on turbines and buildings.	During the operation of the UWF	Carcasses removed once identified and recorded in register. Lambing to be avoided in paddocks beneath turbines where possible to minimise risk of increased bird strike. Feral animals reported and controlled and management works recorded.

Management Objective	Management activities / controls	Timing	Performance Criteria
			Raptors are not observed perching on turbines and subsequently impacted. Lighting sources minimised on turbines and buildings.
Impact triggers Condition B24 (c)	Impact triggers clearly documented in BBAMP (this plan).	Prior to the commissioning of the UWF	Impact triggers clearly identified through operational monitoring should they occur. Impact trigger occurrence communicated to State and Commonwealth agencies within five working days.
Monitoring and reporting program Condition B24 (e) (f)	Operational BUS and BAS. Threatened, migratory and at risk bird species flight path and behaviour tracking. Carcass monitoring program.	During the first four years of UWF full operations	Initial operational phase monitoring program completed for first four years of full operations. Monthly summary reporting completed and Annual reporting completed and submitted to State and Commonwealth agencies within three months.

6. Review

This BBAMP and its implementation will be reviewed at least annually during the first four years of operational implementation. Any recommended changes to the BBAMP will be detailed within the annual reports described in Section 4.6.

Furthermore, in accordance with Condition C2 of the development consent, this plan will be reviewed and, if necessary, revised within 3 months of the:

- submission of an incident report under condition C10 of Schedule 2;
- submission of an audit report under condition C15 of Schedule 2; or
- any modification to the conditions of this consent.

Where a review results in a revision to the BBAMP, consultation with BCS will be undertaken as relevant. The revised plan will then be submitted to the Planning Secretary in accordance with Condition C3 of the Consent.

7. References

Australian Wind Energy Association (AusWEA) 2005. *Wind Farms and Birds: Interim Standards for Risk Assessment*. Prepared for the Australian Wind Energy Association by Brett Lane & Associates Pty Ltd in association with Aria Professional Services Pty Ltd.

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Nature Advisory 2021b. *Sapphire Wind Farm Second Year Annual Report on the Implementation of the Bird and Bat Adaptive Management Plan*. Prepared for SFW1 Operations Pty Ltd.

Stark, E and Muir, S 2020. *Post Construction Bird and Bat Monitoring at Wind Farms in Victoria*. In 13th Wind and Wildlife Search Meeting.

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Appendix A – Bird and Bat Risk Assessment

Table 11: Risk assessment for threatened and at risk bird and bat species

Species	Conservation status	Habitat present at UWF	Seasonality and movement behaviour	No. of records at UWF (No. of individuals)	Recorded flight height	Recorded fatalities at Australian wind farms*	Nature of potential impact	Likelihood	Consequence	Risk Rating
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Listed bird species

Brown Treecreeper (eastern subspecies) <i>Climacteris picumnus victoriae</i>	BC Vulnerable	Act:	Breeding and foraging habitat	Year-round sedentary species who forages on ground, fallen timber and in trees.	6 (8)	3-10 m	None	Direct (habitat clearing)	Highly Unlikely	Moderate	Low
Bush Stone-curlew <i>Burhinus grallarius</i>	BC Endangered	Act:	Breeding and foraging habitat	Mostly ground-dwelling but capable of both short (<20 km) and long-range (>100 km) movements, however, little is known about the nature of these movement patterns.	1 (1)	Not recorded but considered unlikely to fly within RSA heights	None	Direct (habitat clearing)	Highly Unlikely	Moderate	Low
Diamond Firetail <i>Stagonopleura guttata</i>	BC Vulnerable	Act:	Breeding and foraging habitat	A low-flying sedentary species which favours low-lying areas of the Project site, away from wind turbines.	10 (39)	1-2 m	None	Direct (habitat clearing)	Highly Unlikely	Moderate	Low
Dusky Woodswallow (eastern subspecies) <i>Artamus cyanopterus</i> subsp. <i>cyanopterus</i>	BC Vulnerable	Act:	Breeding and foraging habitat	Present year-round where the species predominantly forages aerially and from perches. Often flies above the canopy, however, rarely at heights within the RSA.	3 (5)	12-30 m	1	Direct (turbine collision and habitat clearing)	Highly Unlikely	Moderate	Low

Species		Conservation status		Habitat present at UWF	Seasonality and movement behaviour	No. of records at UWF (No. of individuals)	Recorded flight height	Recorded fatalities at Australian wind farms*	Nature of potential impact	Likelihood	Consequence	Risk Rating
Fork-tailed Swift <i>Apus pacificus</i>		EPBC	Act: Migratory	Foraging habitat	Summer migrant which forages aerially and may also migrate through the site within the RSA.	1 (1)	40 m, known to fly at heights within the RSA	None	Direct (turbine collision); Indirect (disturbance and barrier effects)	Unlikely	Moderate	Moderate
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>		BC Vulnerable	Act: Vulnerable	Breeding and foraging habitat	Highly mobile, typically flying at or above canopy height. Can disperse widely (up to 60 km) in search of foraging habitat.	1 (2)	Not recorded but considered unlikely to fly within RSA heights	None	Direct (habitat clearing)	Highly Unlikely	Moderate	Low
Grey-crowned Babbler (eastern subspecies) <i>Pomatostomus temporalis temporalis</i>		BC Vulnerable	Act: Vulnerable	Breeding and foraging habitat	Year-round sedentary species who forages on ground and in trees. Travels throughout local territories from 1-50 ha in size where it typically flies below canopy height.	4 (8)	Not recorded but considered unlikely to fly within RSA heights	None	Direct (habitat clearing)	Highly Unlikely	Moderate	Low

Species		Conservation status		Habitat present at UWF	Seasonality and movement behaviour	No. of records at UWF (No. of individuals)	Recorded flight height	Recorded fatalities at Australian wind farms*	Nature of potential impact	Likelihood	Consequence	Risk Rating
Hooded (south-eastern form)	Robin	BC	Act:	Breeding and foraging habitat	Year-round species, however, can occupy different breeding (up to 10 ha) and non-breeding (up to 30 ha) home ranges. Forages on ground from perches near to the ground, typically flying below canopy height.	1 (1)	Not recorded but considered unlikely to fly within RSA heights	None	Direct (habitat clearing)	Highly Unlikely	Moderate	Low
<i>Melanodryas cucullata</i>	subsp. <i>cucullata</i>											

Species	Conservation status	Habitat present at UWF	Seasonality and movement behaviour	No. of records at UWF (No. of individuals)	Recorded flight height	Recorded fatalities at Australian wind farms*	Nature of potential impact	Likelihood	Consequence	Risk Rating
Regent Honeyeater <i>Anthochaera phrygia</i>	BC Act: Critically Endangered; EPBC Act: Critically Endangered	Foraging habitat	Nomadic nectarivore with the potential to visit the Project site during winter-spring eucalypt mass flowering events where it flies and forages within the canopy. Given, the small population and scarcity of contemporary records both surrounding the Project site and to its west (combined with the Project site's location west of regional key breeding areas), it is unlikely that this species would migrate through the site, and should it do so would likely fly well below RSA, consistent with other honeyeater species migratory movements in the surrounding region.	None	Canopy height, well below RSA	None	Direct (habitat clearing)	Highly Unlikely	High	Moderate

Species		Conservation status		Habitat present at UWF	Seasonality and movement behaviour	No. of records at UWF (No. of individuals)	Recorded flight height	Recorded fatalities at Australian wind farms*	Nature of potential impact	Likelihood	Consequence	Risk Rating
Scarlet Robin	<i>Petroica boodang</i>	BC	Act: Vulnerable	Breeding and foraging habitat	Maintains a breeding territory (1-2 ha) where it typically flies well below canopy height, generally foraging from low perches and taking invertebrates from the ground. Likely to be present in open areas of the Project site near to wind turbines from autumn to early spring.	1 (1)	Not recorded but considered unlikely to fly within RSA heights	None	Direct (habitat clearing)	Highly Unlikely	Moderate	Low
Speckled Warbler	<i>Chthonicola sagittata</i>	BC	Act: Vulnerable	Breeding and foraging habitat	Year-round sedentary species which spends the majority of its time foraging on the ground and perching within shrubs and low in trees.	11 (19)	1-10 m	None	Direct (habitat clearing)	Highly Unlikely	Moderate	Low
Spotted Harrier	<i>Circus assimilis</i>	BC	Act: Vulnerable	Breeding and foraging habitat	Typically flies at low (<20 m) when foraging above open areas and is known to disperse nomadically across regional scales in search of prey. Recorded soaring at heights approaching the RSA.	1 (1)	40-50 m	1	Direct (turbine collision); Indirect (disturbance and barrier effects)	Unlikely	Moderate	Moderate

Species		Conservation status		Habitat present at UWF	Seasonality and movement behaviour	No. of records at UWF (No. of individuals)	Recorded flight height	Recorded fatalities at Australian wind farms*	Nature of potential impact	Likelihood	Consequence	Risk Rating
Superb Parrot	<i>Polytelis swainsonii</i>	BC Vulnerable	Act: Vulnerable	Breeding and foraging habitat	Recorded within the Project site year-round, however, mostly in low-lying areas away from wind turbines. Forages on the ground and within the canopy level, however, mostly within valleys and well-below RSA height.	13 (35)	11-18 m	None	Direct (habitat clearing)	Highly Unlikely	Moderate	Low

Species		Conservation status		Habitat present at UWF	Seasonality and movement behaviour	No. of records at UWF (No. of individuals)	Recorded flight height	Recorded fatalities at Australian wind farms*	Nature of potential impact	Likelihood	Consequence	Risk Rating
Swift Parrot <i>Lathamus discolor</i>	BC Act: Endangered; EPBC Act: Critically Endangered	Foraging habitat	A non-breeding migratory nectarivore in this region, with the potential to visit the Project site during winter-spring eucalypt mass flowering events where it flies and forages within or just above the canopy. Given, the small population and scarcity of contemporary records surrounding the Project site , it is unlikely that this species would migrate through the site, and should it do so, would likely fly below RSA, consistent with other nectivorous parrot species movements in the surrounding region.			None	Canopy height or just above, below RSA	None	Direct (habitat clearing)	Highly Unlikely	High	Moderate
Varied Sittella <i>Daphoenositta chrysoptera</i>	BC Act: Vulnerable	Breeding and foraging habitat	Year-round sedentary species which spends the majority of its time foraging within the canopy. Unlikely to fly across the Project site at heights within the RSA.			2 (9)	Not recorded but considered unlikely to fly within RSA heights	None	Direct (habitat clearing)	Highly Unlikely	Moderate	Low

Species	Conservation status		Habitat present at UWF	Seasonality and movement behaviour	No. of records at UWF (No. of individuals)	Recorded flight height	Recorded fatalities at Australian wind farms*	Nature of potential impact	Likelihood	Consequence	Risk Rating
White-throated Needletail <i>Hirundapus caudacutus</i>	EPBC	Act: Vulnerable, Migratory	Foraging habitat	Summer migrant which forages aerially and may also migrate through the site within the RSA.	2 (45)	Known to fly within the RSA	40	Direct (turbine collision); Indirect (disturbance and barrier effects)	Potential	Moderate	Moderate
Listed bat species											
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	BC	Act: Vulnerable; EPBC Act: Vulnerable	Foraging habitat	Known to forage 40-50 km from roost camps, with two seasonal camps (Wellington and Mudgee) located within this proximity to the Project site. Local camps are typically occupied from spring through to autumn where numbers can fluctuate significantly. Disperses widely across its range in eastern Australia, including at heights within RSA.	1 (1)	Known to fly within the RSA	14	Direct (habitat clearing and turbine collision); Indirect (disturbance and barrier effects)	Potential	Moderate	Moderate

Species		Conservation status		Habitat present at UWF	Seasonality and movement behaviour	No. of records at UWF (No. of individuals)	Recorded flight height	Recorded fatalities at Australian wind farms*	Nature of potential impact	Likelihood	Consequence	Risk Rating
Large Bent-winged Bat		BC Vulnerable	Act:	Foraging habitat	Undertakes migrations of several hundred kilometres between over-wintering and breeding roosts. Forages widely across open and forested habitats, with calls recorded from detectors placed within the RSA.	37	5 calls recorded at 70 m and 9 calls recorded at 110 m	None	Direct (habitat clearing and turbine collision)	Unlikely	Moderate	Moderate
<i>Miniopterus orianae oceanensis</i>												
Yellow-bellied Sheath-tail Bat		BC Vulnerable	Act:	Breeding and foraging habitat	Typically flies fast above the canopy, though will fly at low levels over open areas. The species has been recorded undertaking a general southerly migration during summer, however, little is known about this aspect of the species movements. Recorded from detectors placed within the RSA.	1	2 potential calls recorded at 70 m and 7 potential calls recorded at 110 m	14	Direct (habitat clearing and turbine collision)	Potential	Moderate	Moderate
<i>Saccolaimus flaviventris</i>												
At risk bird species												

Species	Conservation status	Habitat present at UWF	Seasonality and movement behaviour	No. of records at UWF (No. of individuals)	Recorded flight height	Recorded fatalities at Australian wind farms*	Nature of potential impact	Likelihood	Consequence	Risk Rating
Australian Raven <i>Corvus coronoides</i>		Breeding and foraging habitat	Highly common and abundant species present year-round where it forages widely across open and forested habitats. Recorded flying within RSA.	141 (358)	2-85 m	5 (59 unidentified <i>Corvus</i> spp.)	Direct (habitat clearing and turbine collision); Indirect (disturbance and barrier effects)	Likely	Low	Moderate
Black-shouldered Kite <i>Elanus axillaris</i>		Breeding and foraging habitat	Present year round where it forages in open areas mostly below the RSA, however, has the potential to travel across the site within the RSA.	3 (3)	50 m, known to fly at expected rotor heights within the RSA	4	Direct (habitat clearing and turbine collision); Indirect (disturbance and barrier effects)	Unlikely	Low	Low
Brown Falcon <i>Falco berigora</i>		Breeding and foraging habitat	Present year round where it forages in open areas below and within the RSA.	11 (14)	26-100 m	90	Direct (habitat clearing and turbine collision); Indirect (disturbance and barrier effects)	Likely	Low	Moderate

Species	Conservation status	Habitat present at UWF	Seasonality and movement behaviour	No. of records at UWF (No. of individuals)	Recorded flight height	Recorded fatalities at Australian wind farms*	Nature of potential impact	Likelihood	Consequence	Risk Rating
Little Black Cormorant <i>Phalacrocorax sulcirostris</i>		Foraging habitat	Mostly occupies freshwater waterbodies in central west NSW where it perches on logs, rocks and trees. Flies above the water surface before diving to catch prey. May travel at RSA height between waterbodies.	1 (25)	50 m, known to fly within the RSA	None	Direct (turbine collision); Indirect (disturbance and barrier effects)	Unlikely	Low	Low
Masked Woodswallow <i>Artamus personatus</i>		Breeding and foraging habitat	Undertakes seasonal migrations throughout its range and most likely to occupy the Project site during spring to autumn. Forages aerially in flocks, including at heights within the RSA.	1 (10)	60 m, known to fly at expected rotor heights within the RSA.	None	Direct (turbine collision); Indirect (disturbance and barrier effects)	Unlikely	Low	Low
Nankeen Kestrel <i>Falco cenchroides</i>		Breeding and foraging habitat	Present year round where it forages in open areas mostly below the RSA, however, has been recorded travelling across the site within the RSA.	42 (54)	5-150 m	135	Direct (turbine collision); Indirect (disturbance and barrier effects)	Highly Likely	Moderate	High

Species	Conservation status	Habitat present at UWF	Seasonality and movement behaviour	No. of records at UWF (No. of individuals)	Recorded flight height	Recorded fatalities at Australian wind farms*	Nature of potential impact	Likelihood	Consequence	Risk Rating
Straw-necked Ibis <i>Threskiornis spinicollis</i>		Foraging habitat	Forages on the ground in paddocks, croplands and the margins of swamps and lagoons. The species soars at height (often above RSA) over open areas and is highly mobile throughout its range across the majority of the Australian continent.	2 (73)	100-200 m	2	Direct (turbine collision); Indirect (disturbance and barrier effects)	Unlikely	Low	Low
White-browed Woodswallow <i>Artamus leucorhynchus</i>		Breeding and foraging habitat	Undertakes seasonal migrations throughout its range and most likely to occupy the Project site during spring to autumn. Forages aerially in flocks, including at heights within the RSA.	2 (28)	60-110 m	None	Direct (turbine collision); Indirect (disturbance and barrier effects)	Unlikely	Low	Low
White-necked Heron <i>Ardea pacifica</i>		Foraging habitat	Mostly occupies freshwater waterbodies in central west NSW where it forages at ground level, however, has the potential to fly across the site within the RSA.	1 (1)	75 m	None	Direct (turbine collision); Indirect (disturbance and barrier effects)	Unlikely	Low	Low

Species	Conservation status	Habitat present at UWF	Seasonality and movement behaviour	No. of records at UWF (No. of individuals)	Recorded flight height	Recorded fatalities at Australian wind farms*	Nature of potential impact	Likelihood	Consequence	Risk Rating
Wedge-tailed Eagle <i>Aquila audax</i>		Breeding and foraging habitat	Flies high above ridges and valleys, often within and above the RSA throughout a variable home range generally exceeding 1000 ha. Juveniles may disperse up to several hundred km's to establish their own home range.	53 (74)	10-250 m	148	Direct (turbine collision); Indirect (disturbance and barrier effects)	Highly Likely	Moderate	High

At risk bat species

Gould's Wattled Bat <i>Chalinolobus gouldii</i>		Breeding and foraging habitat	Present year-round where it forages widely across open and forested habitats. Recorded from detectors placed at heights within the RSA.	39	4 calls recorded at 70 m	165	Direct (habitat clearing and turbine collision)	Likely	Low	Moderate
Inland Free-tailed Bat <i>Ozimops petersi</i> ; Southern Free-tailed Bat <i>Ozimops planiceps</i> ; Ride's Free-tailed Bat <i>Ozimops ridei</i>		Breeding and foraging habitat	Present year-round where it forages at and above canopy height across both open and forested habitats. Recorded from detectors placed at heights within the RSA.	58	266 calls recorded at 70 m and 208 calls recorded at 110 m	33	Direct (habitat clearing and turbine collision)	Likely	Low	Moderate

Species	Conservation status	Habitat present at UWF	Seasonality and movement behaviour	No. of records at UWF (No. of individuals)	Recorded flight height	Recorded fatalities at Australian wind farms*	Nature of potential impact	Likelihood	Consequence	Risk Rating
Little Forest Bat <i>Vespadelus vulturnus</i>		Breeding and foraging habitat	Present year-round where it forages widely across open and forested habitats. Recorded from detectors placed at heights within the RSA.	32	3 calls recorded at 110 m	29	Direct (habitat clearing and turbine collision)	Likely	Low	Moderate
Little Red Flying-fox <i>Pteropus scapulatus</i>		Foraging habitat	Known to forage widely from roost camps, with two seasonal camps (Wellington and Mudgee) located within this proximity to the Project site. Local camps are typically occupied spring through to autumn where numbers can fluctuate significantly. Disperses widely across its range in northern and eastern Australia, including at heights within RSA.	0	Known to fly at heights within the RSA.	293	Direct (habitat clearing and turbine collision); Indirect (disturbance and barrier effects)	Potential	Moderate	Moderate

Species	Conservation status	Habitat present at UWF	Seasonality and movement behaviour	No. of records at UWF (No. of individuals)	Recorded flight height	Recorded fatalities at Australian wind farms*	Nature of potential impact	Likelihood	Consequence	Risk Rating
White-striped Freetail <i>Austronomus australis</i>	Bat	Breeding and foraging habitat	Present year-round where it forages above the canopy, although lower over open areas. Can undertake nightly foraging within a large range from 2.5 - 20 km. Recorded from detectors placed at heights within the RSA.	32	13 calls recorded at 70 m and 6 calls recorded at 110 m	323	Direct (habitat clearing and turbine collision)	Highly Likely	Moderate	High

*based on published data available as of March 2023 and collated by ELA.

Appendix B – Symbolix Uungula WF BBAMP advice



Uungula WF BBAMP advice

Prepared for CWP Renewables, 15 December 2021, Ver. 1.0

1 About this document

CWP is preparing a BBAMP as part of the approvals process for Uungula Wind Farm. This document provides statistical review of key components of the study. In undertaking the review we consider the competing survey needs:

- Obtaining an unbiased estimate of total turbine strike.
- Optimising the probability of carcass detections, through survey frequency and timing.
- Maintaining operational safety and human/canine resources (e.g. avoiding excessive field survey load or poor field conditions).

In this memo we consider each component of the proposed surveys and provide general advice about each, with reference to the methodology in the provided BBAMP ([EcoLogical Australia 2021](#)). To guide this advice we will estimate the impact of our choices on both the statistical uncertainty of the mortality estimate and the survey effort.

2 Design considerations

2.1 Site specifics

- The species of concern are: White-throated Needletail, Superb Parrot, Grey-headed Flying Fox, Yellow-bellied Shearwater, Wedge-tailed Eagle, Straw-necked Ibis, and White-striped Freetail Bat.
- The site has three broad vegetation types: cleared/grassland vegetation, open woodland, and closed woodland vegetation. This may require stratification into areas of different scavenger rate or searcher efficiency.

What determines a statistically valid monitoring program

A good statistical sampling design must balance four broad considerations ([Kish 1995](#)):

- **Goal orientation:** The design must reflect the goal; e.g. to determine the mortality rate



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Ungula WF BBAMP advice

across the whole site we should sample randomly from the whole site (rather than bias to certain areas).

- **Measurability:** The design must support statistical inference/estimation, including the ability to determine measures of statistical variability (e.g. standard errors). In this project, we want to ensure the design will support the application of a Horvitz-Thompson style estimator (analytical or algorithmic) for mortality estimation.
- **Practicality:** The design must be practical. For example, assuring 95%+ detection probability is not practical within the bounds of OH&S requirements using dogs or humans (e.g. see [Moloney and Smales \(2019\)](#) for modelling of detection probabilities). However, collecting robust data to enable a Horvitz-Thompson style estimate of mortality (see next section) is practical and feasible.
- **Economy:** This is economy in the broad sense of not oversampling beyond the point required by our objectives. For instance, we will obtain a more precise estimate of the time to scavenger loss with 200 carcass trials than 20, but there is a point of diminishing returns where the extra information gathered is not justified by the effort (when such effort could potentially be used on actual conservation outcomes).

2.2 Mortality program objectives

The primary objective of this wind farm post-construction mortality program is to generate a statistical estimate of the number of bird and bat fatalities due to turbine collision over a period of time (typically annually). We will need to estimate total mortalities for groups of species and individual estimates for species of concern.

This requires a statistical design so that the carcass counts can be expanded to estimate total mortality. This does not require full coverage of the site - only a randomised statistical sample. However, we attempt to ensure there is "reasonable" coverage to assist with adaptive management.

This letter will assess the design based on **current understanding of best practice for estimating mortality from carcass search programs**. For clarity, we outline that approach first.

Standard approach to estimation

To assess measurability, we need to establish the metric the data will feed. Mortalities ($\hat{M}_{ij}$) at turbine i during search j are estimated by ([M. M. P. Huso, Dalthorp, and Korner-Nievergelt \(2015\)](#) and references therein)

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



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where

- 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

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

- a_i is the fraction of total carcasses within the searched area
- p_{ij} is the probability that an existing carcass will be detected by the searcher
- s_{ij} is the fraction of the carcasses that arrived at turbine i but have not been lost to scavenge or decay before search j . It is a function of the rate of decay and the search interval, relative to the expected time to scavenge (M. M. Huso 2011)

Through field surveys we can estimate $\hat{A}$, $\hat{s}$ and $\hat{p}$. C is given by the field observation data.

These components estimate $\hat{M}$ (and confidence bounds) for the site and time period.

Now that we have outlined the framework, we consider each component of the proposed design against that framework.

3 Field design

3.1 Scavenger trials

Scavenger trials involve leaving carcasses out in field and monitoring their time until removal.

3.1.1 Aim

The purpose of scavenger (or carcass persistence) trials is to quantify the rate of removal of carcasses from the study area.

3.1.2 Metric studied

The metric studied is the *survival function* $S(t)$, which determines the probability that a carcass will "survive" in-field past time t . When this is estimated, the mean and confidence interval on time to scavenge can be found.

3.1.3 Field methodology

- Two studies will be conducted, with one in winter and one in summer.

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- *"The turbines used for the Scavenger Trial will be a subset of the turbines monitored each month and will represent the range of surrounding broad vegetation types and adequate spatial distribution across the site."* (EcoLogical Australia 2021)
- In total, 14 microbat/small bird carcasses, 14 medium bird carcasses, and 10 large bird carcasses will be used.
- Remote cameras will monitor the carcasses for a period of 30 days.

3.1.4 Advice: Minimum sample size

If we assume a lognormal loss function for carcasses, the relative standard error on the median loss time is:

$$RSE(n|\hat{\mu}, \hat{\sigma}^2) = \frac{\sqrt{[\exp(\hat{\sigma}^2/n) - 1] \cdot \exp(2\hat{\mu} + \hat{\sigma}^2/n)}}{\exp(\hat{\mu})}$$

Figure 1 shows the sample size n versus the relative standard error, under the assumption of a lognormal scavenger loss function. The parameters μ and σ^2 are taken from a model of time to loss for bat carcasses (Stark and Muir 2020).

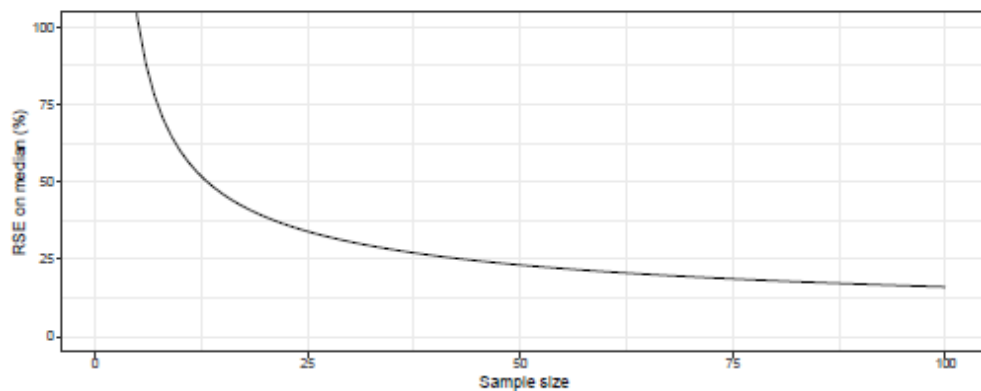


Figure 1: Sample size versus relative standard error.

The precision is not greatly improved by increasing the number of trials. 20 trials balances the precision requirements with the operational difficulty of sourcing carcasses.

As each stratum is estimated independently, you would need to have 20 trials for each size class.



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3.2 Searcher efficiency trials

Searcher efficiency trials involve the surveyors going out into field as in the main mortality program and looking for prior (manually) placed carcasses.

3.2.1 Aim

The aim of searcher efficiency trials is to quantify the probability that the searcher will find a carcass, given it is within their search area.

3.2.2 Metric studied

We are interested in the parameter p , which is the probability of that a searcher finds a carcass given it is within their search area.

3.2.3 Field methodology

- Two detectability trials will be performed, with one in winter and one in summer.
- The carcass classes and quantities used will be the same as those used for the scavenger trials.

3.2.4 Advice: Minimum sample size

Stark and Muir (2020) found that while human and canine searchers had approximately the same searcher efficiency for birds, they were quite different for bats (52% for humans versus 84% for dogs).

Figure 2 shows the confidence intervals on two searcher types. The left plot shows the confidence interval when probability of success $p = 0.52$, which is consistent with human observers looking for bats (Stark and Muir 2020). The right plot shows the confidence interval when $p = 0.86$, which is consistent with canine observers, or human observers looking for birds. In both, we can see diminishing returns in the size of the 95% confidence intervals with increasing sample size.

For observers with high searcher efficiency (right plot), about $n = 20$ trials is a good balance between confidence interval size and sample size. If the searcher efficiency is closer to 50% (left plot), then approximately $n = 30$ are needed. As for scavenger trials, you would need to have this number of trials for each stratum.

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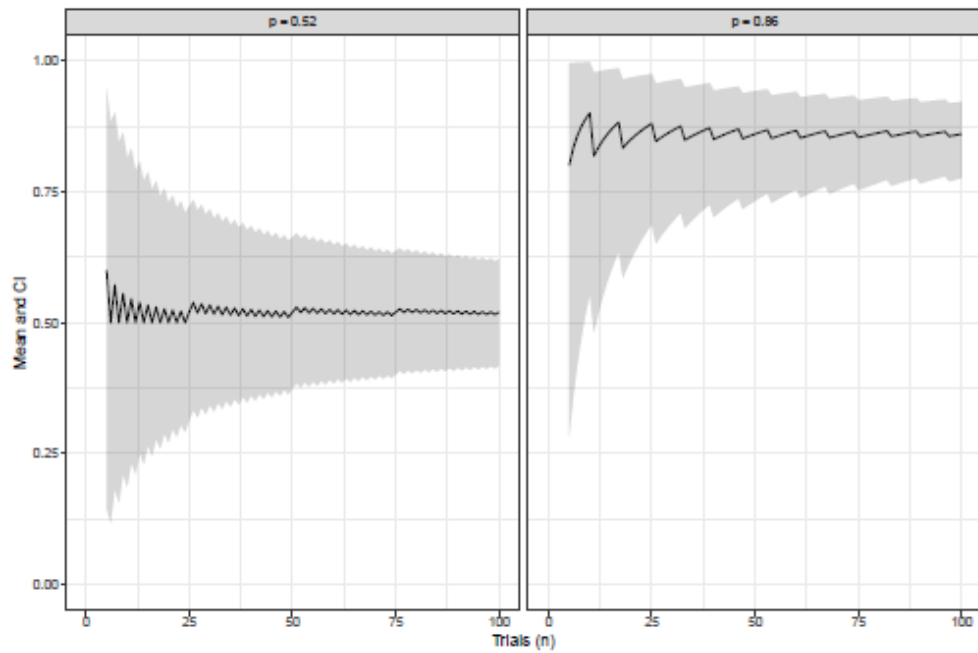


Figure 2: Confidence intervals of probability of finding a carcass.



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3.3 Proportion of area searched

3.3.1 Aim

Quantify an expansion factor to account for carcasses that fall outside the searched area of a turbine.

3.3.2 Metric estimated

The landing position of a struck carcass forms a radial distribution from the base of the turbine, and is dependant on the mass, size, and shape of the animal, as well as the size and height of the turbine (Hull and Muir 2010).

We need to estimate the proportion of this distribution covered by the proposed survey protocol.

3.3.3 Analysis method

Hull and Muir (2010) use a Monte-Carlo simulation to generate the distribution of landing positions (the 'fall zone'), using a physics-based ballistics equation.

We have used that same software to generate the fall zone distribution for bats for Uungulua Wind Farm. We assume the hub height is 148 m and the blade length 80.4 m.

The results are shown in Figure 3.

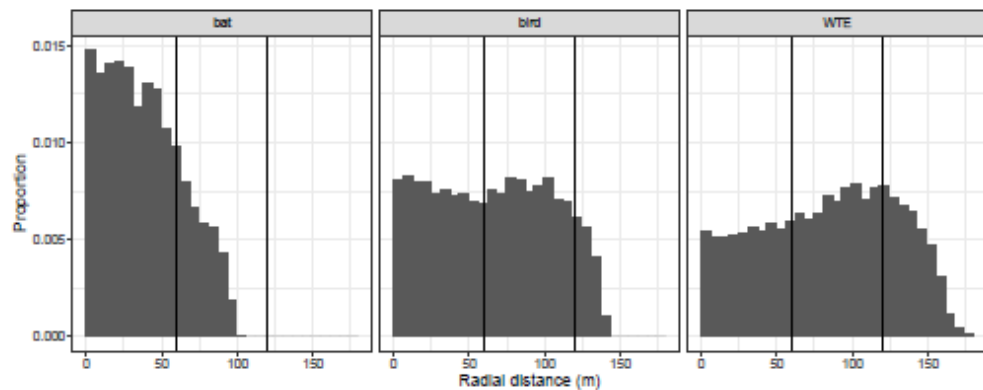


Figure 3: Fall zone distributions for bats, birds, and WTEs. The vertical lines represents the 60 m and 120 m search radii.



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3.3.4 Advice: Suitable search radius

The proposed search radius for standard searches of 120 m covers approximately 100% of the bat fall zone, 91% of the bird fall zone, and 75% of the WTE fall zone. The 60 m circular search zone used in pulse searches covers approximately 78% of the bat fall zone, 45% of the bird fall zone, and 33% of the WTE fall zone.

The 120m radius survey is sufficiently sized to capture general birds and Wedge-tailed Eagles, while the 60m survey (of which the aim is to capture fast-scavenged carcasses such as bats and small birds) is also sufficient.

3.4 Carcass searches and mortality estimation

3.4.1 Aim

The carcass searches sample the actual turbine collision mortalities and provide the final input to estimate the total mortality.

Mortality estimation aims to quantify the total collision mortality of a species or species cohort. It provides a comparison metric between sites, and adds to cumulative modelling.

3.4.2 Metric studied

The metric under consideration is the total mortality of a species (cohort) of interest due to wind turbine operation.

3.4.3 Assumptions

These are the set of assumptions for the model:

- Bats are only on site October - April (inclusive).
- Detectability: Using human searchers, bird detectability is 88% and bat detectability is 52%. Values are taken from [Stark and Muir \(2020\)](#).
- Scavenge rate: The median time to total loss via scavenge for bat carcasses is 2.7 days, with a 95% confidence window of [2.1, 3.4] days. For bird carcasses, the median time to total loss via scavenge is 5.7 days, with a 95% confidence window of [4.8, 6.8] days. For WTE carcasses, the median time to total loss via scavenge is 287.3 days, with a 95% confidence window of [130.1, 634.5] days. Values taken from [Stark and Muir \(2020\)](#).
- Proportion of fall zone searched: We use the values for each species and search radius from Section 3.3.



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3.4.4 Scenarios

We compare the following set of scenarios:

- Original (described in the BBAMP): 33 turbines (34% of total) are searched each month to a radius of 120 m. In October to April (inclusive), a "pulse" survey with a search radius of 60 m is performed three days after the first search.
- Scenario 1: 97 (100%) turbines are searched each month to a radius of 60 m.
- Scenario 2: 97 (100%) turbines are searched each month to a radius of 120 m.
- Scenario 3: 48 (50%) turbines are searched twice every month, first to a radius of 120 m and then three days later to a radius of 60 m.

3.4.5 Advice: Survey design

There are a variety of ways to assess a survey design. The two we have chosen to focus on are **precision** and **searcher effort**.

Precision is the degree of certainty on the true value of mortalities, given a number of carcasses found on the ground. We are looking for a high precision, which means a small spread of potential true values of mortalities.

Figure 4 shows the precision of the various designs. To generate this figure, we look at all simulations in which **two carcasses were found over a two year period** (under the simulated search conditions).

We use a boxplot to show the spread of the potential total number of mortalities¹. The one-sided 95% confidence limit² is shown with the red marking.

We can see that scenarios 1 and 2 have the highest precision (low spread), whereas the original scenario and scenario 3 have lower precision (high spread).

¹A boxplot has the middle 50% of the data within the "box," with the horizontal centre line being the median values. The vertical lines show the tail of the distribution (lower 25% and upper 25%), with dots showing outlier values.

²The value which there's only a 5% chance of exceeding

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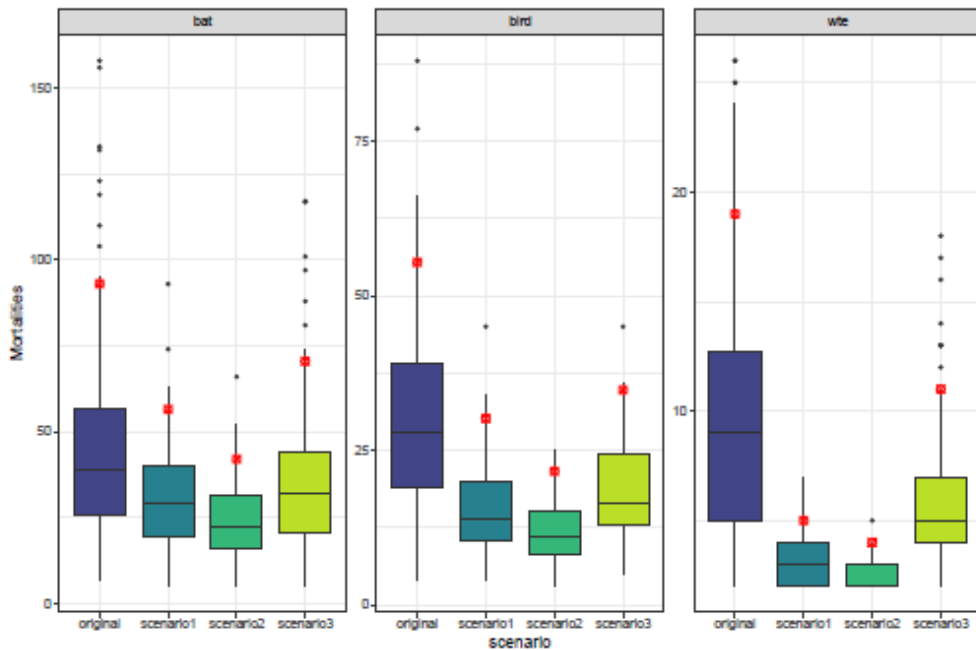


Figure 4: Comparison of scenario precision. Boxplots show the spread of potential total number of mortalities given that two carcasses are found over a two year period. The one-sided 95% confidence limit is shown in red. Note: the scale of y-axis is different between panels.

We assess searcher effort by analysing the distance walked by the observers. To do this, we use the methodology specified in the BAM Plan. Assuming 6 m between transects in the inner zone (to 60 m) and 12 m between transects in the outer search zone (to 120 m), the total transect length is 5089 m for a 120 m search radius or 2073 m for a 60 m search radius.

Figure 5 shows searcher effort in kilometres walked in one year (by a single searcher). We can see that the scenario 2 has the highest search effort, followed by scenario 3. The original scenario and scenario 1 have the lowest search effort.



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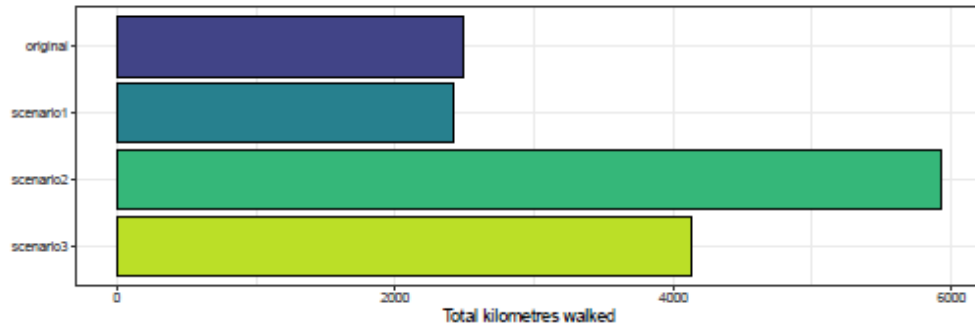


Figure 5: Kilometres walked per year for each scenario.

Balancing the results from Figures 4 and 5, we can see there are different “classes” of survey when we cross-classify by precision and search effort. The two higher-precision designs are scenario 1 and scenario 2 (scenario 2 is generally more precise), and the two lower-precision designs are the original and scenario 3 (scenario 3 is generally more precise). In terms of search effort, the original and scenario 1 have a similar amount of walking per year (approx. 2000 km), followed by scenario 3 (approx. 4000 km), followed by scenario 2 (approx. 5800 km). Evidently, the price for greater precision is greater search effort. That being said, a few key results emerge:

- for a similar amount of km walked (original versus scenario 1), **scenario 1 has a higher precision**
- scenario 1 and scenario 3 have similar precision (although scenario 1 is generally a little more precise), but **scenario 1** requires far less search effort
- scenario 1 and scenario 2 have similar precision (although scenario 2 is a little more precise), but **scenario 1** requires far less search effort.

Out of our proposed options, scenario 1 appears to be a good balance between precision and distance walked. We are happy to refine the survey design upon discussion.



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- Stark, E, and S Muir. 2020. "Post Construction Bird and Bat Monitoring at Wind Farms in Victoria." In. 13th Wind and Wildlife Research Meeting.

Appendix C – Additional compliance requirements for SSD-6687

Table 12: Additional conditions and compliance requirements (Development Consent SSD-6687)

Condition	Condition Wording	Commitment to Compliance
OBLIGATION TO MINIMISE HARM TO THE ENVIRONMENT		
A1	In meeting the specific performance measures and criteria in this consent, all reasonable and feasible measures must be implemented to prevent, and if prevention is not reasonable and feasible, minimise, any material harm to the environment that may result from the construction, operation, rehabilitation or decommissioning of the development.	All reasonable and feasible measures will be implemented to prevent and minimise harm to the environment throughout all stages of the development. Adherence to conditions of the consent are to be incorporated into UWF's internal Compliance Tracking Matrix, which will be maintained by the Environmental Advisor throughout the development.
TERMS OF CONSENT		
A2	The development may only be carried out: a. in compliance with the conditions of this consent; b. in accordance with all written directions of the Planning Secretary; c. generally in accordance with the EIS; and d. generally in accordance with the Development Layout in Appendix 2.	The development will be carried in accordance with the terms detailed in Condition A2 and listed adjacent. All conditions of consent incorporated into UWF's internal Compliance Tracking Matrix, which will be maintained by the Environmental Advisor throughout the development.
A3	The Applicant must comply with any requirement/s of the Planning Secretary arising from the Department's assessment of: a. any strategies, plans or correspondence that are submitted in accordance with this consent; b. any reports, reviews or audits commissioned by the Department regarding compliance with this consent; and c. the implementation of any actions or measures contained in these documents.	The development will comply with any requirement/s of the Planning Secretary included the items detailed in Condition A3 and listed adjacent. All conditions of consent incorporated into UWF's internal Compliance Tracking Matrix, which will be maintained by the Environmental Advisor throughout the development.
EVIDENCE OF CONSULTATION		
A9	Where conditions of this consent require consultation with an identified party, the Applicant must: a. consult with the relevant party prior to submitting the subject document to the Planning Secretary for approval; and b. provide details of the consultation undertaken including: i. the outcome of that consultation, matters resolved and unresolved; and ii. details of any disagreement remaining between the party consulted and the Applicant and how the Applicant has addressed the matters not resolved.	Details of consultation completed with an identified party are included in this Management Strategy/Plan/Program.

Condition	Condition Wording	Commitment to Compliance
COMPLIANCE		
A13	The Applicant must ensure that all of its employees, contractors (and their sub-contractors) are made aware of, and are instructed to comply with, the conditions of this consent relevant to activities they carry out in respect of the development.	Employees, contractors, and sub-contractors will be made aware of, and will be instructed to comply with the conditions of the consent, including the requirements of Management Plans and Strategies that are relevant to the works they carry out, including this BBAMP. This will be achieved through Project inductions, toolbox talks, and other training and awareness requirements detailed within the Environmental Management Strategy, which will include the requirement for bird and bat collision recording and notification throughout the development.
COMMUNITY CONSULTATIVE COMMITTEE		
A20	The Applicant must operate a Community Consultative Committee (CCC) for the development in accordance with the Department's Community Consultative Committee Guidelines: State Significant Projects (2016), or its latest version.	A Community Consultative Committee (CCC) has been established for the Uungula Wind Farm in accordance with the Department's Guideline. Minutes of the CCC meetings will be made publicly available via the Project Website, at: http://squadronenergy.com/our-projects/uungula-wind-farm
REVISION OF STRATEGIES, PLANS AND PROGRAMS		
C2	The Applicant must: - update the strategies, plans or programs required under this consent to the satisfaction of the Planning Secretary prior to carrying out any upgrading or decommissioning activities on site; and - review and, if necessary, revise the strategies, plans or programs required under this consent to the satisfaction of the Planning Secretary within 3 month of the: - submission of an incident report under condition C10 of Schedule 2; - submission of an audit report under condition C15 of Schedule 2; or - any modification to the conditions of this consent.	The Proponent will ensure that Management Strategies, Plans, and Programs will be reviewed and updated in accordance with the requirements of this Condition. If a Strategy, Plan or Program is updated, then the Proponent will comply with the requirements of Condition C3 regarding approval.

Condition	Condition Wording	Commitment to Compliance
STAGING, COMBINING AND UPDATING STRATEGIES, PLANS OR PROGRAMS		
C3	With the approval of the Planning Secretary, the Applicant may: - prepare and submit any strategy, plan or program required by this consent on a staged basis (if a clear description is provided as to the specific stage and scope of the development to which the strategy, plan or program applies, the relationship of the stage to any future stages and the trigger for updating the strategy, plan or program); - combine any strategy, plan or program required by this consent (if a clear relationship is demonstrated between the strategies, plans or programs that are proposed to be combined); and - update any strategy, plan or program required by this consent (to ensure the strategies, plans and programs required under this consent are updated on a regular basis and incorporate additional measures or amendments to improve the environmental performance of the development).	The Project will be developed in two stages: - Stage 1: Wind Farm and associated infrastructure with the exception of the 'Battery Storage Facility'. - Stage 2: Battery Storage Facility. The Planning Secretary has agreed that the Fire Hazard Analysis (condition B38) and Fire Safety Study (condition B39) are only required for Stage 2. All other Strategies, Plans and Programs will be prepared and submitted for Stage 1, and then updated for Stage 2 where required. Updated Strategies, Plans and Programs will be submitted to the Planning Secretary for approval in accordance with Condition C3(c).
C4	If the Planning Secretary agrees, a strategy, plan or program may be staged or updated without consultation being undertaken with all parties required to be consulted in the relevant condition in this consent	The Proponent will stage or update Strategies, Plans or Programs in consultation with the relevant identified party, unless the Secretary has agreed that the consultation is not required.
C5	If approved by the Planning Secretary, updated strategies, plans or programs supersede the previous versions of them and must be implemented in accordance with the condition that requires the strategy, plan or program.	Updated Strategies, Plans and Programs will supersede the previous versions of them and will be implemented in accordance with the relevant condition. Also, the plan will be updated on the project website in accordance with Condition C16.
C6	If the Planning Secretary agrees, a strategy, plan or program may be staged without addressing particular requirements of the relevant condition of this consent if those requirements are not applicable to the particular stage.	The Project will be developed in two stages: - Stage 1: Wind Farm and associated infrastructure with the exception of the 'Battery Storage Facility'. - Stage 2: Battery Storage Facility. The Planning Secretary has agreed that the Fire Hazard Analysis (condition B38) and Fire Safety Study (condition B39) are only required for Stage 2. All other Strategies, Plans and Programs will be prepared and submitted for Stage 1, and then updated for Stage 2 where required.

Condition	Condition Wording	Commitment to Compliance
NOTIFICATION OF DEPARTMENT		
C7	Prior to commencing the construction, operations, upgrading or decommissioning of the development or the cessation of operations, the Applicant must notify the Department in writing via the Major Projects website portal of the date of commencement, or cessation, of the relevant phase. If any of these phases of the development are to be staged, then the Applicant must notify the Department in writing prior to commencing the relevant stage, and clearly identify the development that would be carried out during the relevant stage.	Prior to commencing the construction, operations, upgrading or decommissioning of the development or the cessation of operations, the Applicant will notify the Department in writing via the Major Projects website portal of the date of commencement, or cessation, of the relevant phase. If any of these phases of the development are to be staged, then the Applicant will notify the Department in writing prior to commencing the relevant stage, and clearly identify the development that would be carried out during the relevant stage.
FINAL LAYOUT PLANS		
C8	Prior to commencing construction, the Applicant must submit detailed plans of the final layout of the development to the Department via the Major Projects website, including: - details on siting of wind turbines, including micro-siting of any wind turbines and/or ancillary infrastructure (including wind monitoring masts); - the GPS coordinates of the wind turbines; and - showing comparison to the approved layout. The Applicant must ensure that the development is constructed in accordance with the Final Layout Plans.	Detailed plans of the final layout of the development will be submitted to the Department via the Major Projects website, prior to the commencement of construction, in accordance with this Condition.
WORK AS EXECUTED PLANS		
C9	Prior to commencing operations or following the upgrades of any wind turbines or ancillary infrastructure, the Applicant must submit work as executed plans of the development and showing comparison to the final layout plans to the Planning Secretary, via the Major Projects website.	Work As Executed Plans will be submitted to the Planning Secretary prior to commencing operations or following the upgrades of any wind turbines or ancillary infrastructure. Note: The Work as Executed Plans can only be produced upon completion of construction of the development.
INCIDENT NOTIFICATION		
C10	The Department must be notified via the Major Projects website portal immediately after the Applicant becomes aware of an incident. The notification must identify the development (including the development application number and the name of the development if it has one), and set out the location and nature of the incident. Subsequent notification requirements must be given, and reports submitted in accordance with the requirements set out in Appendix 9.	If the Applicant becomes aware of an Incident, the Department will be notified in writing via the Major Projects portal as soon as practicable. The requirements of Appendix 9 'Incident Notification and Reporting Requirements' are listed at the bottom of this Table. An Incident is defined as: <i>An occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance.</i>

Condition	Condition Wording	Commitment to Compliance
NON-COMPLIANCE NOTIFICATION		
C11	The Planning Secretary must be notified in writing via the Major Projects website within seven days after the Applicant becomes aware of any non-compliance.	The Proponent will submit a written notification to the Department via the Major Projects website, within seven days of becoming aware of any non-compliance. A non-compliance is defined as: <i>An occurrence, set of circumstances or development that is a breach of this consent.</i>
C12	A non-compliance notification must identify the development and the application number for it, set out the condition of consent that the development is non-compliant with, the way in which it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance.	Any non-compliance notification submitted to the Department under Condition C11 will address the requirements of Condition C12.
C13	A non-compliance which has been notified as an incident does not need to also be notified as a noncompliance	The Proponent notes that a non-compliance does not need to be notified to the Department if it has already been notified as an Incident.
INDEPENDENT ENVIRONMENTAL AUDIT		
C15	Independent Audits of the development must be conducted and carried out at the frequency described and in accordance with the Independent Audit Post Approval Requirements (2020), unless otherwise agreed or directed by the Planning Secretary.	Unless otherwise agreed or directed by the Planning Secretary, an Independent Environmental Audit will be conducted in accordance with the timeframes nominated in the PAR (2020), being: • within the 12 weeks of the commencement of construction; • during construction, at intervals no greater than 6 months from the date of the initial audit; • within 6 months of commencement of operations; and • at intervals no greater than 3 years from the initial operational audit.

Condition	Condition Wording	Commitment to Compliance
ACCESS TO INFORMATION		
C16	The Applicant must: a. make the following information publicly available on its website as relevant to the stage of the development: i. the EIS; ii. the final layout plans for the development; iii. current statutory approvals for the development; iv. approved strategies, plans or programs required under the conditions of this consent; v. the proposed staging plans for the development if the construction, operation and/or decommissioning of the development is to be staged; vi. a comprehensive summary of the monitoring results of the development, which have been reported in accordance with the various plans and programs approved under the conditions of this consent; vii. a complaints register, which is to be updated on a monthly basis; viii. minutes of CCC meetings; ix. the annual Statement of Compliance with the EPL; x. any independent environmental audit, and the Applicant's response to the recommendations in any audit; and xi. any other matter required by the Planning Secretary; and b. keep this information up to date	The Proponent will make this information available on the website, including Management Strategies, Plans and Programs per item (iv).

Condition	Condition Wording	Commitment to Compliance
INCIDENT NOTIFICATION AND REPORTING REQUIREMENTS		
APPENDIX 9	1. A written incident notification addressing the requirements set out below must be submitted to the Planning Secretary via the Major Projects website within seven days after the Applicant becomes aware of an incident. Notification is required to be given under this condition even if the Applicant fails to give the notification required under condition C10 of Schedule 2 or, having given such notification, subsequently forms the view that an incident has not occurred. 2. Written notification of an incident must: b. identify the development and application number; c. provide details of the incident (date, time, location, a brief description of what occurred and why it is classified as an incident); d. identify how the incident was detected; e. identify when the applicant became aware of the incident; f. identify any actual or potential non-compliance with conditions of consent; g. describe what immediate steps were taken in relation to the incident; h. identify further action(s) that will be taken in relation to the incident; and i. identify a project contact for further communication regarding the incident 3. Within 30 days of the date on which the incident occurred or as otherwise agreed to by the Planning Secretary, the Applicant must provide the Planning Secretary and any relevant public authorities (as determined by the Planning Secretary) with a detailed report on the incident addressing all requirements below, and such further reports as may be requested. 4. The Incident Report must include: j. a summary of the incident; k. outcomes of an incident investigation, including identification of the cause of the incident; l. details of the corrective and preventative actions that have been, or will be, implemented to address the incident and prevent recurrence; and m. details of any communication with other stakeholders regarding the incident.	This information will be included in any written Incident Notification that is submitted to the Department in accordance with Condition C10.

